DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 281

SURFACE WATER SUPPLY OF THE UNITED STATES

1910

PART I. NORTH ATLANTIC COAST

PREPARED UNDER THE DIRECTION OF M. O. LEIGHTON

BY

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WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

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SURFACE WATER SUPPLY OF THE NORTH ATLANTIC COAST, 1910.

By C. C. BABB, C. C. COVERT, and R. H. BOLSTER.

INTRODUCTION.

AUTHORITY FOR INVESTIGATIONS.

This volume contains results of measurements of the flow of certain streams in the United States. The work was performed by the water-resources branch of the United States Geological Survey, either independently or in cooperation with private or State organizations. The organic law of the Geological Survey (Stat. L., vol. 20, p. 394) contains the following paragraph:

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

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

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.

The various appropriations that have been made for this purpose are as follows:

Annual appropriations for the fiscal year ending June 30—

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

SCOPE OF INVESTIGATIONS.

These investigations are not complete nor do they include all streams that might be advantageously studied. The scope of the work is limited by the appropriations available. The field covered is the widest and the character of the work is believed to be the best possible under the controlling conditions. The work would undoubtedly have greater scientific importance and ultimately be of more practical value if the money now expended for wide areas were concentrated on a few small drainage basins, but such a course is impossible because general appropriations made by Congress are applicable to all parts of the country. Each part demands its proportionate share of the benefits.

It is essential that records of stream flow shall be kept during a period of years long enough to determine within reasonable limits the entire range of flow from the absolute maximum to the absolute minimum. The length of such a period manifestly differs for different streams. Experience has shown that the records for some streams should cover 5 to 10 years, and those for other streams 20 years or even more, the limit being determined by the relative importance of the stream and the interdependence of the results with other long-time records on adjacent streams.

In the performance of this work an effort is made to reach the highest degree of precision possible with a reasonable expenditure of time and a judicious expenditure of a small amount of money. In all engineering work there is a point beyond which refinement is needless and wasteful, and this statement applies with especial force to stream-flow measurements. It is confidently believed that the stream-flow data presented in the publications of the Survey are in general sufficiently accurate for all practical purposes. Many of the records are, however, of insufficient length, owing to the unforeseen reduction of appropriations and consequent abandonment of stations. All persons are cautioned to exercise the greatest care in using such incomplete records.

Records have been obtained at nearly 2,000 different points in the United States. The surface water supply of small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in Hawaii has also been investigated. During 1910 regular gaging stations were maintained by the Survey and cooperating organizations at about 1,100 points in the United States, and many discharge measurements were made at other points. Data were also obtained in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the regular surface water-supply papers and in special papers from time to time.

PUBLICATIONS.

The data on stream flow collected by the United States Geological Survey have appeared in the annual reports, bulletins, and water-supply papers. Owing to natural processes of evolution and to changes in governmental requirements, the character of the work and the territory covered by these different publications have varied greatly. For the purpose of uniformity in the presentation of reports a general plan has been agreed upon by the United States Reclamation Service, the United States Forest Service, the United States Weather Bureau, and the United States Geological Survey, according to which the area of the United States has been divided into twelve parts, whose boundaries coincide with certain natural drainage lines. The areas so described are indicated by the following list of papers on surface-water supply for 1910. The dividing line between the North Atlantic and South Atlantic drainage areas lies between York and James rivers.

Papers on surface water supply of the United States, 1910.

Part.	No.	Title.
I	281.	North Atlantic coast.
II	282	South Atlantic coast and eastern Gulf of Mexico.
III	283	Ohio River basin.
IV	284	St. Lawrence River basin.
V	285	Upper Mississippi River and Hudson Bay basins.
VI	286	Missouri River basin.
VII	287	Lower Mississippi River basin.
VIII	288	Western Gulf of Mexico.
IX	289	Colorado River basin.
X	290	Great Basin.
XI	291	Pacific coast in California.
XII	292	North Pacific coast.

The following table gives the character of data regarding stream flow at regular stations, to be found in the various publications of the United States Geological Survey, exclusive of special papers:

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

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

Report.	Character of data.	Year.
10th A., pt. 2	Descriptive information only	
11th A., pt. 2	Monthly discharge	1884 to Sept., 1890.
12th A., pt. 2	do	1884 to June 30, 1891.
13th A., pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A., pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B. 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A., pt. 2	Descriptive information only	
B. 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
W. S. 11	Gage heights (also gage heights for earlier years)	1896.
18th A., pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for earlier years).	1895 and 1896.
W. S. 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W. S. 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. S. 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
W. S. 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.

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

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

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. An index of the reports containing records prior to 1904 has been published in Water-Supply Paper 119.

The first table which follows gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1910. Wherever the data for a drainage basin appear in two papers the number of one is placed in parentheses and the portion of the basin covered by that paper is indicated in the second table. For example, in 1904 the data for Missouri River were published in Water-Supply Papers 130 and 131, and the portion of the records contained in Water-Supply Paper 131, as indicated by the second table, is that relating to Platte and Kansas rivers.

Numbers of water-supply papers containing results of stream measurements, 1899–1910.

	1899 [a]	1900 [b]	1901	1902	1903
Atlantic coast and eastern Gulf of Mexico:					
New England rivers	35	47	65, 75	82	97
Hudson River to Delaware River, inclusive	35	47, (48)	65, 75	82	97
Susquehanna River to York River, inclusive	35	48	65, 75	82	97
James River to Yadkin River, inclusive	(35), 36	48	65, 75	(82), 83	(97), 98
Santee River to Pearl River, inclusive	36	48	65, 75	83	98
St. Lawrence River	36	49	65, 75	(82), 83	97
Hudson Bay	....	....	66, 75	85	100
Mississippi River:					
Ohio River	36	48, (49)	65, 75	83	98
Upper Mississippi River	36	49	65, 75	83	98, (99)
Missouri River	(36), 37	49, (50)	66, 75	84	99
Lower Mississippi River	37	50	(65), 66, 75	(83), 84	(98), 99
Western Gulf of Mexico	37	50	66, 75	84	99
Pacific coast and Great Basin.					
Colorado River	(37), 38	50	66, 75	85	100
Great Basin	38, (39)	51	66, 75	85	100
South Pacific coast to Klamath River, inclusive	(38), 39	51	66, 75	85	100
North Pacific coast	38	51	66, 75	85	100

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.
[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.

Numbers of water-supply papers containing results of stream measurements, 1899–1910—Continued.

	1904	1905	1906	1907-8	1909	1910
Atlantic coast and eastern Gulf of Mexico:						
New England rivers	124	165	201	241	261	281
Hudson River to Delaware River, inclusive	125	166	202	241	261	281
Susquehanna River to York River, inclusive	126	167	203	241	261	281
James River to Yadkin River, inclusive	126	167	203	242	262	282
Santee River to Pearl River, inclusive	127	168	204	242	262	282
St. Lawrence River	129	170	206	244	264	284
Hudson Bay	130	171	207	245	265	285
Mississippi River:						
Ohio River	128	169	205	243	263	283
Upper Mississippi River	128, (130)	171	207	245	265	285
Missouri River	130, (131)	172	208	246	266	286
Lower Mississippi River	(128), 131	(169), 173	(205), 209	247	267	287
Western Gulf of Mexico	132	174	210	248	268	288
Pacific coast and Great Basin:						
Colorado River	133, (134)	175, (177)	211, (213)	249, (251)	269, (271)	289
Great Basin	133, (134)	176, (177)	212, (213)	250, (251)	270, (271)	290
South Pacific coast to Klamath River, inclusive	134	177	213	251	271	291
North Pacific coast	135	(177), 178	214	252	272	292

Numbers of water-supply papers containing data covering portions of drainage basins.

No.	River basin.	Tributaries included.
35	James	
36	Missouri	Gallatin.
37	Colorado	Green, Gunnison, Grand above junction with Gunnison.
38	Sacramento	Except Kings and Kern.
39	Great Basin	Mohave.
48	Delaware	Wissahickon and Schuylkill.
49	Ohio	Scioto.
50	Missouri	Loup and Platte near Columbus, Nebr. All tributaries below junction with Platte.
65	Lower Mississippi	Yazoo.
82	James	
	St. Lawrence	Lake Ontario, tributaries to St. Lawrence River proper.
83	Lower Mississippi	Yazoo.
97	James	
98	Lower Mississippi	Yazoo.
99	Upper Mississippi	Tributaries from the west.
128	Lower Mississippi	Yazoo.
130	Upper Mississippi	Tributaries from the west.
131	Missouri	Platte, Kansas.
134	Colorado	Data near Yuma, Ariz., repeated.
	Great Basin	Susan, Owens, Mohave.
169	Lower Mississippi	Yazoo.
177	Colorado	Below junction with Gila.
	Great Basin	Susan repeated, Owens, Mohave.
	North Pacific coast	Rogue, Umpqua, Siletz.
205	Lower Mississippi	Yazoo, Homocnitto.
213	Colorado	Data at Hardyville repeated; at Yuma, Salton Sea.
	Great Basin	Owens, Mohave.
251	Colorado	Yuma and Salton Sea stations repeated.
271	Great Basin	Owens River basin.

The order of treatment of stations in any basin in these papers is downstream. The main stem of any river is determined by measuring or estimating the 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. Records for all stations from the source to the mouth of the main stem of the river are presented first, and records for the tributaries in regular order from source to mouth follow, all records in each tributary basin being given before those of the next basin below.

The exceptions to this rule occur in the records for Mississippi River, which are given in four parts, as indicated above, and in the record for large lakes, where it is simpler to take up the streams in regular order around the rim of the lake than to cross back and forth over the lake surface.

DEFINITION OF TERMS.

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

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

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

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

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

CONVENIENT EQUIVALENTS.

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

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

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

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

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

1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches equals 96 Colorado miner's inches.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches equals 104 California miner's inches.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
$1\frac{1}{3}$ horsepower equals about 1 kilowatt.

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

EXPLANATION OF DATA.

For each drainage basin there is given a brief general description covering such items as area, source, tributaries, topography, geology, forestation, rainfall, irrigation, storage, power, and other interesting and important facts.

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

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

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, width and area of cross section, gage height, and discharge in second-feet.

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

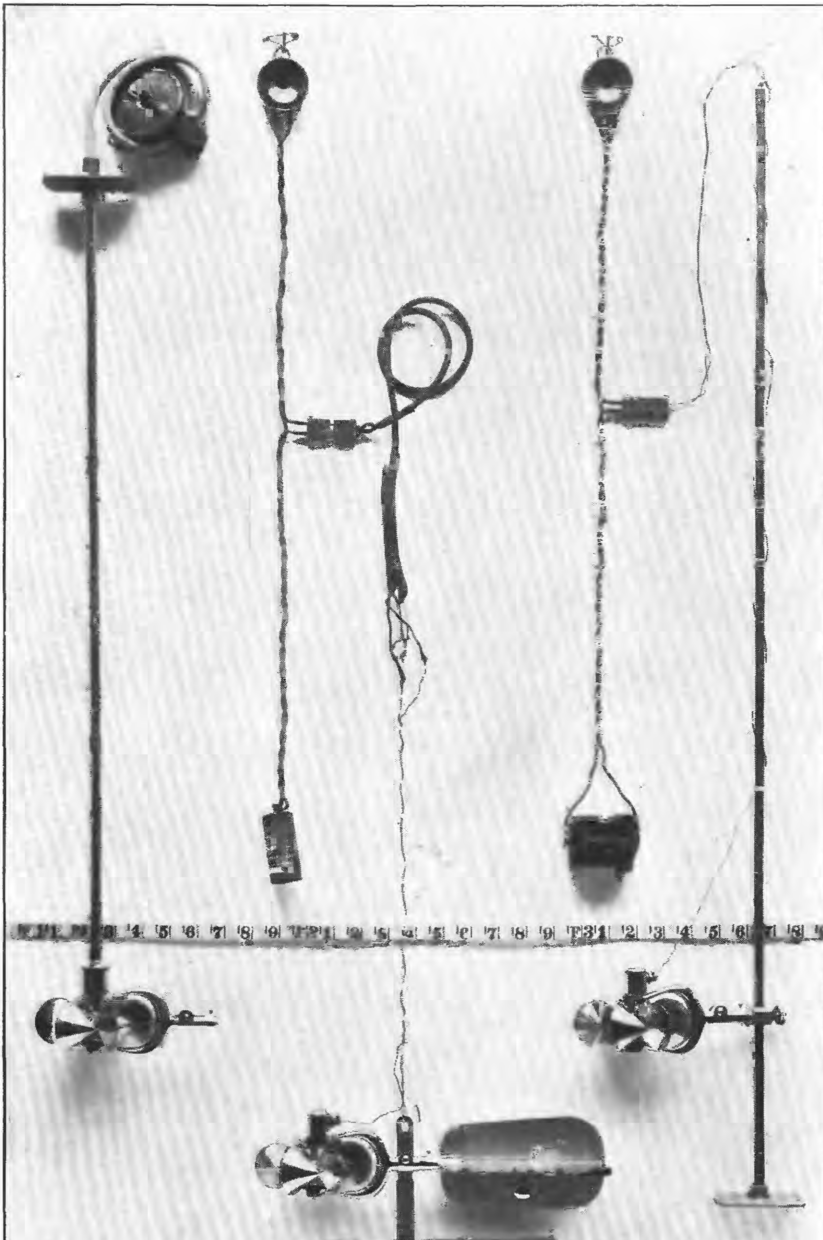
The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

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

A. FOR BRIDGE MEASUREMENT.

B. FOR WADING MEASUREMENT.

TYPICAL GAGING STATIONS.



SMALL PRICE CURRENT METERS.

heights and daily discharges, for the purpose of verifying the published results as follows:

First plot the discharge measurements for the current and earlier years on cross-section paper with gage heights in feet as ordinates and discharge in second-feet as abscissas. Then tabulate a number of gage heights taken from the daily gage-height table for the complete range of stage given and the corresponding discharges for the days selected from the daily discharge table and plot the values on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve, a table can be developed by scaling off the discharge in second-feet for each tenth foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant, except for known backwater conditions.

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

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on page 12, are based.

The field methods used in the collection of the data presented in this series of reports are described in the introductory sections of Water-Supply Papers 261 to 272, inclusive, "Surface water supply of the United States, 1909." Plate I shows typical gaging stations and indicates the method of suspending the current meter; Plate II shows the various types of current meters[1] used in the work.

ACCURACY AND RELIABILITY OF FIELD DATA AND COMPARATIVE RESULTS.

The accuracy of stream-flow data depends, first, on the natural conditions at the gaging station and, second, on the methods and care with which the data are collected. Errors of the first class depend on the degree of permanency of channel and of the relation of gage height to discharge.

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

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

Practically all discharge measurements made under fair conditions are well within 5 per cent of the true discharge at the time of observation. Inasmuch as the errors of meter measurements are largely compensating, the mean rating curve, when well defined, is much more accurate than the individual measurements. Numerous experiments made to test the accuracy of current-meter work show that it compares very favorably with the results from standard weirs and, owing to simplicity of methods, usually gives results that are much more reliable than those from stations at dams, where the coefficient may be uncertain and conditions of flow are complicated.

The work is, of course, dependent on the reliability of the gage observers. With comparatively few exceptions, the observers perform their work honestly. The records are, however, closely watched, and the cause of any discrepancy is investigated. It is obvious that one gage reading a day does not always give the mean height for that day. As an almost invariable rule, however, errors from this source are compensating and virtually negligible in the period of one month, although a single day's reading may, when taken by itself, be considerably in error.

An effort is made to visit every station at least once each year for the purpose of making a measurement to determine the constancy of conditions of flow since the last measurement made the preceding year and also to check the elevation of the gage. On account of lack of funds or for other causes some stations were not visited during the current year. If conditions of flow have been reasonably permanent up to the time of the last preceding measurement, it is considered best to publish estimates of discharge based on the latest verified rating curve rather than to omit them altogether, although it should be distinctly understood that such records are at times subject to considerable error. This is also true, although to a less degree, of the period of records since the date of the last measurement of the current year. As a rule, the accuracy notes are based on the assumption that the rating curve used is strictly applicable to the current year.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily-discharge tables, stating the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly-discharge table. For the rating tables "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly-discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, and knowledge of local conditions. In this column, A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

USE OF THE DATA.

In general, the base data which are collected in the field each year by the Survey engineers are published, not only to comply with the law but also for the express purpose of giving to any engineer the opportunity of examining the computed results and of changing and adjusting them as may seem best to him. Although it is believed that the rating tables and computed monthly discharges are as good as the base data up to and including the current year will warrant, it should always be borne in mind that the additional data collected at each station from year to year nearly always throw new light on data already collected and published and hence allow more or less improvement in the computed results of earlier years. It is therefore expected that the engineer who makes serious use of the figures presented in these papers will verify all ratings and make such adjustments for earlier years as may seem necessary. The work of compiling, studying, revising, and republishing data for different drainage basins for 5 or 10 year periods or more is carried on by the United States Geological Survey so far as the funds for such work are available.

The estimates in the table of monthly discharge are so arranged as to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

The daily discharges are published to allow a more detailed study of the variation in flow and to determine the periods of deficient flow.

COOPERATIVE DATA.

Cooperative data of various kinds and data regarding the run-off at many stations maintained wholly by private funds are incorporated in the surface-water supply reports of the United States Geological Survey.

Many stations throughout the country are maintained for specific purposes by private parties, who supply the records gratuitously to the United States Geological Survey for publication. When such records are furnished by responsible parties and appear to be reasonably accurate, they are verified, so far as possible, and estimated values of accuracy are given. Records clearly worthless or misleading are not published. As it is, however, impossible to completely verify all such records furnished—because of lack of funds or for other causes—they are published for what they are worth, as they are of value as a matter of record and afford at least approximate information regarding stream flow at the particular localities. The Survey does not, however, assume any responsibility for inaccuracies found in such records, although most of them are believed to be reasonably good.

COOPERATION AND ACKNOWLEDGMENTS.

NEW ENGLAND.

Assistance has been rendered or records furnished in New England by the following, to whom special acknowledgment is due:

Maine State Water Storage Commission, Bert M. Fernald, governor, chairman; Maine State Survey Commission; M. H. Ranney, chief engineer for International Commission, River St. John; the State of Vermont, George H. Prouty, governor; the State of Massachusetts, Eben S. Draper, governor; Natural Resources Survey of Rhode Island, Prof. Charles W. Brown, superintendent; C. M. Tolman, engineer for Bar Harbor & Union River Power Co.; Sellers & Rippey; H. B. Moor; H. F. Lord; H. S. Ferguson, engineer for Great Northern Paper Co.; A. D. Butterfield; Fred Cort; F. E. Boston, manager, and George H. Marr, engineer for Hollingsworth & Whitney Co.; C. A. Mixer, engineer for Rumford Falls Power Co.; Walter H. Sawyer, agent for Union Water Power Co.; Joseph A. Warren, of S. D. Warren & Co.; J. A. Fleet, general manager for Portland Electric Co.; J. Brodie Smith, manager of Manchester Traction, Light & Power Co.; R. A. Hale, principal assistant engineer of Essex Co.; Arthur T. Safford, principal assistant engineer of Locks & Canals Co.; Dexter Brackett, chief engineer of Metropolitan Water and Sewerage Board; Charles Bigelow, treasurer of Haile & Frost Manufacturing Co.; Frederick S. Leonard, of Fisk Paper Co.; Charles Of, general superintendent, and H. M. Sumner, engineer for Vermont Copper Co.; International Paper Co.; Bellows Falls Canal Co.; C. W. Hazelton, treasurer of Turners Falls Co.; H. I. Harriman, general manager of Connecticut River Power Co.; A. F. Sickman, hydraulic engineer, Holyoke Water Power Co.; Greenfield Electric Light & Power Co.; Otis Co.; George H. Gilbert Manufacturing Co.; E. E. Lochridge, engineer Springfield Water Board; Charles T. Main; Prof. George F. Swain; William D. Thompson, engineer, and A. W. Hubbard, manager, of Orange Electric Light Co.; Hollis French; McElwain Co.;

C. S. Taylor, of Taylor Manufacturing Co.; F. J. Pitts, of James Pitts & Sons; Barrows & Breed, consulting engineers; P. M. Churchill; and S. F. Dunlap, of East Providence Water Co.

NEW YORK.

Assistance has been rendered or records furnished in New York by the following, to whom special acknowledgment is due: Hon. Frank M. Williams, State engineer and surveyor, William B. Landreth, special deputy State engineer, representing New York State cooperation; State Water Supply Commission of New York, Hon. Henry H. Persons, president, Walter McCulloh, consulting engineer; New York Additional Water Supply Commission, J. Waldo Smith, chief engineer; United States Weather Bureau; R. P. Bloss, engineer, West Virginia Pulp & Paper Co.; Union Bag & Paper Co.

The stream-gaging work in New York was carried on during 1910 in cooperation with the State engineer and surveyor, and the State Water Supply Commission.

Since April 13, 1900, there has been on the statutes of New York State an act providing for cooperation between the United States Geological Survey and the State engineer and surveyor under "the measurement of volume of streams and flow of water in the State of New York." The appropriation made available by this act was contingent upon an appropriation of an equal amount by the United States Geological Survey. During the last three or four years the amount appropriated by each has been $1,500.

The passing by the State legislature in 1907 of certain laws relating to water-supply investigation made it necessary for the State Water Supply Commission to obtain additional data regarding the discharge of certain streams in the State. At the request of the Water Supply Commission the Geological Survey undertook to carry on this work, the appropriations being made by the Water Supply Commission. Subsequent legislative acts have added to the duties of the Water Supply Commission, increased its appropriations, and led to the enlargement of the stream-gaging work, and on July 1, 1910, the Water Supply Commission made an appropriation of $10,000 toward this work, an increase of $6,500 over that of 1909. This appropriation of $10,000 was made for the following purposes:

Stream gaging	$7,500
Rainfall records	1,500
Evaporation records	1,000

Nothing was done, however, toward evaporation work, and the total amount was used on stream gaging and investigations of rainfall.

The appropriations available for this work during the year ending December 31, 1910, were as follows:

Unexpended balance in United States Geological Survey fund Jan. 1, 1910	$1,192.93
Unexpended balance in Water Supply Commission fund Jan. 1, 1910	1,574.25
Unexpended balance in State engineer's fund Jan. 1, 1910	290.83
	3,058.01

During the year the following additional appropriations were made:

June 27, State engineer	$1,500
July 1, United States Geological Survey	2,500
Water Supply Commission	10,000
	14,000

The unexpended balances from these appropriations January 1, 1911, were as follows:

United States Geological Survey	$1,585.24
Water Supply Commission	5,344.16
State engineer	590.01
	7,519.41

There remained unexpended from all funds July 1, 1910, $141.53, which was canceled, making the net total expenditure for the year $9,397.07.

With these funds 34 stream-gaging stations and 15 rainfall stations were maintained. Two hundred and twenty-five discharge measurements were made during the year.

NEW JERSEY, PENNSYLVANIA, MARYLAND, AND VIRGINIA.

Assistance has been rendered or records furnished in New Jersey, Pennsylvania, Maryland, and Virginia by the following, to whom special acknowledgment is due: United States Weather Bureau; Water Supply Commission of Pennsylvania, John Birkinbine, chairman, Farley Gannett, engineer; Philadelphia Bureau of Water, John E. Codman, in charge of hydrographic work; J. A. Walls, chief engineer, Pennsylvania Water & Power Co.; William C. Whitner, president, Fredericksburg Power Co.

DIVISION OF WORK.

In accordance with a cooperative agreement between the Director of the United States Geological Survey and the governor of Maine, ex officio chairman of the State Water Storage Commission, a new district, known as the Maine district, with headquarters at Augusta, was established December 1, 1909. The work was placed in charge of C. C. Babb, district engineer, who has been aided by F. E. Pressey, assistant engineer.

The field data of New York and for New England, exclusive of Maine, were collected under the direction of C. C. Covert, district engineer, assisted by W. G. Hoyt, F. J. Shuttleworth, and J. J. Phelan, junior engineers.

The field data for the Middle Atlantic States were collected under the direction of R. H. Bolster, assistant engineer, assisted by G. C. Stevens, junior engineer.

The ratings, computations, ice estimates, and special studies were made by C. C. Babb, assisted by F. E. Pressey; C. C. Covert, assisted by W. G. Hoyt, F. J. Shuttleworth, and J. J. Phelan; and R. H. Bolster, assisted by G. C. Stevens, J. G. Mathers, M. I. Walters, A. H. Tuttle, O. DeCarre, and A. McMillan.

The manuscript for Maine was reviewed by C. C. Babb, and that for New England and New York by C. C. Covert. The complete manuscript was edited by Mrs. B. D. Wood.

LIST OF GAGING STATIONS MAINTAINED IN THE NORTH ATLANTIC COAST DRAINAGE BASINS.

The following list comprises the gaging stations maintained in the North Atlantic coast drainage basins (from St. John River to York River) by the United States Geological Survey and cooperative parties. Data for these stations have been published in the reports listed on pages 9 to 11. The stations are arranged by river basins, in downstream order, tributaries of main streams being indicated by indention. (See p. 11.)

ST. JOHN RIVER BASIN.

St. John River near Dickey, Me., 1910.
St. John River at Fort Kent, Me., 1905–1910.
St. John River at Van Buren, Me., 1910.
- Allagash River near Allagash, Me., 1910.
- St. Francis River, near St. Francis, Me., 1910.
- Fish River at Wallagrass, Me., 1903–1908.
- Madawaska River at Ste. Rose du Degele, P. Q., 1910.
- Aroostook River at Fort Fairfield, Me., 1903–1910.

ST. CROIX RIVER BASIN.

St. Croix River near Woodland, Me., 1902–1910.
- West Branch St. Croix River at Baileyville, Me., 1910.

MACHIAS RIVER BASIN.

Machias River at Whitneyville, Me., 1903–1910.

UNION RIVER BASIN.

Union River, West Branch, at Amherst, Me., 1909–10.
Union River, West Branch, near Mariaville, Me., 1909.
Union River at Ellsworth, Me., 1909–10.
- Union River, East Branch, near Waltham, Me., 1909.
- Webbs Brook at Waltham, Me., 1909.

Union River basin—Continued.
- Green Lake at Green Lake, Me., 1909-10.
- Green Lake Stream at Lakewood, Me., 1909-10.
- Branch Lake near Ellsworth, Me., 1909-10.
- Branch Lake Stream near Ellsworth, Me., 1909-10.

PENOBSCOT RIVER BASIN.

Penobscot River, West Branch, at Millinocket, Me., 1901-1910.
Penobscot River at West Enfield, Me., 1901-1910.
Penobscot River at Sunk Haze Rips, near Costigan, Me., 1899-1900.
- Penobscot River, East Branch, at Grindstone, Me., 1902-1910.
- Mattawamkeag River at Mattawamkeag, Me., 1902-1910.
- Piscataquis River near Foxcroft, Me., 1902-1910.
- Cold Stream at Enfield, Me., 1904-1906.
- Kenduskeag Stream near Bangor, Me., 1908-1910.
- Phillips Lake Outlets at Holden and Dedham, Me., 1904-1908.

KENNEBEC RIVER BASIN.

Moose River (head of Kennebec River) near Rockwood, Me., 1902-1908 and 1910.
Moosehead Lake at Greenville, Me., 1903-1908 (stage only).
Moosehead Lake at East Outlet, Me., 1895-1910 (stage only).
Kennebec River at The Forks, Me., 1901-1910.
Kennebec River at Bingham, Me., 1907-1910.
Kennebec River at North Anson, Me., 1901-1907.
Kennebec River at Waterville, Me., 1891-1910.
- Roach River at Roach River, Me., 1901-1908.
- Dead River near The Forks, Me., 1901-1907 and 1910.
- Carrabassett River at North Anson, Me., 1901-1907.
- Sandy River near Farmington, Me., 1910.
- Sandy River at Madison, Me., 1904-1908.
- Sebasticook River at Pittsfield, Me., 1908-1910.
- Messalonskee Stream at Waterville, Me., 1903-1905.
- Cobbosseecontee Stream at Gardiner, Me., 1890-1910.

ANDROSCOGGIN RIVER BASIN.

Androscoggin River at Errol Dam, N. H., 1905-1910.
Androscoggin River at Gorham, N. H., 1903 (fragmentary).
Androscoggin River at Shelburne, N. H., 1903-1907 and 1910.
Androscoggin River at Rumford Falls, Me., 1892-1910.
Androscoggin River at Dixfield, Me., 1902-1908.

PRESUMPSCOT RIVER BASIN.

Presumpscot River at outlet of Sebago Lake, Me., 1887-1910.

SACO RIVER BASIN.

Saco River near Center Conway, N. H., 1903-1910.
Saco River at West Buxton, Me., 1907-1910.

MERRIMAC RIVER BASIN.

Pemigewasset River at Plymouth, N. H., 1886-1910.
Merrimac River at Franklin Junction, N. H., 1903-1910.
Merrimac River at Garvins Falls, N. H., 1904-1910.

Merrimac River at Lawrence, Mass., 1890–1910.
  Contoocook River at West Hopkinton, N. H., 1903–1907.
  Suncook River at East Pembroke, N. H., 1904–5.
  Souhegan River at Merrimac, N. H., 1909–10.
  South Branch of Nashua River at Clinton, Mass., 1897–1910.
  Sudbury River at Framingham, Mass., 1875–1910.
  Lake Cochituate at Cochituate, Mass., 1863–1910.

MYSTIC RIVER BASIN.

Mystic Lake near Boston, Mass., 1897–1898.

TAUNTON RIVER BASIN.

Matfield River at Elmwood, Mass., 1909–10.
  Satucket River near Elmwood, Mass., 1909–10.

TENMILE RIVER BASIN.

Tenmile River near Rumford, R. I., 1909.

BLACKSTONE RIVER BASIN.

Blackstone River at Woonsocket, R. I., 1904–5.
Blackstone River at Berkeley, R. I., 1900–1901.
  Branch River at Branch Village, R. I., 1909–10.

WOONASQUATUCKETT RIVER BASIN.

Woonasquatuckett River at Olneyville, R. I., 1910.

PAWTUXET RIVER BASIN.

Pawtuxet River at Harris, R. I., 1909–10.

PAWCATUCK RIVER BASIN.

Wood River at Hope Valley, R. I., 1909–10.

THAMES RIVER BASIN.

Shetucket River at Willimantic, Conn., 1904–5.

CONNECTICUT RIVER BASIN.

Connecticut River at Orford, N. H., 1900–10.
Connecticut River at Sunderland, Mass., 1904–10.
Connecticut River at Holyoke, Mass., 1880–1898.
Connecticut River at Hartford, Conn., 1896–1908.
  Israel River above South Branch at Jefferson Highlands, N. H., 1903–1906.
  Israel River below South Branch at Jefferson Highlands, N. H., 1903–1907.
  Passumpsic River near St. Johnsbury, Vt., 1903 and 1909–10.
  Ammonoosuc River at Bretton Woods, N. H., 1903–1907.
    Zealand River at Twin Mountain, N. H., 1903–1907.
    Little River at Twin Mountain, N. H., 1904–5.
  White River near Sharon, Vt., 1903–4 and 1909–10.
  Ashuelot River at Winchester, N. H., 1903–4.
  Ashuelot River at Hinsdale, N. H., 1907–1910.
  Millers River at Wendell, Mass., 1909–10.
    Moss Brook at Wendell, Mass., 1909–10.
  Deerfield River at Hoosac Tunnel, Mass., 1909–10.
  Deerfield River at Shelburne Falls, Mass., 1907–1910.
  Deerfield River at Deerfield, Mass., 1904–5.

Connecticut River basin—Continued.
    Chicopee River:
        Ware River near Ware, Mass., 1904-1908 and 1910.
            Burnshirt River near Templeton, Mass., 1909.
        Swift River at West Ware, Mass., 1910.
        Quaboag River at West Warren, Mass., 1904-1907.
        Quaboag River at West Brimfield, Mass., 1909-10.
    Westfield River at Knightville, Mass., 1909-10.
    Westfield River at Russell, Mass., 1904-5.
        Westfield River, Middle Branch, at Goss Heights, Mass., 1910.
        Westfield Little River near Blandford, Mass., 1905-1910.
    Salmon River at Leesville, Conn., 1905-6.

HOUSATONIC RIVER BASIN.

Housatonic River at Gaylordsville, Conn., 1900-1910.
    Tenmile River at Dover Plains, N. Y., 1901-1903.

MIANUS RIVER BASIN.

Mianus River near Stamford, Conn., 1903.
Mianus River at Bedford, N. Y., 1903.

BYRAM RIVER BASIN.

Byram River at Pemberwick, Conn., 1903.
    Byram River, West Branch, near Port Chester, N. Y., 1903.
    Byram River, East Branch, near Greenwich, Conn., 1903.
    Byram River, Middle Branch, near Riverville, Conn., 1903.

HUDSON RIVER BASIN.

Hudson River at North Creek, N. Y., 1907-1910.
Hudson River at Thurman, N. Y., 1907-1910.
Hudson River at Fort Edward, N. Y., 1895-1908.
Hudson River at Mechanicville, N. Y , 1888-1910.
    Champlain Canal and Glens Falls Feeder, N. Y., 1910.
    Indian Lake Reservoir at Indian Lake, N. Y., 1900-1910.
    Schroon Lake near Pottersville, N. Y., 1908-1910.
    Schroon River at Riverbank, N Y , 1907-1910.
    Schroon River at Warrensburg, N. Y., 1895-1902.
    Sacandaga River at Wells, N. Y., 1907-1910.
    Sacandaga River at Northville, N Y., 1907-1910.
    Sacandaga River (upper bridge) near Hadley, N. Y., 1907-1910.
    Sacandaga River (at cable) near Hadley, N. Y., 1910.
    Sacandaga River at Union Bag & Paper Co.'s Mill, at Hadley, N. Y., 1909-10.
    Sacandaga, West Branch, at Whitehouse, N. Y., 1910.
    Battenkill River at Battenville, N. Y., 1908.
    Fish Creek at Burgoyne, N. Y., 1904-5 and 1908.
    Hoosic River above Eagle Bridge, N. Y., 1910.
    Hoosic River at Buskirk, N. Y., 1903-1909.
    Mohawk River at Ridge Mills near Rome, N Y., 1898-1900.
    Mohawk River at Utica, N. Y., 1901-1903.
    Mohawk River at Little Falls, N. Y., 1898-1910.
    Mohawk River at Rocky Rift Dam near Indian Castle, N. Y., 1901.
    Mohawk River at Schenectady, N. Y., 1899-1901.
    Mohawk River at Rexford Flats, N. Y., 1898-1901.

Hudson River basin—*Continued.*
- Mohawk River at Dunsbach Ferry, N. Y., 1898–1910.
  - Ninemile Creek at Stittville, N. Y., 1898–9.
  - Oriskany Creek at Coleman, N. Y., 1904–1906.
  - Oriskany Creek at Wood Road Bridge near Oriskany, N. Y., 1901–1904.
  - Oriskany Creek at Oriskany State Dam near Oriskany, N. Y., 1898–1906.
  - Saquoit Creek at New York Mills, N. Y., 1898–1900.
  - Nail Creek at Utica, N. Y., 1904.
  - Reels Creek at Deerfield, N. Y., 1901–1904.
  - Reels Creek at Utica, N. Y., 1901–2.
    - Johnston Brook at Deerfield, N. Y., 1903–1905.
  - Starch Factory Creek at New Hartford, N. Y., 1903–1906.
    - Graefenberg Creek at New Hartford, N. Y., 1903–1906.
    - Sylvan Glen Creek at New Hartford, N. Y., 1900–1906.
  - West Canada Creek at Twin Rock Bridge near Grant, N. Y., 1900–1910.
  - West Canada Creek at Middleville, N. Y., 1898–1901.
  - West Canada Creek at Kast Bridge, N. Y., 1905–1910.
  - East Canada Creek at Dolgeville, N. Y., 1898–1910.
  - Garoga Creek 3 miles above junction with Mohawk, 1898–9.
  - Cayadutta Creek at Johnstown, N. Y., 1898–1900.
  - Schoharie Creek at Prattsville, N. Y., 1902–1910.
  - Schoharie Creek at Schoharie Falls above Mill Point, 1900–1.
  - Schoharie Creek at Mill Point, N. Y., 1900–1903.
  - Schoharie Creek at Fort Hunter, N. Y., 1898–1901.
  - Schoharie Creek at Erie Canal Aqueduct below Fort Hunter, N. Y., 1900.
- Quackenkill Creek at Quackenkill, N. Y., 1894.
- Normanskill Creek at French's Mill, N. Y., 1891.
- Kinderhook Creek at Wilson's Dam, near Garfield, N. Y., 1893–4.
- Kinderhook Creek at East Nassau, N. Y., 1892–1894.
- Kinderhook Creek at Rossman, N. Y., 1906–1910.
- Catskill Creek at South Cairo, N. Y., 1901–1907.
- Esopus Creek at Olivebridge, N. Y., 1903–4.
- Esopus Creek near Olivebridge, N. Y. (weir station), 1906–1910.
- Esopus Creek at Kingston, N. Y., 1901–1909.
- Esopus Creek at Mount Marion, N. Y., 1907–1910.
- Rondout Creek at Rosendale, N. Y., 1901–1903, 1905–1910.
  - Diversion to Delaware and Hudson Canal at Rosendale, N. Y., 1901–1907.
  - Wallkill River at Newpaltz, N. Y., 1901–1903.
- Wappinger Creek at Wappinger Falls, N. Y., 1903–1905.
- Fishkill Creek at Glenham, N. Y., 1901–1903.
- Foundry Brook at Coldspring, N. Y., 1902–3.
- Croton River at Croton Dam, near Croton Lake, N. Y., 1868–1903.

PASSAIC RIVER BASIN.

- Passaic River at Millington, N. J., 1903–1906.
- Passaic River near Chatham, N. J., 1902–1910.
- 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., 1903–1908.
      - Wanaque River at Wanaque, N. J., 1903–1905.

RARITAN RIVER BASIN.

Raritan River at Stanton, N. J., 1903–1906.
Raritan River at Finderne, N. J., 1903–1907.
Raritan River at Boundbrook, N. J, 1903–1909.
  Raritan River, North Branch, at Pluckemin, N. J., 1903–1906.
  Millstone River at Millstone, N. J., 1903–4.

DELAWARE RIVER BASIN.

Delaware River, East Branch, at Hancock, N. Y., 1902–1910.
Delaware River at Port Jervis, N. Y., 1904–1910.
Delaware River at Riegelsville, N. J., 1906–1910.
Delaware River at Lambertville, N. J., 1897–1908.
  Delaware River, West Branch, at Hancock, N. Y., 1902–1910.
  Mongaup River near Rio, N. Y., 1909–10.
  Neversink River at Godeffroy, N. Y., 1903, 1909–10.
  Neversink River at Port Jervis, N. Y., 1902–3.
  Paulins Kill at Columbia, N. J., 1908–1909.
  Lehigh River at South Bethlehem, Pa., 1902–1905, 1909–10.
  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., 1883–1910.
  Neshaminy Creek below Forks, Pa., 1884–1910.
  Schuylkill River near Philadelphia, Pa., 1898–1910.
    Perkiomen Creek near Frederick, Pa., 1884–1910.
    Wissahickon Creek near Philadelphia, Pa., 1897–1906.

SUSQUEHANNA RIVER BASIN.

Susquehanna River at Colliersville, N. Y., 1907–8.
Susquehanna River at Binghamton, N. Y., 1901–1910.
Susquehanna River at Wysox, Pa., 1908–9.
Susquehanna River at Wilkes-Barre, Pa., 1899–1910.
Susquehanna River at Danville, Pa., 1899–1910.
Susquehanna River at Harrisburg, Pa., 1891–1910.
Susquehanna River at McCalls Ferry, Pa., 1902–1910.
  Chenango River at South Oxford, N. Y., 1903.
  Chenango River near Greene, N. Y., 1908.
  Chenango River at Binghamton, N. Y., 1901–1910.
    Eaton Brook, Madison County, N. Y., 1835.
    Madison Brook, Madison County, N. Y., 1835.
    Tioughnioga River at Chenango Forks, N. Y., 1903.
  Cayuta Creek at Waverly, N. Y., 1898–1902.
  Chemung River at Chemung, N. Y., 1903–1910.
  Susquehanna River, West Branch, at Williamsport, Pa., 1895–1910.
  Susquehanna River, West Branch, at Allenwood, Pa., 1899–1902.
  Juniata River at Newport, Pa., 1899–1910.
  Broad Creek at Mill Green, Md., 1904–1909.
  Octoraro Creek at Rowlandsville, Md., 1896–1899.
  Deer Creek near Churchville, Md., 1904–1909.

GUNPOWDER RIVER BASIN.

Gunpowder Falls at Glencoe, Md., 1904–1909.
  Little Gunpowder Falls near Belair, Md., 1904–1909.

PATAPSCO RIVER BASIN.

Patapsco River at Woodstock, Md., 1896–1909.

PATUXENT RIVER BASIN.

Patuxent River at Laurel, Md., 1896–1898.

POTOMAC RIVER BASIN.

Potomac River, North Branch (head of Potomac River), at Piedmont, W. Va., 1899–1906.
Potomac River, North Branch, at Cumberland, Md., 1894–1897.
Potomac River at Great Cacapon, W. Va., 1894–1896.
Potomac River at Point of Rocks, Md., 1895–1910.
- Savage River at Bloomington, Md., 1905–6.
- Georges Creek at Westernport, Md., 1905–6.
- Wills Creek near Cumberland, Md., 1905–6.
- Potomac River, South Branch, near Springfield, W. Va., 1894–1896, 1899–1906.
- Opequan Creek near Martinsburg, W. Va., 1905–6.
- Tuscarora Creek at Martinsburg, W. Va., 1905.
- Antietam Creek near Sharpsburg, Md., 1897–1905.
- South River at Basic City, Va., 1905–6.
- South River at Port Republic, Va., 1895–1899.
- Shenandoah River, South Fork, near Front Royal, Va., 1899–1906.
- Shenandoah River at Millville, W. Va., 1895–1909.
  - North River at Port Republic, Va., 1895–1899.
    - Lewis Creek near Staunton, Va., 1905–6.
    - Cooks Creek at Mount Crawford, Va., 1905–6.
  - Elk Run at Elkton, Va., 1905–6.
  - Hawksbill Creek near Luray, Va., 1905–6.
  - Shenandoah River, North Fork, near Riverton, Va., 1899–1906.
    - Passage Creek at Buckton, Va., 1905–6.
- Monocacy River near Frederick, Md., 1896–1910.
- Goose Creek near Leesburg, Va., 1909–10.
- Rock Creek at Zoological Park, D. C., 1897–1900.
- Rock Creek at Lyons Mill, D. C., 1892–1894.

RAPPAHANNOCK RIVER BASIN.

Rappahannock River near Fredericksburg, Va., 1907–1910.

ST. JOHN RIVER.

GENERAL FEATURES OF AREA DRAINED.

St. John River drains the largest basin between St. Lawrence and Susquehanna rivers. Its extreme headwaters lie in the mountainous region between Maine and Canada, adjacent to those of the Penobscot. From the junction of the northwest and southwest branches, where the river first takes its name, to its junction with St. Francis River, a distance of 90 miles, its course is in general northeastward and lies wholly in Maine, although a portion of the tributary drainage area lies wholly in Canada. In this distance it receives Allagash River, its second largest tributary. From its junction with the St. Francis the St. John flows eastward, forming the northern boundary of Maine for 70 miles and receiving in this stretch two important tributaries—Fish River, from the south, at Fort Kent, and Madawaska River, from the north, at Madawaska. At the point where the St. John leaves the State line its drainage area measures 8,200 square miles. Beyond this point it flows southward and receives the waters of Aroostook, Presque Isle, and Meduxnekeag rivers, the basins of which are almost entirely in Maine. From source to mouth its length is about 450 miles, and its total drainage area measures about 26,000 square miles.

In the eastern or lower portion of the basin the country is almost level near the river, but at a distance from the stream it becomes undulating and moderately hilly, finally subsiding and merging into the flat country bordering Aroostook River. Above the mouths of St. Francis and Allagash rivers the aspect of the basin is diversified by highlands.

The basin of the St. John is higher than that of any other river in the State, but as its elevation is fairly uniform the fall of the stream and the opportunities for the development of water power are less than on the other great rivers. Allagash River, which drains, exclusive of Chamberlain Lake drainage, 1,240 square miles of entirely wild and forest country, has considerable fall and affords excellent storage facilities, all unutilized.

The area as a whole is well forested. Large tracts have never been touched by the ax, and other portions have been lumbered for pine only. Probably 90 per cent of the whole basin tributary to the St. John at the eastern boundary of Maine is in forest.

The prevailing rocks in the eastern part of the area are limestones and slate, with patches of sandstone, coarse rock, and granite. Clays and slates are found over about 75 per cent of the total area.

According to the Maine State Water Storage Commission [1] the ponds and lakes in the St. John Basin have an aggregate area of 227 square miles, the largest of these lakes being tributary to Allagash and Fish rivers. On some of the lakes rough timber crib dams are used to store water for log driving, but no attempt is made to store water after the driving season is over. Previous to 1845 a canal was cut from Telos Lake, in the Allagash basin, to Webster Lake, in the Penobscot basin, and a dam was constructed between Chamberlain and Eagle lakes. In this way Chamberlain Lake, with its drainage area of 270 square miles, was rendered in part tributary to the Penobscot. This diversion continues at the present time. Its general effect is to supply most of the water to the Penobscot during the log-driving season, but after the gates at the dams are opened more water flows toward the St. John, as the Chamberlain dam gate sills are 0.6 foot lower than those at Telos Lake.

[1] Second Ann. Rept. Maine State Water Storage Commission.

Precipitation records in the basin of the St. John are very meager, but from the best information available it seems probable that the mean annual rainfall is not over 30 to 35 inches.

The river and its tributaries are completely frozen over during the winter season, which usually extends from the 1st of November until after the middle of April, and provides a large amount of snow storage.

ST. JOHN RIVER NEAR DICKEY, MAINE.

This station, which was established July 5, 1910, is located near Dickey post office, Maine, on the farm of L. V. Henderson, 2 miles above the mouth of Allagash River and three-fourths of a mile below the mouth of Little Black River.

A rod gage is used. Gage heights are given as elevations above mean sea level.

Discharge measurements were made from a boat and by wading at a point 32½ feet below the gage.

The channel is composed of gravel and small bowlders. The banks are high and not liable to overflow.

The station was established and the discharge records have been furnished by the International Commission, River St. John.

Discharge measurements of St. John River near Dickey, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 18[a]	Douglas L. McLean [b]	421	1,028	587.02	2,471
July 5[c]	....do	395	539	586.01	1,146
18[c]	....do	295	382	585.68	495
22[c]	....do	295	343	585.46	388
Sept. 7[c]	....do	305	409	585.63	511

[a] Made at Dickey Ferry, about 2,000 feet above L. V. Henderson's farm.
[b] Measurements made under direction of International Commission, River St. John.
[c] Made by wading at L. V. Henderson's farm.

Daily gage height, in feet, and discharge, in second-feet, of St. John River near Dickey, Maine, for 1910.

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	......	......	587.3	2,640	585.5	410	585.6	470	588.1	4,220	......	......
2	......	......	587.1	2,300	585.4	350	585.6	470	587.9	3,790	......	......
3	......	......	586.9	1,980	585.4	350	585.6	470	587.	3,380	......	......
4	......	......	586.7	1,680	585.4	350	......	470	587.0	2,140	......	......
5	586.2	1,020	587.5	3,000	585.4	350	585.6	470	587.1	2,300	......	......
6	586.1	910	587.5	3,000	585.5	410	585.7	540	588.1	4,220	......	......
7	586.2	1,020	587.1	2,300	585.6	470	585.9	710	589.1	6,900	......	......
8	586.2	1,020	587.0	2,140	586.4	350	586.2	1,020	588.8	6,020	......	......
9	586.1	910	586.9	1,980	587.9	3,790	586.2	1,020	588.3	4,690	......	......
10	586.0	810	586.5	1,400	588.1	4,220	586.9	1,980	587.7	3,380	......	......
11	585.9	710	586.5	1,400	587.6	3,190	587.7	3,380	587.4	2,820	......	......
12	585.9	710	587.0	2,140	587.2	2,470	587.2	2,470	587.1	2,300	......	......
13	585.8	620	587.4	2,820	587.0	2,140	587.0	2,140	587.0	2,140	......	......
14	585.8	620	587.7	3,380	586.7	1,680	586.3	1,140	586.7	1,680	......	......
15	585.7	540	587.2	2,470	586.5	1,400	586.2	1,020	586.6	1,540	......	......
16	585.7	540	586.7	1,680	586.5	1,400	586.1	910	586.4	1,270	......	......
17	585.7	540	586.3	1,140	586.3	1,140	586.1	910	586.3	1,140	......	......
18	585.6	470	586.1	910	586.1	910	586.2	1,020	586.2	1,020	......	......
19	585.5	410	586.2	1,020	586.0	810	586.1	910	586.2	1,020	......	......
20	585.4	350	586.4	1,270	585.9	710	586.3	1,140	586.2	1,020	......	......
21	585.4	350	586.4	1,270	585.7	540	586.3	1,140	586.1	910	......	......
22	585.5	410	586.2	1,020	585.6	470	586.2	1,020	586.1	910	......	......
23	585.6	470	586.0	810	585.5	410	586.2	1,020	586.0	810	......	......
24	585.8	620	585.9	710	585.5	410	586.1	910	585.9	710	......	......
25	586.1	910	585.8	620	585.5	410	586.3	1,140	......	......	......	......
26	586.3	1,140	585.7	540	585.5	410	586.3	1,140	......	......	......	......
27	586.6	1,540	585.7	540	585.5	410	586.9	1,980	......	......	......	......
28	586.8	1,830	585.7	540	585.5	410	587.3	2,640	......	......	......	......
29	587.6	3,190	585.6	470	585.6	470	587.4	2,820	......	......	......	......
30	587.7	3,380	585.6	470	585.6	470	588.0	4,000	......	......	......	......
31	587.7	3,380	585.5	410	......	......	587.7	3,380	......	......	......	......

NOTE.—Daily discharge obtained from a discharge rating curve which is fairly well defined.

Monthly discharge of St. John River near Dickey, Maine, for 1910.

[Drainage area, 2,820 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
June	......	......	......	......	......	
July 5-31	3,380	350	1,050	0.372	0.37	B.
August	3,380	410	1,550	.550	.63	B.
September	4,220	350	1,040	.369	.41	B.
October	4,000	470	1,410	.500	.58	B.
Nov. 1-24	6,900	710	2,510	.890	.79	B.
December	......	......	......	......	......	

ST. JOHN RIVER AT FORT KENT, MAINE.

This station, which is located at the footbridge that crosses the St. John near Fort Kent post office a short distance above the confluence of Fish River with the St. John, was established October 13, 1905. It is about 15 miles below the mouth of St. Francis River and about 50 miles above Grand Falls, which is an important undeveloped power. Many power sites exist along the river.

Discharge measurements are made from the footbridge. The inclined staff gage is attached to a pier of the bridge. Its datum has remained the same during the maintenance of the station. During the winter months the discharge is affected by ice. The discharge is also at times affected by log jams, which form in the river in the vicinity of the station, especially on the bridge piers.

Conditions for obtaining accurate free-flow results are fair, and a good discharge rating curve has been developed.

The bed of the river is of gravel and rock and is probably permanent. Both banks are high and not subject to overflow except in extreme freshets.

The International Commission, River St. John, is especially interested in the work at this station at the present time in connection with investigations of the International control of St. John River.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of St. John River at Fort Kent, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 20[a]	F. E Pressey	645	2,100	6.69	1,140
May 3	.....do	689	5,490	10.47	25,100
June 10	W. E. Parsons	666	3,530	7.00	12,000
June 22	.....do	647	2,080	4.90	4,640

[a] Measurement made under ice conditions. Thickness of ice, 1.47 feet. The measurement was also much affected by anchor ice.

Daily gage height, in feet, of St. John River at Fort Kent, Maine, for 1910.

[Alice M. Currie. observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	......	......	7.05	3.95	4.75	3.2	3.0	4.5	3.3
2	......	......	......	......	10.75	8.1	3.8	5.0	3.2	3.0	4.5	3.3
3	......	......	......	......	10.55	8.65	......	4.8	3.1	3.0	4.5	3.3
4	......	......	......	......	11.15	8.25	......	4.45	3.1	3.0	4.85	......
5	......	6.4	5.7	9.5	11.35	......	3.65	4.4	3.1	3.0	5.9	4.1
6	......	......	......	9.25	11.4	6.7	3.55	4.55	3.1	3.15	6.85	4.3
7	......	......	......	9.65	11.4	7.15	3.5	4.7	3.4	3.55	7.75	4.5
8	......	......	......	11.4	......	7.15	3.5	4.55	3.7	4.0	7.9	......
9	......	......	......	12.05	9.45	7.0	3.45	4.35	4.6	4.4	7.6	......
10	......	......	......	......	9.1	7.0	......	4.15	5.2	4.5	7.1	......
11	......	......	......	12.25	8.75	6.9	3.35	3.95	5.5	4.45	5.8	......
12	......	6.2	5.8	11.3	8.5	......	3.25	3.95	5.35	4.15	5.0	......
13	......	......	......	10.55	8.2	6.5	3.2	4.05	5.2	3.85	......	......
14	6.7	......	......	9.9	7.85	6.45	3.1	4.25	4.85	3.65	4.75	......
15	......	......	......	9.15	......	6.25	3.1	4.55	4.6	3.5	4.45	......
16	......	......	......	8.5	7.15	5.95	3.0	4.3	4.1	3.4	4.35	......
17	......	......	......	......	6.95	5.75	......	3.95	3.9	3.25	4.2	4.1
18	......	......	......	8.4	6.65	5.6	3.35	3.75	......	3.35	4.05	......
19	......	6.0	5.9	8.6	6.25	......	3.4	3.7	4.1	3.65	4.0	......
20	6.7	......	......	10.05	6.05	5.1	3.3	3.75	4.05	3.75	......	......

Daily gage height, in feet, of St. John River, at Fort Kent, Maine, for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21				12.1	5.85	4.9	3.3	3.75	3.85	3.55	3.9	
22				13.7		4.95	3.4	3.65	3.7	3.5	3.8	
23				15.6	5.4	4.9	3.4	3.6	3.4	3.7	3.75	
24				16.65	5.05	4.9	3.4	3.5	3.2	3.65	3.65	4.6
25				16.15	5.25	4.9	3.55	3.6	3.0	3.5	3.55	
26		5.8	7.2	15.65	5.7		3.8	3.5	3.0	3.5	3.5	
27				15.35	6.1	4.65	3.95	3.4	3.0	3.85		
28				14.6	6.75	4.45	4.15	3.35	3.0	4.3	3.4	
29				14.1		4.15	4.3	3.3	3.0	4.4	3.4	
30				13.1	6.35	3.95	4.45	3.25	3.0		3.35	
31	7.3				6.55			3.2		4.5		

NOTE.—Gage heights affected by the presence of ice from Jan. 1 to Apr. 4 and from Dec. 4 to 31. Gage heights were taken to water surface. The ice thickness during January to March varied from about 1.2 feet to 2.5 feet. The ice attained a thickness of about 1.3 feet during December.

From Sept. 1 to 10 the gage heights were computed from the records of the gage of the International Commission, River St. John, at Carron.

Daily discharge, in second-feet, of St. John River at Fort Kent, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					35,000	11,900	2,420	4,240	1,270	1,060	3,610	1,390
2					28,600	16,200	2,140	4,900	1,270	1,060	3,610	1,390
3					27,600	18,600	2,060	4,370	1,160	1,060	3,610	1,390
4					30,700	16,900	1,970	3,490	1,160	1,060	4,500	
5				22,500	31,700	13,700	1,890	3,370	1,160	1,060	7,660	
6				21,400	32,000	10,500	1,740	3,740	1,160	1,220	11,100	
7				23,200	32,000	12,300	1,660	4,110	1,520	1,740	14,700	
8				32,000	27,200	12,300	1,660	3,740	1,970	2,510	15,400	
9				35,500	22,300	11,700	1,590	3,260	3,860	3,370	14,100	
10				36,000	20,700	11,700	1,520	2,820	5,470	3,610	12,100	
11				36,600	19,100	11,300	1,460	2,420	6,380	3,490	7,330	
12				31,500	18,000	10,500	1,330	2,420	5,920	2,820	4,900	
13				27,600	16,700	9,770	1,270	2,610	5,470	2,230	4,570	
14				24,400	15,200	9,580	1,160	3,030	4,500	1,890	4,240	
15				20,900	13,800	8,860	1,160	3,740	3,860	1,660	3,490	
16				18,000	12,300	7,830	1,060	3,140	2,710	1,520	3,260	
17				17,800	11,500	7,170	1,260	2,420	2,320	1,330	2,920	
18				17,500	10,300	6,690	1,460	2,060	2,520	1,460	2,610	
19				18,400	8,860	5,940	1,520	1,970	2,710	1,890	2,510	
20				25,100	8,170	5,180	1,390	2,060	2,610	2,060	2,420	
21				35,800	7,500	4,630	1,390	2,060	2,230	1,740	2,320	
22				44,900	6,780	4,760	1,520	1,890	1,970	1,660	2,140	
23				56,600	6,070	4,630	1,520	1,810	1,520	1,970	2,060	
24				63,300	5,040	4,630	1,520	1,660	1,270	1,890	1,890	
25				60,100	5,620	4,630	1,740	1,810	1,060	1,660	1,740	
26				56,900	7,010	4,300	2,140	1,660	1,060	1,660	1,660	
27				55,000	8,340	3,980	2,420	1,520	1,060	2,230	1,590	
28				50,300	10,700	3,490	2,820	1,460	1,060	3,140	1,520	
29				47,300	9,960	2,820	3,140	1,390	1,060	3,370	1,520	
30				41,400	9,220	2,420	3,490	1,330	1,060	3,490	1,460	
31					9,960		3,860	1,270		3,610		

NOTE.—Daily discharge determined from a well-defined rating curve. The discharge for Sundays and for other days when the gage was not read estimated by means of gage-height records taken at other points by the International Commission, River St. John.

Monthly discharge of St. John River at Fort Kent, Maine, for 1910.

[Drainage area, 4,880 [a] square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			1,450	0.297	0.34	D.
February			1,200	.246	.26	D.
March			3,200	.656	.76	D.
April	63,300		32,900	6.74	7.52	A.
May	35,000	5,040	16,400	3.36	3.87	A.
June	18,600	2,420	8,630	1.77	1.98	A.
July	3,860	1,060	1,850	.379	.44	A.
August	4,900	1,270	2,640	.541	.62	A.
September	6,380	1,060	2,410	.494	.55	A.
October	3,610	1,060	2,080	.426	.49	A.
November	15,400	1,460	4,880	1.00	1.12	A.
December			1,400	.287	.33	D.
The year	63,300		6,570	1.35	18.28	

[a] Does not include Chamberlain Lake drainage area of 270 square miles. See description of drainage area, p. 28.

NOTE.—The mean discharge Apr. 1 to 4 estimated at 16,800 second-feet. Discharge determined for the winter months is based on one measurement made Jan. 20, with ice present and on climatological records. The discharge did not vary greatly during the month of January, February, or December, but increased considerably during the later part of March.

This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

ST. JOHN RIVER AT VAN BUREN, MAINE.

This station, which is located at the new international bridge at Van Buren, Maine, about 14 miles above Grand Falls, New Brunswick, was established May 4, 1908.

The gage heights during 1908–1910 were read on a vertical rod attached to the pier of the sawdust carrier of Hammonds mill, about 700 feet below the international bridge. The bridge gage is painted on the second pier (from the Van Buren side of the bridge); the zero of the gage is 407.69 feet above sea level. All gage readings for 1908–1910 have been reduced to the corresponding bridge gage readings.

Discharge measurements are made from bridge. No measurements were made in 1908–1910; the discharge has been computed from the 24 measurements made during 1911.

The control of the stream above the station for log driving probably does not materially affect the flow past the gage. The relation of gage height to discharge is affected by ice during the winter months, but an ice-rating curve has been developed.

The station is maintained by the International Commission, River St. John.

Daily gage height, in feet, of St. John River at Van Buren, Maine, for 1908–1910.

[J. N. Johnson, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1908.						1908.					
1	......	427.6	415.2	411.0	410.6	16	431.4	417.0	413.0	411.8	......
2	......	428.2	414.8	410.8	410.6	17	430.6	418.0	412.6	411.8	......
3	......	427.0	414.6	410.8	410.6	18	430.6	419.6	412.4	412.0	......
4	431.6	425.4	414.6	410.6	410.4	19	430.8	419.2	412.2	412.4	......
5	431.2	424.0	414.2	410.6	......	20	430.6	419.4	412.0	413.4	......
6	431.0	422.8	414.2	410.6	......	21	430.6	420.4	411.8	413.4	......
7	430.6	421.6	414.2	410.8	......	22	429.6	421.4	411.8	413.4	......
8	430.6	420.4	414.2	411.2	......	23	428.2	420.8	411.8	413.0	......
9	430.8	420.2	414.6	411.4	......	24	427.2	419.8	411.8	412.6	......
10	431.2	419.4	414.8	411.6	......	25	426.2	419.0	411.6	412.2	......
11	430.4	418.8	414.2	411.2	......	26	425.2	418.2	411.8	411.4	......
12	430.2	418.2	414.0	411.2	......	27	424.8	417.8	411.6	411.2	......
13	430.4	418.0	413.8	411.2	......	28	425.2	417.2	411.4	411.0	......
14	430.4	417.6	413.4	411.6	......	29	425.2	416.8	411.2	410.6	......
15	430.8	417.0	413.4	411.8	......	30	424.6	416.2	411.2	410.6	......
						31	424.2	......	411.4	410.6	......

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.								
1	....	420.9	413.1	413.1	414.5	426.5	413.2	415.4
2	....	420.1	412.9	413.0	415.2	425.1	413.1	415.2
3	....	419.3	412.9	412.4	416.1	423.1	413.3	415.1
4	....	418.4	413.5	411.7	416.3	421.9	413.7	414.8
5	....	417.8	413.8	411.3	415.7	420.7	414.6	414.4
6	....	417.4	414.2	411.0	416.8	419.7	414.3	414.6
7	....	415.8	414.7	410.8	417.6	418.9	414.1	414.4
8	....	415.4	415.3	410.7	417.8	418.1	414.1	414.2
9	....	414.8	415.3	410.8	417.1	417.5	414.0	413.8
10	427.9	414.5	415.4	411.4	416.2	416.7	413.8	413.5
11	430.5	414.2	414.7	412.4	415.8	416.2	413.5	413.3
12	433.5	413.8	413.9	413.7	415.4	415.8	413.3	413.3
13	434.9	413.5	414.1	413.6	415.1	415.4	413.7	415.9
14	434.5	413.1	414.3	413.1	414.6	415.0	414.3	......
15	433.6	413.5	414.4	412.8	414.2	414.9	413.5	......
16	432.8	413.3	413.9	412.4	413.9	414.8	413.5	......
17	432.5	413.0	415.3	412.0	413.7	414.7	413.3	......
18	432.2	413.0	416.0	412.0	413.3	414.5	413.1	......
19	431.5	413.9	416.4	411.6	413.1	414.2	412.9	......
20	431.1	416.3	416.3	411.4	412.9	414.0	412.8	......
21	429.7	418.3	416.2	411.2	412.7	413.7	413.0	......
22	428.6	417.5	416.6	411.0	412.6	413.6	413.2	......
23	427.2	416.7	416.0	410.8	412.4	413.5	413.4	......
24	426.8	415.9	415.2	410.5	412.1	413.7	413.5	......
25	426.3	415.5	414.9	410.5	412.1	413.9	414.5	......
26	425.5	414.8	414.7	410.9	412.0	414.1	414.7	......
27	424.6	414.2	414.3	413.2	412.5	413.9	415.8	......
28	423.6	413.9	413.9	415.8	414.4	413.7	415.8	......
29	423.0	413.5	413.6	415.8	418.4	413.6	415.7	......
30	422.2	413.3	413.4	416.5	425.7	413.5	415.7	......
31	421.5	....	413.2	415.3	....	413.4	....	......

Daily gage height, in feet, of St. John River at Van Buren, Maine, for 1908–1910—Contd.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.								
1	....	417.15	411.35	411.35	409.35	408.95	411.15	410.55
2	....	418.15	411.35	411.55	409.15	408.75	410.95	410.55
3	....	419.15	411.35	411.75	408.95	408.55	410.75	410.55
4	....	418.95	410.75	411.35	408.95	409.15	410.55	410.35
5	....	418.15	410.75	410.95	418.95	409.15	410.35	410.35
6	....	417.35	410.95	410.75	408.75	409.35	410.55	410.55
7	424.55	416.95	410.95	410.75	409.35	409.55	412.75	410.75
8	423.55	417.35	410.75	411.15	409.95	409.75	413.95	410.95
9	422.75	417.15	410.55	410.95	410.55	409.95	413.95	410.75
10	422.35	416.95	410.55	410.75	410.95	410.15	413.35	410.75
11	421.95	416.55	410.35	409.75	411.35	410.55	412.75	410.75
12	421.35	416.15	410.15	409.95	411.75	410.15	412.55	410.75
13	420.55	416.35	410.15	410.15	411.85	409.75	412.15	410.55
14	420.15	416.35	410.15	410.55	411.35	409.55	411.95	410.55
15	419.35	415.75	409.95	410.95	410.75	409.55	411.75	410.55
16	418.75	415.35	410.15	410.95	410.55	409.55	411.45	410.55
17	418.35	414.95	410.15	410.35	410.55	409.35	411.35	410.55
18	417.75	414.55	410.15	409.95	409.75	409.35	411.15	410.55
19	417.35	414.15	410.15	409.95	409.55	409.35	410.95	410.35
20	416.95	413.75	409.95	410.15	409.35	409.35	410.75	410.35
21	416.75	413.55	409.75	409.95	409.15	409.35	410.55	410.35
22	416.35	413.35	409.55	409.95	409.15	409.55	410.35	410.35
23	416.15	413.15	409.95	409.75	409.15	409.55	410.35	410.55
24	415.55	412.95	409.15	409.75	409.15	409.35	410.35	410.55
25	414.95	412.75	409.95	409.75	408.95	409.55	410.35	410.55
26	415.35	412.75	410.15	409.55	408.95	409.55	410.35	410.55
27	415.55	412.55	410.35	409.55	409.15	410.15	410.35	410.55
28	417.35	412.35	410.55	409.35	408.95	410.55	410.15	410.55
29	417.75	411.95	410.55	409.15	408.95	410.95	410.35	410.75
30	417.35	411.55	410.55	408.95	408.95	411.15	410.35	410.95
31	416.95	....	410.95	409.15	....	411.35	....	411.55

NOTE.—The relation of gage height to discharge was affected by ice from about Dec. 4 to 31, 1910.

Daily discharge, in second-feet, of St. John River at Van Buren, Maine, for 1908–1910.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1908.						1908.					
1	....	78,800	17,600	6,260	5,330	16	106,000	23,800	11,300	8,220	....
2	....	82,900	16,400	5,790	5,330	17	100,000	27,600	10,300	8,220	....
3	....	74,800	15,800	5,790	5,330	18	100,000	34,200	9,740	8,720	....
4	108,000	64,700	15,800	5,330	4,880	19	102,000	32,400	9,230	9,740	....
5	105,000	56,500	14,600	5,330	....	20	100,000	33,300	8,720	12,400	....
6	103,000	49,900	14,600	5,330	....	21	100,000	37,900	8,220	12,400	....
7	100,000	43,700	14,600	5,790	....	22	92,800	42,700	8,220	12,400	....
8	100,000	37,900	14,600	6,740	....	23	82,900	39,800	8,220	11,300	....
9	102,000	36,900	15,800	7,230	....	24	76,100	35,100	8,220	10,300	....
10	105,000	33,300	16,400	7,720	....	25	69,700	31,600	7,720	9,230	....
11	106,000	30,800	14,600	6,740	....	26	63,500	28,300	8,220	7,230	....
12	97,300	28,300	14,000	6,740	....	27	61,100	26,800	7,720	6,740	....
13	98,800	27,600	13,500	6,740	....	28	63,500	24,500	7,230	6,260	....
14	98,800	26,000	12,400	7,720	....	29	63,500	23,000	6,740	5,330	....
15	102,000	23,800	12,400	8,220	....	30	60,000	20,900	6,740	5,330	....
						31	57,600	....	7,230	5,330	....

NOTE.—Daily discharge for 1908 obtained from a well-defined rating curve based on measurements made during 1911.

Daily discharge, in second-feet, of St. John River at Van Buren, Maine, for 1908-1910—Continued.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.								
1	....	40,300	11,600	11,600	15,500	71,600	11,800	18,200
2	....	36,500	11,000	11,300	17,600	62,900	11,600	17,600
3	....	32,900	11,000	9,740	20,600	51,500	12,100	17,300
4	....	29,100	12,600	7,970	21,300	45,200	13,200	16,400
5	....	26,800	13,500	6,980	19,200	39,300	15,800	15,200
6	....	25,200	14,600	6,260	23,000	34,600	14,900	15,800
7	....	19,600	16,100	5,790	26,000	31,200	14,300	15,200
8	....	18,200	17,900	5,560	26,800	27,900	14,300	14,600
9	....	16,400	17,900	5,790	24,100	25,600	14,000	13,500
10	80,800	15,500	18,200	7,230	20,900	22,700	13,500	12,600
11	99,600	14,600	16,100	9,740	19,600	20,900	12,600	12,100
12	123,000	13,500	13,800	13,200	18,200	19,600	12,100	12,100
13	134,000	12,600	14,300	12,900	17,300	18,200	13,200	....
14	131,000	11,600	14,900	11,600	15,800	17,000	14,900	....
15	124,000	12,600	15,200	10,800	14,600	16,700	12,600	....
16	117,000	12,100	13,800	9,740	13,800	16,400	12,600	....
17	115,000	11,300	17,900	8,720	13,200	16,100	12,100	....
18	113,000	11,300	20,200	8,720	12,100	15,500	11,600	....
19	107,000	13,800	21,600	7,720	11,600	14,600	11,000	....
20	104,000	21,300	21,300	7,230	11,000	14,000	10,800	....
21	93,600	28,700	20,900	6,740	10,500	13,200	11,300	....
22	85,700	25,600	22,300	6,260	10,300	12,900	11,800	....
23	76,100	22,700	20,200	5,790	9,740	12,600	12,400	....
24	73,500	19,900	17,600	5,100	8,980	13,200	12,600	....
25	70,300	18,600	16,700	5,100	8,980	13,800	15,500	....
26	65,300	16,400	16,100	6,020	8,720	14,300	16,100	....
27	60,000	14,600	14,900	11,800	10,000	13,800	19,600	....
28	54,300	13,800	13,800	19,600	15,200	13,200	19,600	....
29	51,000	12,600	12,900	19,600	29,100	12,900	19,200	....
30	46,700	12,100	12,400	22,000	66,500	12,600	19,200	....
31	43,200	....	11,800	17,900	....	12,400	....	....

NOTE.—Daily discharge for 1909 obtained from a well-defined rating curve based on measurements made during 1911.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.								
1	....	24,300	7,110	7,110	2,650	1,910	6,620	5,220
2	....	28,100	7,110	7,600	2,270	1,570	6,140	5,220
3	....	32,200	7,110	8,100	1,910	1,250	5,680	5,220
4	....	31,400	5,680	7,110	1,910	2,270	5,220	4,000
5	....	28,100	5,680	6,140	1,910	2,270	4,770	3,500
6	....	25,000	6,140	5,680	1,570	2,650	5,220	3,000
7	59,700	23,600	6,140	5,680	2,650	3,060	10,600	2,000
8	54,000	25,000	5,680	6,620	3,900	3,480	13,900	1,450
9	49,600	24,300	5,220	6,140	5,220	3,900	13,900	1,250
10	47,500	23,600	5,220	5,680	6,140	4,330	12,200	1,250
11	45,400	22,100	4,770	3,480	7,110	5,220	10,600	1,250
12	42,500	20,800	4,330	3,900	8,100	4,330	10,100	1,250
13	38,600	21,400	4,330	4,330	8,340	3,480	9,100	1,060
14	36,700	21,400	4,330	5,220	7,110	3,060	8,600	1,060
15	33,100	19,400	3,900	6,140	5,680	3,060	8,100	1,060
16	30,600	18,100	4,330	6,140	5,220	3,060	7,350	1,060
17	28,900	16,800	4,330	4,770	5,220	2,650	7,110	1,060
18	26,600	15,600	4,330	3,900	3,480	2,650	6,620	1,060
19	25,000	14,500	4,330	3,900	3,060	2,650	6,140	875
20	23,600	13,300	3,900	4,330	2,650	2,650	5,680	875
21	22,800	12,800	3,480	3,900	2,270	2,650	5,220	875
22	21,400	12,200	3,060	3,900	2,270	3,060	4,770	875
23	20,800	11,700	3,900	3,480	2,270	3,060	4,770	1,060
24	18,700	11,200	2,270	3,480	2,270	2,650	4,770	1,060
25	16,800	10,600	3,900	3,480	1,910	3,060	4,770	1,060
26	18,100	10,600	4,330	3,060	1,910	3,060	4,770	1,060
27	18,700	10,100	4,770	3,060	2,270	4,330	4,770	1,060
28	25,000	9,610	5,220	2,650	1,910	5,220	4,330	1,060
29	26,600	8,600	5,220	2,270	1,910	6,140	4,770	1,250
30	25,000	7,600	5,220	1,910	1,910	6,620	4,770	1,450
31	23,600	....	6,140	2,270	....	7,110	....	2,120

NOTE.—For 1910: Daily discharge May 7 to Dec. 3 obtained from a well-defined rating curve which is based on measurements made during 1911; daily discharge during the ice period, except Dec. 4-7, obtained from a well-defined rating curve based on measurements made under ice cover; Dec. 4-7 estimated.

Monthly discharge of St. John River at Van Buren, Maine, for 1908–1910.

[Drainage area, 8,270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1908.						
May 4–31	108,000	57,600	90,200	10.9	11.35	B.
June	82,900	20,900	38,600	4.67	5.21	A.
July	17,600	6,740	11,500	1.39	1.60	A.
August	12,400	5,330	7,630	.923	1.06	A.
1909.						
May 10–31	134,000	43,200	89,500	10.8	8.84	B.
June	40,300	11,300	19,300	2.33	2.60	A.
July	22,300	11,000	15,900	1.92	2.21	A.
August	22,000	5,100	9,820	1.19	1.37	A.
September	66,500	8,720	18,000	2.18	2.43	A.
October	71,600	12,400	23,400	2.83	3.26	A.
November	19,600	10,800	13,900	1.68	1.87	A.
December 1–12	18,200	12,100	15,000	1.81	.81	A.
1910.						
May 7–31	59,700	16,800	31,200	3.77	3.50	A.
June	32,200	7,600	18,500	2.24	2.50	A.
July	7,110	2,270	4,890	.591	.68	A.
August	8,100	1,910	4,690	.567	.65	A.
September	8,340	1,570	3,570	.432	.48	A.
October	7,110	1,250	3,430	.415	.48	A.
November	13,900	4,330	7,050	.852	.95	A.
December	5,220	875	1,800	.218	.25	B.

ALLAGASH RIVER NEAR ALLAGASH, MAINE.

This station, which is located 2 miles below Dickey post office, 105 feet below the ferry crossing Allagash River, and 1,500 feet above the confluence of Allagash and St. John rivers, was established July 21, 1910, by the International Commission, River St. John, by whom the discharge records were furnished.

A rod gage is used. Gage heights are given as elevations above mean sea level.

The banks are high and not liable to overflow. The bed of the river is composed of gravel and small bowlders.

Discharge measurements are made from a boat and by wading at a point 35 feet above the gage.

Dams at Long, Ross, and Musquacook lakes may at times hold water back and for a given gage height may cause a much lower flow at the station than the natural minimum flow of the stream

A discharge rating curve has been developed which nearly covers the range in the stage of the river for 1910.

Discharge measurements of Allagash River near Allagash, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 17[a]	Douglas L. McLean [b]	288	835	583.36	2,208
July 4[a]	.....do	180	370	581.53	258
16[c]	.....do	247	511	582.20	661
21[d]	.....do	108.5	165.5	581.67	259

[a] Made 70 feet below ferry at gaging station.
[b] Measurements made under direction of International Commission, River St. John.
[c] Gage height referred to a temporary gage and somewhat uncertain.
[d] Made by wading about 1½ miles above ferry at gaging station.

Daily gage height, in feet, and discharge, in second-feet, of Allagash River near Allagash, Maine, for 1910.

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1		[a] 200	581.9	420	581.8	355	581.9	420	582.3	740		
2		[a] 200	581.9	420	581.9	420	581.9	420	582.5	935		
3	581.5	200	582.0	490	581.9	420	581.9	420	582.5	935		
4	581.5	200	582.0	490	582.0	490	581.8	355	582.5	935		
5	581.9	420	582.0	490	582.0	490	581.8	355	582.4	835		
6	581.9	420	582.0	490	581.9	420	581.7	295	582.3	740		
7	581.5	200	582.0	490	581.9	420	581.7	295	582.1	565		
8	581.5	200	581.9	420	582.0	490	581.8	355	581.7	295		
9	581.5	200	581.8	355	582.4	835	581.9	420	581.7	295		
10	581.4	165	581.8	355	582.4	835	581.9	420	581.7	295		
11	581.4	165	581.8	355	583.6	2,410	581.8	355	581.7	295		
12	582.7	1,160	581.8	355	584.1	3,230	581.8	355	581.7	295		
13	582.7	1,160	581.9	420	583.5	2,260	581.8	355	581.7	295		
14	582.7	1,160	581.9	420	583.1	1,660	581.7	295	581.7	295		
15	582.4	835	582.0	490	582.9	1,400	581.7	295	581.7	295		
16	582.2	650	581.9	420	582.8	1,280	581.7	295	581.7	295		
17	582.4	835	581.8	355	582.7	1,160	581.7	295	581.8	355		
18	581.8	355	581.7	295	582.5	935	581.6	245	581.8	355		
19	581.7	295	581.7	295	582.5	935	581.6	245	581.8	355		
20	581.7	295	581.7	295	582.5	935	581.6	245	581.8	355		
21	581.6	245	581.7	295	582.4	835	581.6	245	581.7	295		
22	581.6	245	581.7	295	582.3	740	581.5	200				
23	581.7	295	581.9	420	582.3	740	581.5	200				
24	582.0	490	582.3	740	582.2	650	581.6	245				
25	581.9	420	582.2	650	582.4	835	581.7	295				
26	582.0	490	582.1	565	582.0	490	581.8	355				
27	581.9	420	582.0	490	582.0	490	581.9	420				
28	581.9	420	582.0	490	582.0	490	582.0	490				
29	581.9	420	581.9	420	582.0	490	582.1	565				
30	581.9	420	581.8	355	581.9	420	582.2	650				
31	581.9	420	581.8	355			582.2	650				

[a] Estimated.

NOTE.—The gage heights from July 3 to 15 and 17 to 20 are estimated from the record of the temporary gage at Michaud farm, about 15 miles above the mouth of the river, used by the International Commission, River St. John, for river profile work.

Daily discharge obtained from a discharge rating curve fairly well defined between 500 and 7,000 second-feet. Below about 500 second-feet it is not well defined.

Monthly discharge of Allagash River near Allagash, Maine, for 1910.

[Drainage area, 1,240 square miles.]

Month	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
July	1,160	165	439	0.354	0.41	B.
August	740	295	426	.344	.40	B.
September	3,230	355	919	.741	.83	B.
October	650	200	356	.287	.33	B.
November 1-21	935	295	479	.386	.30	B.
December						

ST. FRANCIS RIVER NEAR ST. FRANCIS, MAINE.

St. Francis River rises in Lake St. Francis in Temiscouata County, Quebec, and flows southeastward, passing through Dohenagamook and Glazier lakes and uniting with St. John River at St. Francis, Aroostook County, Maine.

The gaging station, which is located 1 mile above the mouth of the river, 1½ miles from St. Francis, Maine, 4 miles from Conners, New Brunswick, and 3 miles below Glazier Lake, was established May 11, 1910, by the International Commission, River St. John, by whom the records are furnished.

The drainage area is about 560 square miles.

Three gages were maintained by the International Commission, River St. John, on this river during 1910:

No. 1, a permanent rod gage, 1 mile above the mouth of the river. The zero of this gage is 528.84 feet above mean sea level. An observer for daily readings could not be found during 1910.

No. 2 (Cooper gage), a temporary gage, located 1½ miles above gage No. 1, and half a mile below Fall Brook at the farm of Richard Cooper. This gage was read from July 25 to November 30, 1910, as recorded in the following table.

No. 3, a temporary gage, located at the outlet of Glazier Lake, 3 miles above the permanent gage. This gage was read daily from May 11 to November 30, 1910.

Measurements are made from a canoe or by wading 10 feet above the permanent gage.

The discharge measurements for 1910 here published are referred to gage No. 3. Temporary gages 2 and 3 were discontinued on November 30, 1910. During 1911 gage readings were recorded from the permanent gage. The gage heights at gage No. 3 record the rise and fall of Glazier Lake as well as the fluctuations of the river, and for this reason the computations of daily and monthly discharge are somewhat uncertain.

Discharge measurements of St. Francis River near St. Francis, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 15	Douglas L. McLean	110	376	5.1	1,188
July 1	.....do	100	237	4.0	461
14	.....do	96	205	3.7	336
24	.....do	94	179	3.5	216
Oct. 20	.....do	94	174	3.4	219
Nov. 27	.....do	96	207	3.7	331

NOTE.—Measurements made under direction of International Commission, River St. John, at the permanent gage 1 mile above the mouth of St. Francis River. Gage heights refer to temporary gage No. 3.

Daily gage height, in feet, referred to gage No. 2, of St. Francis River near St. Francis, Maine, for 1910.

[Richard Cooper, observer.]

Day.	July.	Aug.	Sept.	Oct.	Nov.	Day.	July.	Aug.	Sept.	Oct.	Nov.
1		1.6	0.7	0.6	1.3	16		1.2	1.1	1.0	2.0
2		1.7	.7	.6	1.3	17		1.1	1.0	1.0	1.9
3		1.7	.6	.6	1.2	18		1.1	1.0	1.0	1.9
4		1.6	.6	.6	1.2	19		1.2	.9	1.0	1.8
5		1.7	.6	.6	1.2	20		1.1	.8	1.0	1.7
6		1.7	.6	.7	1.3	21		1.1	.8	1.0	1.6
7		1.6	.7	.7	1.5	22		1.0	.8	1.0	1.6
8		1.5	.7	.7	1.9	23		1.0	.8	1.0	1.5
9		1.5	.8	.7	2.0	24		1.0	.7	1.0	1.5
10		1.4	.9	.7	2.1	25	1.1	.9	.7	1.0	1.4
11		1.4	.9	.9	2.2	26	1.1	.9	.7	1.0	1.3
12		1.4	1.0	1.0	2.2	27	1.2	.9	.7	1.1	1.3
13		1.3	1.1	1.0	2.2	28	1.3	.9	.6	1.2	1.4
14		1.3	1.1	1.0	2.1	29	1.4	.8	.6	1.3	1.4
15		1.3	1.1	1.0	2.1	30	1.4	.8	.6	1.3	1.4
						31	1.5	.7		1.3	

NOTE.—Gage heights taken at the Cooper gage, ½ mile below Fall Brook and 1½ miles above the permanent gage. Readings on this gage were discontinued Nov. 30, 1910.

Daily gage height, in feet, referred to gage No. 3, of St. Francis River near St. Francis, Maine, for 1910.

[Mrs. Charles Morris, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		6.2	4.0	4.0	3.2	3.1	3.7
2		6.2	3.9	4.0	3.2	3.1	3.7
3		6.2	3.9	4.1	3.1	3.1	3.6
4		6.2	3.9	4.1	3.1	3.1	3.6
5		6.1	3.9	4.0	3.1	3.1	3.6
6		6.1	3.9	4.0	3.1	3.1	3.7
7		5.9	3.9	4.0	3.2	3.1	3.9
8		5.7	4.0	4.0	3.2	3.2	4.0
9		5.6	4.0	3.9	3.2	3.2	4.3
10		5.5	3.9	3.8	3.2	3.2	4.5
11	7.5	5.5	3.9	3.8	3.4	3.2	4.6
12	7.5	5.4	3.8	3.8	3.4	3.3	4.6
13	7.3	5.3	3.7	3.7	3.4	3.4	4.5
14	7.0	5.2	3.7	3.7	3.5	3.4	4.4
15	6.9	5.1	3.7	3.6	3.5	3.4	4.3
16	6.5	5.1	3.7	3.6	3.5	3.4	4.3
17	6.3	5.0	3.6	3.5	3.4	3.4	4.2
18	6.0	4.9	3.6	3.5	3.4	3.4	4.2
19	6.0	4.8	3.6	3.6	3.3	3.4	4.1
20	6.3	4.7	3.6	3.6	3.3	3.4	4.1

Daily gage height, in feet, referred to gage No. 3, of St. Francis River near St. Francis, Maine, for 1910—Continued.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
21	6.5	4.6	3.5	3.5	3.2	3.4	4.0
22	6.2	4.5	3.5	3.5	3.2	3.4	4.0
23	5.9	4.4	3.5	3.5	3.2	3.4	3.9
24	5.8	4.4	3.5	3.4	3.2	3.4	3.8
25	5.5	4.3	3.5	3.4	3.2	3.4	3.8
26	5.5	4.2	3.6	3.4	3.2	3.4	3.8
27	5.5	4.2	3.6	3.3	3.2	3.5	3.7
28	5.5	4.1	3.7	3.3	3.1	3.5	3.7
29	6.5	4.1	3.8	3.3	3.1	3.6	3.7
30	6.0	4.0	3.8	3.3	3.1	3.6	3.7
31	6.2	....	3.9	3.2	....	3.7	....

NOTE.—Read on the gage at the outlet of Glazier Lake, 3 miles above the permanent gage. The gage heights record the rise and fall of the lake and probably do not represent fully the true fluctuations of the river.

Daily discharge, in second-feet, of St. Francis River near St. Francis, Maine, for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	....	2,070	460	460	145	120	320
2	....	2,070	409	460	145	120	320
3	....	2,070	409	516	120	120	279
4	....	2,070	409	516	120	120	279
5	....	1,990	409	460	120	120	279
6	....	1,990	409	460	120	120	320
7	....	1,820	409	460	145	120	409
8	....	1,660	460	460	145	145	460
9	....	1,580	460	409	145	145	632
10	....	1,500	409	361	145	145	762
11	3,300	1,500	409	361	207	145	830
12	3,300	1,420	361	361	207	175	830
13	3,100	1,340	320	320	207	207	762
14	2,800	1,260	320	320	240	207	696
15	2,710	1,190	320	279	240	207	632
16	2,350	1,190	320	279	240	207	632
17	2,170	1,110	279	240	207	207	572
18	1,900	1,040	279	240	207	207	572
19	1,900	970	279	279	175	207	516
20	2,170	900	279	279	175	207	516
21	2,350	830	240	240	145	207	460
22	2,080	762	240	240	145	207	460
23	1,820	696	240	240	145	207	409
24	1,740	696	240	207	145	207	361
25	1,500	632	240	207	145	207	361
26	1,500	572	279	207	145	207	361
27	1,500	572	279	175	145	240	320
28	1,500	516	320	175	120	240	320
29	2,350	516	361	175	120	279	320
30	1,900	460	361	175	120	279	320
31	2,080	....	409	145	....	320	....

NOTE.—The daily discharges are based on a discharge rating curve which is well defined between 200 and 1,400 second-feet.

Monthly discharge of St. Francis River near St. Francis, Maine, for 1910.

[Drainage area, 560 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
May 11-31	3,300	1,500	2,190	3.91	3.05	C.
June	2,070	460	1,230	2.20	2.46	C.
July	460	240	343	.612	.71	C.
August	516	145	313	.559	.64	C.
September	240	120	161	.288	.32	C.
October	320	120	189	.338	.39	C.
November	830	279	477	.852	.95	C.

MADAWASKA RIVER AT STE. ROSE DU DEGELE, QUEBEC, CANADA.

Madawaska River rises in Lake Temiscouata, in Temiscouata County, Province of Quebec, flows southeastward, and unites with the St. John at Edmundston, New Brunswick.

The gaging station, which is located at the highway bridge crossing the river one-fifth mile from Temiscouata railroad station, 2 miles below the foot of Lake Temiscouata, and 21 miles above the mouth of the river, was established May 12, 1910, by the International Commission, River St. John, by which the discharge records were furnished. The drainage area above this station is 958 square miles.

The gage is a rod nailed to the west abutment of highway bridge, and is referred to levels of the International Commission, River St. John. Gage heights are given as elevations above mean sea level. The banks are high and not liable to overflow. The bottom of the river is composed of sand and gravel.

Some of the discharge measurements were made at the St. Jacques bridge 6 miles above the mouth of the river and referred to the Ste. Rose gage. The Edmundston dam, at the mouth of the river, affects the gage at St. Jacques at certain stages of the river.

The discharge measurements made during 1910 do not define a good discharge rating curve, and the determination of daily discharge is deferred until more data are available.

Discharge measurements of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 13[a]	Douglas L. McLean [b]			479.04	3,440
24[a]	do			478.14	1,950
July 8[a]	do			477.20	1,145
23[a]	do			476.6	784
Oct. 20[a]	do			476.1	480
22	do	60	222	476.03	400
Nov. 26	do	237	1,539	476.87	1,120

[a] Measurements made at St. Jacques bridge and referred to Ste. Rose gage.
[b] Measurements made under direction of International Commission, River St. John.

Daily gage height, in feet, of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

[Mrs. Delphis Leveresque, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	479.5	477.4	476.9	476.1	475.9	476.3	476.8
2	....	479.5	477.3	476.9	476.0	475.9	476.3	476.8
3	....	476.6	477.3	476.8	476.0	475.9	476.3	476.8
4	....	479.4	477.2	476.8	476.0	475.9	476.3	476.7
5	....	479.3	477.2	476.8	476.0	475.9	476.4	476.7
6	....	479.3	477.1	476.8	476.1	475.9	476.5	476.7
7	....	479.2	477.2	476.8	476.1	475.9	476.6	476.7
8	....	479.2	477.2	476.7	476.0	475.9	476.6	476.7
9	....	479.2	477.1	476.7	476.1	475.9	476.7	476.7
10	....	479.1	477.1	476.7	476.1	475.8	476.7	476.7
11	....	479.1	477.1	476.6	476.1	475.8	476.8	476.7
12	483.1	479.0	477.1	476.6	476.1	475.8	476.8	476.7
13	482.8	479.0	477.1	476.5	476.1	475.8	476.9	476.7
14	482.6	478.9	477.1	476.5	476.1	475.9	476.9	476.7
15	482.3	478.8	477.0	476.5	476.1	475.9	476.9	....
16	482.0	478.7	477.0	476.5	476.0	476.0	476.9	....
17	481.8	478.6	476.9	476.4	476.0	476.2	476.9	....
18	481.5	478.5	476.9	476.5	476.0	476.1	476.9	....
19	481.3	478.4	476.8	476.5	476.0	476.1	476.9	....
20	481.1	478.4	476.7	476.4	476.0	476.1	476.9	....
21	480.9	478.3	476.6	476.4	476.0	476.0	476.9	....
22	480.7	478.2	476.6	476.3	476.0	476.0	476.9	....
23	480.4	478.2	476.6	476.3	476.0	476.1	476.8	....
24	480.2	478.1	476.6	476.3	476.0	476.1	476.8	....
25	480.1	478.0	476.6	476.3	476.0	476.1	476.9	....
26	480.0	477.9	476.7	476.3	476.0	476.2	476.9	....
27	480.1	477.8	476.6	476.2	476.0	476.2	476.9	....
28	479.9	477.7	476.6	476.2	475.9	476.3	476.8	....
29	479.8	477.6	476.7	476.2	475.9	476.3	476.8	....
30	479.7	477.5	476.7	476.1	475.9	476.3	476.8	....
31	479.6	....	476.9	476.1	....	476.3	....	....

Daily discharge, in second-feet, of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	3,700	1,460	1,020	455	350	575	935
2	....	3,700	1,360	1,020	400	350	575	935
3	....	3,820	1,360	935	400	350	575	935
4	....	3,580	1,280	935	400	350	575	855
5	....	3,460	1,280	935	400	350	640	855
6	....	3,460	1,180	935	455	350	710	855
7	....	3,350	1,280	935	455	350	780	855
8	....	3,350	1,280	855	400	350	780	855
9	....	3,350	1,180	855	455	350	855	855
10	....	3,240	1,180	855	455	305	855	855
11	....	3,240	1,180	780	455	305	935	855
12	8,220	3,120	1,180	780	455	305	935	855
13	7,830	3,120	1,180	710	455	305	1,020	855
14	7,570	3,010	1,180	710	455	350	1,020	855
15	7,180	2,900	1,100	710	455	350	1,020	....
16	6,790	2,790	1,100	710	400	400	1,020	....
17	6,530	2,680	1,020	640	400	515	1,020	....
18	6,140	2,570	1,020	710	400	455	1,020	....
19	5,900	2,460	935	710	400	455	1,020	....
20	5,640	2,460	855	640	400	455	1,020	....
21	5,400	2,360	780	640	400	400	1,020	....
22	5,140	2,260	780	575	400	400	1,020	....
23	4,780	2,260	780	575	400	455	935	....
24	4,540	2,150	780	575	400	455	935	....
25	4,420	2,050	780	575	400	455	1,020	....
26	4,300	1,950	855	575	400	515	1,020	....
27	4,420	1,850	780	515	400	515	1,020	....
28	4,180	1,750	780	515	350	575	935	....
29	4,060	1,650	855	515	350	575	935	....
30	3,940	1,550	855	455	350	575	935	....
31	3,820	....	1,020	455	....	575	....	....

NOTE.—Discharges obtained from a rating curve not well defined.

Monthly discharge of Madawaska River at Ste. Rose du Degele, Quebec, for 1910.

[Drainage area, 958 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
May 12-31	8,220	3,820	5,540	5.78	4.30	C.
June	3,820	1,550	2,770	2.89	3.22	C.
July	1,460	780	1,050	1.10	1.27	C.
August	1,020	455	721	.753	.87	C.
September	455	350	413	.431	.48	C.
October	575	305	414	.432	.50	C.
November	1,020	575	891	.930	1.04	C.
December 1-14	935	855	872	.910	.47	C.

AROOSTOOK RIVER AT FORT FAIRFIELD, MAINE.

The sources of Aroostook River lie adjacent to those of the Mattawamkeag and the East Branch of the Penobscot. Although its drainage area is large—2,230 square miles, nearly all in Maine—its flow is variable because of lack of storage facilities. During the low-water seasons, which frequently occur in both the fall and midwinter, its flow has been known to reach a minimum of 0.06 second-foot per square mile, a remarkably low figure for so large a stream in the northeast.

The gaging station, which was established July 31, 1903, is located at the steel highway bridge in the village of Fort Fairfield, about 3 miles upstream from the international boundary line and about 8 miles below the mouth of Little Madawaska Stream. This station was discontinued December 31, 1910.

The datum of the chain gage, attached to the bridge, has remained unchanged during the maintenance of the station. Discharge measurements are made from the bridge or by wading a short distance below the bridge.

The dam of the Maine & New Brunswick Electric Power Co. is located about a mile east of the international boundary line or about 4 miles below the station. The fall between the two points is so great that the gage heights are not affected by backwater.

Heavy ice exists at this station during the winter.

Conditions for accurate determinations of discharge are good, and an excellent discharge rating curve was developed for 1903–1909. This curve was also used for 1910, although the three measurements made during the open period of 1910 plot uniformly about 200 second-feet less than the curve. The cause for this difference is unknown, and at low stages there may be considerable percentage error in the discharge values owing to the use of the 1909 discharge rating.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Aroostook River at Fort Fairfield, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 18	F. E. Pressey	350	1,020	[a] 6.52	855
May 6	.....do	482	3,290	10.38	16,900
June 9	W. E. Parsons	391	1,490	6.36	5,150
21	.....do	358	1,100	5.38	3,230

[a] Gage height to top of ice, 6.70; ice 1.53 feet thick.

Daily gage height, in feet, of Aroostook River at Fort Fairfield, Maine, for 1910.

[F. E. Peterson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.7					7.55		4.5		3.3	3.9	3.4
2					9.1	7.6	5.5	4.4		3.3	3.9	3.4
3					8.75	7.8	5.4	4.35		3.3	3.8	3.35
4					9.5	7.45		4.15		3.3	3.8	3.6
5		7.1	6.0	8.85	10.4	6.8	5.45	4.0		3.3	3.8	3.6
6				9.8	10.4	6.85	5.3	4.0		3.3	4.5	3.7
7				11.65	9.95	6.65	5.6	3.85	3.6	3.3	5.1	3.7
8	7.6			11.9	9.2	6.55	5.5	3.8	3.6	3.3	5.35	3.8
9				11.9	8.8	6.55	5.4	3.7	3.75	3.3	5.3	3.8
10				9.9	8.85	6.4	5.25	3.6	4.15	3.3	5.4	3.8
11				9.8	8.75	6.3	5.25	3.55	4.05	3.3	5.2	3.6
12				9.0	8.3	6.1	5.4	3.45	3.8	3.3	4.5	3.95
13				8.85	7.9	6.05	5.5	3.45	3.8	3.3	4.3	4.2
14				8.75	7.3	6.15	5.5	3.4	3.65	3.3	4.25	4.4
15	7.0			8.5	6.8	6.1	5.5	3.4	3.55	3.3	4.2	4.4
16				8.3	6.45	6.0	5.4	3.4	3.4	3.3	4.15	4.4
17				8.3	6.9	6.15	5.35	3.4	3.4	3.3	4.1	4.4
18				8.6	6.85	6.3	5.3	3.4	3.4	3.3	4.0	4.4
19		7.9	5.5	9.1	6.45	6.2	5.3	3.4	3.4	3.3	4.2	4.4
20				10.4	6.65	6.05	5.15	3.45	3.3	3.15	3.95	4.4
21				11.45	6.8	5.95	5.1	3.5	3.4	3.2	3.85	4.4
22	6.7			12.5	6.6	5.85	5.05	3.5	3.35	3.2	3.6	4.4
23					6.55	5.7	4.9		3.3	3.3	3.55	4.4
24					6.4	5.6	4.75	3.45	3.35	3.3	3.5	4.5
25					6.35	5.5	4.8	3.45	3.3	3.3	3.6	4.5
26		5.7	5.9		6.45	5.4	4.7	3.4	3.25	3.3	3.6	4.5
27					6.85	5.45	4.55	3.4	3.3	3.55	3.5	4.5
28	10.6			12.2	7.9	5.7	4.45	3.5	3.3	4.0	3.5	4.4
29	10.15			11.6	7.7		4.3	3.5	3.3	4.0	3.5	4.4
30	9.35			10.65	7.15	5.5	4.4		3.3	4.1	3.5	4.4
31					7.35		4.3			4.1		4.4

NOTE.—Ice existed at this station from Jan. 1 to Apr. 4, and from about Dec. 4 to 31. Gage heights are to water surface. The thickness of ice during January to March varied from about 1.1 feet to 1.7 feet.

Daily discharge, in second-feet, of Aroostook River at Fort Fairfield, Maine, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		15,600	8,230	3,620	1,820	[a] 480	310	940	390
2		12,900	8,360	3,620	1,660	[a] 480	310	940	390
3		11,800	8,910	3,420	1,590	[a] 480	310	810	350
4		14,200	7,970	3,420	1,290	[a] 390	310	810	
5	12,100	17,300	6,400	3,520	1,080	[a] 390	310	810	
6	15,200	17,300	6,510	3,230	1,080	[a] 390	310	1,820	
7	21,700	15,700	6,050	3,820	875	580	310	2,850	
8	22,600	13,200	5,830	3,620	810	580	310	3,330	
9	22,600	12,000	5,830	3,420	690	750	310	3,230	
10	15,600	12,100	5,500	3,140	580	1,290	310	3,420	

[a] Estimated from temporary gage of International Commission.

Daily discharge, in second-feet, of Aroostook River at Fort Fairfield, Maine, for 1910—Continued.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	15,200	11,800	5,280	3,140	530	1,140	310	3,040	....
12	12,600	10,400	4,840	3,420	435	810	310	1,820	....
13	12,100	9,200	4,740	3,620	435	810	310	1,510	....
14	11,800	7,590	4,950	3,620	390	635	310	1,440	....
15	11,000	6,400	4,840	3,620	390	530	310	1,360	....
16	10,400	5,600	4,640	3,420	390	390	310	1,290	....
17	10,400	6,630	4,950	3,330	390	390	310	1,220	....
18	11,300	6,510	5,280	3,230	390	390	310	1,080	....
19	12,900	5,600	5,060	3,230	390	390	310	1,360	....
20	17,300	6,050	4,740	2,950	435	310	210	1,010	....
21	21,000	6,400	4,530	2,850	480	390	240	875	....
22	24,800	5,940	4,320	2,760	480	350	240	580	....
23	25,600	5,830	4,020	2,490	480	310	310	530	....
24	25,200	5,500	3,820	2,240	435	350	310	480	....
25	24,800	5,380	3,620	2,320	435	310	310	580	....
26	24,500	5,600	3,420	2,150	390	275	310	580	....
27	24,100	6,510	3,520	1,900	390	310	530	480	....
28	23,700	9,200	4,020	1,740	480	310	1,080	480	....
29	21,600	8,630	3,820	1,510	480	310	1,080	480	....
30	18,200	7,220	3,620	1,660	480	310	1,220	480	....
31	....	7,720	....	1,510	480	....	1,220	....	....

NOTE.—Daily discharge obtained from the 1909 discharge rating curve. (See description for discussion of the accuracy of this curve.) Discharge interpolated for days when the gage was not read, except for Sept. 1 to 6, which was estimated from the records of the temporary gage of the International Commission, River St. John, located at an old pier about one-fourth mile below the gaging station.

Monthly discharge of Aroostook River at Fort Fairfield, Maine, for 1910.

[Drainage area, 2,230 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	....	....	2,100	0.942	1.09	D.
February	....	....	1,200	.538	.56	D.
March	....	....	1,800	.807	.93	D.
April	25,600	....	16,500	7.40	8.26	B.
May	17,300	5,380	9,410	4.22	4.86	A.
June	8,910	3,420	5,250	2.35	2.62	B.
July	3,820	1,510	2,950	1.32	1.52	B.
August	1,820	390	666	.299	.34	C.
September	1,290	275	494	.222	.25	D.
October	1,220	210	418	.187	.22	D.
November	3,420	480	1,320	.592	.66	C.
December	....	....	350	.157	.18	D.
The year	25,600	210	3,530	1.58	21.49	

NOTE.—Discharge during the winter months based on one measurement made Jan. 18, on climatological records, and on general run-off conditions in northern Maine during the winter of 1910.

Mean discharge Apr. 1 to 4, estimated, 6,750 second-feet.

The accuracy for the months of low discharge is uncertain (see station description, p. 44).

This table supersedes discharge tables published in the first annual report of the Maine State Water Storage Commission.

ST. CROIX RIVER.

GENERAL FEATURES OF AREA DRAINED.

St. Croix River is formed by two principal branches. The East Branch, also known as the Upper St. Croix, is the outlet of the Schoodic Lake system, including Grand and Spednic lakes; the West Branch is formed by the Grand Lake system, including Sysladobsis, Grand, and Big lakes. The St. Croix, including the East Branch, forms nearly half of the eastern boundary of Maine, and its total length is about 100 miles. Tributaries are small and unimportant. The total drainage area is 1,473 square miles at Calais, the East or principal branch draining 644 square miles, and the West Branch 674 square miles at their junction. The river discharges into Passamaquoddy Bay.

The basin is in general lower than that of any other of the larger streams in the State flowing into the Atlantic, its headwaters having an elevation of about 540 feet.

A large part of the drainage basin is still covered with timber, and above Vanceboro and Princeton, at the foot of the two systems of lakes, the region is for the most part wild and inaccessible.

The mean annual precipitation is probably about 41 inches, ranging from 44 inches at Eastport, on the coast, to 38 inches in the northern section. The river is generally frozen over during the winter, although more subject to thaws during this season than rivers draining basins farther inland.

The lake system of the St. Croix is the largest in the State in proportion to the drainage basin, except that of the Presumpscot, which is, however, a much smaller stream. The lake surface of the Upper St. Croix aggregates 48.62 square miles, and that of the West Branch 82.64 square miles, as determined from recent studies of the Maine State Water Storage Commission. In fact, above Vanceboro and Princeton each branch of the river is simply a succession of lakes almost to the extreme headwaters. The total lake surface of the St. Croix is 134.46 square miles, or about one-eleventh the total drainage area.

The St. Croix is a valuable stream for water power, owing to its very uniform flow. Power has been developed at Calais, Baring, and Woodland, principally for the manufacture of pulp, paper, and lumber. Opportunities for increased storage are excellent, and a systematic regulation of water areas easily controlled by dams would make this one of the best power streams in the country.

The river is navigable as far as Calais, except for the two or three months in the year when it is frozen.

ST. CROIX RIVER NEAR WOODLAND, MAINE.

This station was originally established December 4, 1902, at a point a short distance above Sprague Falls, now called Woodland, near Baring, Maine. On June 8, 1905, it was moved about 1½ miles downstream to avoid backwater effect from a paper mill and dam constructed at Sprague Falls. It is about 10 miles below the junction of the West with the East Branch, and about 14 miles above the mouth of the St. Croix. Power plants are numerous along the river, the nearest being at Woodland, above, and at Baring, 5 miles below. Backwater from the lower dam extends about 2 miles and does not affect the flow at the station.

There is no determined relation between the gage datums at the original and present locations of the station. A vertical staff gage is attached to a bowlder on the left bank about 1 mile below the dam at Sprague Falls. A chain gage for use in high water is located on the left bank about 300 feet above the staff gage. The cable from which discharge measurements are made is at a point about 400 feet below the staff gage. During the winter the discharge is usually not affected by ice, because the operation of the mill above tends to keep the channel open. In the log-driving season the discharge is often materially affected by log jams. On Sundays and holidays and occasionally at other times when the natural discharge is relatively low, the mill is shut down and water stored, which usually greatly reduces the discharge on such days.

When the channel at this station is unobstructed, the conditions favor accuracy of discharge measurements, and for such periods a good discharge rating curve has been developed. During 1910, however, conditions were especially poor. The first four measurements indicated an apparent backwater effect of 0.15 foot; the other three measurements define a discharge rating curve with an apparent backwater effect of about 0.75 foot. Hence, the discharge from January 1 to June 28 is determined from the discharge rating curve defined by the first four measurements of the year, and the discharge for June 29 to August 11 from a rating curve defined by the remaining 3 measurements. From August 12 to 23 shifting-channel methods were adopted to cover the period of transition between backwater conditions and conditions of free flow. It is very uncertain when this change from backwater to free flow took place and, consequently, values from August 24 to the end of the year, which are based on the unobstructed channel discharge rating curve, are somewhat uncertain.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of St. Croix River near Woodland, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 14[a]	F. E. Pressey	296	1,160	7.97	2,290
Mar. 11	.....do	284	1,240	8.68	3,520
May 12[b]	.....do	276	1,180	8.32	2,860
June 16[b]	W. E. Parsons	280	1,110	7.98	2,520
July 19[b]	.....do	280	1,210	8.28	1,960
21[b]	.....do	285	1,270	8.43	2,270
Aug. 9[b]	.....do	285	1,160	8.20	1,820

[a] Affected by anchor ice.
[b] Affected by backwater from log jam.

Daily gage height, in feet, of St. Croix River near Woodland, Maine, for 1910.

[Simeon Phinney, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			8.2	7.9		7.8	8.4	8.3	7.7		7.1	7.2
2		8.3	8.2	8.1	8.4	7.9		8.2	7.7		7.1	7.45
3	7.8		8.1		8.5	7.9		8.1	7.7	7.6	7.0	7.4
4			8.0	7.9	8.5	7.9		8.0		7.6	6.8	
5			8.0	7.9	8.4		8.5	8.4		7.7	6.6	
6				7.8	8.3	8.0	8.4	8.4		7.7		7.3
7		8.2		7.8	8.3	8.1	8.4		7.6	7.7	6.6	7.3
8		8.0		8.1		8.3	8.4	8.3	7.7	7.7	6.7	7.2
9		8.0	8.9	8.1	8.3	8.4	8.4	8.2	7.7		6.8	
10		8.0	8.8		8.3	8.5		8.2	7.6	7.7	6.8	7.1
11			8.7	8.0	8.2	8.6	8.5	8.1		7.8	6.8	
12			8.5	8.0	8.2		8.5	8.0	7.6			7.0
13				7.9			8.5	7.9	7.6			6.9
14	8.0		8.1	7.9		8.6			7.7		7.0	6.7
15			8.1	8.0		8.4	8.6	7.9	7.7		7.0	6.6
16			8.0	8.0	8.0	8.3	8.6	7.9	7.8		7.1	6.6
17		8.0	8.0		8.0	8.0		7.8	7.8	7.7	7.1	
18			8.0	8.0	7.9		8.5	7.8		7.7	7.1	
19				8.1	7.8		8.5	7.7	7.7	7.6	7.1	
20				8.3	7.7	8.0	8.6	7.7	7.7	7.6		6.8
21	8.0		8.0	8.5	7.7	8.1	8.6		7.6	7.6	7.0	7.0
22			8.0	8.5		8.1		7.7	7.6	7.6	7.0	7.0
23			8.0	8.5	7.5	8.0	8.6	7.7			7.0	7.1
24		8.0	8.1		7.5	8.1		7.6		7.5	7.0	
25			8.0	8.5	7.5	8.1	8.5	7.6		7.4	7.0	
26			8.1	8.5	7.6		8.5	7.6	7.6	7.4	7.0	
27				8.5	7.6	8.1	8.5	7.6	7.6	7.3		7.1
28			8.0	8.6	7.7	8.2	8.4		7.7		7.0	7.1
29	9.0		8.1	8.5		8.4	8.4	7.6	7.7	7.2	7.1	7.1
30			8.0	8.4	7.7	8.4		7.7	7.7		7.1	
31			7.9		7.7			7.7		7.1		

NOTE.—The discharge was probably not much affected by ice during 1910. Note, however, that the measurement made Jan. 14 showed backwater effect, which was duly allowed for in the discharge rating curve used. The gage heights during the greater portion of the year were much affected by backwater from log jams.

Daily discharge, in second-feet, of St. Croix River near Woodland, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,200	3,170	2,720	2,280	3,030	2,140	2,160	2,030	2,230	2,230	1,470	1,590
2	500	2,870	2,720	2,570	3,030	2,280	2,200	1,900	2,230	1,000	1,470	1,900
3	2,140	2,840	2,570	2,420	3,190	2,280	2,230	1,780	2,230	2,090	1,360	1,830
4	2,140	2,810	2,420	2,280	3,190	2,280	2,260	1,660	1,000	2,090	1,150	1,000
5	2,170	2,780	2,420	2,280	3,030	2,350	2,300	2,160	1,000	2,230	950	1,710
6	2,200	500	2,420	2,140	2,870	2,420	2,160	2,160	2,230	2,230	1,000	1,710
7	2,220	2,720	2,910	2,140	2,870	2,570	2,160	2,100	2,090	2,230	950	1,710
8	2,250	2,420	3,400	2,570	2,870	2,870	2,160	2,030	2,230	2,230	1,050	1,590
9	500	2,420	3,890	2,570	2,870	3,030	2,160	1,900	2,230	1,000	1,150	1,470
10	2,310	2,420	3,710	2,500	2,870	3,190	2,230	1,900	2,090	2,230	1,150	1,470
11	2,340	2,420	3,530	2,420	2,720	3,360	2,300	1,780	1,000	2,370	1,150	1,000
12	2,360	2,420	3,190	2,420	2,720	3,360	2,300	1,750	2,090	2,230	1,150	1,360
13	2,390	500	2,880	2,280	2,640	3,360	2,300	1,680	2,090	2,230	1,000	1,250
14	2,420	2,420	2,570	2,280	2,570	3,360	2,370	1,740	2,230	2,230	1,360	1,050
15	2,420	2,420	2,570	2,420	2,500	3,030	2,440	1,810	2,230	2,230	1,360	950
16	500	2,420	2,420	2,420	2,420	2,870	2,440	1,870	2,370	1,000	1,470	950
17	2,420	2,420	2,420	2,420	2,420	2,420	2,370	1,820	2,370	2,230	1,470	950
18	2,420	2,420	2,420	2,420	2,280	2,420	2,300	1,870	1,000	2,230	1,470	1,000
19	2,420	2,420	2,420	2,570	2,140	2,420	2,300	1,830	2,230	2,090	1,470	1,150
20	2,420	500	2,420	2,870	2,010	2,420	2,440	1,910	2,230	2,090	1,000	1,150
21	2,420	2,420	2,420	3,190	2,010	2,570	2,440	1,990	2,090	2,090	1,360	1,360
22	2,630	2,420	2,420	3,190	1,880	2,570	2,440	2,070	2,090	2,090	1,360	1,360
23	500	2,420	2,420	3,190	1,760	2,420	2,440	2,150	2,090	1,000	1,360	1,470
24	3,040	2,420	2,570	3,190	1,760	2,570	2,370	2,090	2,090	1,960	1,360	1,470
25	3,240	2,480	2,420	3,190	1,760	2,570	2,300	2,090	1,000	1,830	1,360	1,000
26	3,450	2,540	2,570	3,190	1,880	2,570	2,300	2,090	2,090	1,830	1,360	1,000
27	3,660	500	2,500	3,190	1,880	2,570	2,300	2,090	2,090	1,710	1,000	1,470
28	3,860	2,660	2,420	3,360	2,010	2,720	2,160	2,090	2,230	1,710	1,360	1,470
29	4,070	....	2,570	3,190	2,010	2,160	2,160	2,090	2,230	1,590	1,470	1,470
30	500	....	2,420	3,030	2,010	2,160	2,120	2,230	2,230	1,000	1,470	1,470
31	3,470	....	2,280	....	2,010	....	2,070	2,230	....	1,470	....	1,470

NOTE.—See description for discussion of discharge rating curves used for 1910. Discharge estimated or interpolated for Sundays and other days on which the gage was not read.

Monthly discharge of St. Croix River near Woodland, Maine, for 1910.

[Drainage area, 1,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	4,070	500	2,310	1.63	1.88	B.
February	3,170	500	2,260	1.59	1.66	B.
March	3,890	2,280	2,680	1.89	2.18	B.
April	3,360	2,140	2,670	1.88	2.10	B.
May	3,190	1,760	2,430	1.71	1.97	B.
June	3,360	2,140	2,640	1.86	2.08	B.
July	2,440	2,070	2,280	1.61	1.86	C.
August	2,230	1,660	1,960	1.38	1.59	C.
September	2,370	1,000	1,990	1.40	1.56	C.
October	2,370	1,000	1,900	1.34	1.54	C.
November	1,470	950	1,270	.894	1.00	B.
December	1,900	950	1,350	.951	1.10	B.
The year	4,070	500	2,140	1.51	20.52	

NOTE.—This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

GRAND LAKE, MAINE.

Grand Lake is in Tps. 5 and 6, N. D.; 5 and 6, Range 1, N. B. P. P.; and 3, Range 1, T. S., and is on the West Branch of St. Croix River. The area of the lake is 23.5 square miles. A dam at the outlet gives an available storage depth of about 8 feet. The nearest gaging station on the West Branch of St. Croix River is at Baileyville, about 4 miles from Princeton village.

The following table gives the dates of opening or the disappearance of ice from this lake since 1878, the record being furnished by M. P. Kneeland, game warden, Princeton, Maine, to the Commissioners of Inland Fisheries and Game:

Dates of opening of Grand Lake, Maine.

1878, Apr. 26.	1890, May 8.	1902, Apr. 8.
1879, May 10.	1891, May 4.	1903, Apr. 20.
1880, May 2.	1892, Apr. 30.	1904, May 5.
1881, May 3.	1893, May 9.	1905, Apr. 28.
1882, May 6.	1894, Apr. 30.	1906, May 5.
1883, May 9.	1895, May 2.	1907, May 5.
1884, Apr. 30.	1896, Apr. 29.	1908, May 6.
1885, May 5.	1897, May 4.	1909, Apr. 30.
1886, May 3.	1898, Apr, 27.	1910, Apr. 11.
1887, May 11.	1899, Apr. 27.	1911, May 3.
1888, May 17.	1900, Apr. 29.	
1889, Apr. 26.	1901, Apr. 25.	

WEST BRANCH OF ST. CROIX RIVER AT BAILEYVILLE, MAINE.

This station, which is located at the highway bridge 1 mile from Baileyville—a station on the Washington County Railroad—and about 4 miles below Princeton, was established May 10, 1910. The drainage area is 509 square miles.

A standard chain gage is attached to the bridge. Discharge measurements are made from the downstream side of the bridge.

The channel is about 225 feet wide and the current is broken by four piers. The banks are of medium height, but extreme high water is liable to flow around the abutments of the bridge.

The discharge rating curve for this station has not been developed owing to insufficient measurements. Some of these measurements cover periods of backwater from log jams below the station and will be used later in interpolating the discharge for such backwater periods.

Discharge measurements of West Branch of St. Croix River at Baileyville, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 9[a]	F. E. Pressey	153	432	4.99	586
10	.....do	153	484	5.32	1,130
June 15[a]	W. E. Parsons	153	410	4.88	662
24	.....do	154	484	5.33	1,130
July 19	.....do	153	375	4.75	742
20	.....do	153	374	4.70	683
Aug. 9	.....do	153	423	5.00	670

[a] Affected by backwater.

Daily gage height, in feet, of West Branch of St. Croix River at Baileyville, Maine, for 1910.

[Herbert H. Gardner, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		5.1	5.5	4.45	4.35	4.3	4.5	4.5
2		5.15	5.3	4.45	4.3	4.3	4.6	4.6
3		5.15	5.0	4.45	4.3	4.35	4.2	4.6
4		5.1	4.45	4.4	4.2	4.4	4.05	4.6
5		5.05	4.7	4.5	4.3	4.8	4.05	4.6
6		5.05	4.5	5.15	4.4	4.8	4.2	4.5
7		4.95	4.5	5.1	4.7	4.7	4.55	4.6
8		5.1	4.65	5.1	4.35	4.3	4.55	4.8
9		5.45	4.55	5.0	4.4	4.3	4.5	4.7
10	5.5	5.55	4.45	4.9	4.3	4.3	4.35	4.4
11	6.2	5.05	4.5	4.85	4.2	4.1	4.2	4.2
12	5.85	4.7	4.55	4.7	4.25	4.2	4.3	4.2
13	5.5	4.8	4.7	4.75	4.6	4.6	4.25	4.3
14	5.35	4.95	4.55	4.6	4.75	4.55	4.5	4.3
15	5.0	5.3	4.4	4.65	4.6	4.05	4.95	4.5
16	6.05	5.45	4.45	4.8	4.45	4.0	4.8	4.5
17	5.45	5.5	4.45	5.0	4.5	4.3	4.8	4.4
18	5.1	5.3	4.55	4.7	4.5	4.55	4.8	4.6
19	5.25	5.45	4.8	4.5	4.45	4.6	4.8	4.6
20	5.3	6.0	4.8	4.5	4.6	4.65	4.7	4.8
21	5.25	5.7	4.85	4.45	4.9	4.65	4.7	5.0
22	5.3	5.45	4.45	4.75	4.8	4.6	4.7	5.0
23	5.25	5.2	4.4	5.05	4.75	4.35	4.7	4.8
24	5.3	5.2	4.35	5.0	4.75	4.8	4.7	4.6
25	5.35	5.25	4.35	4.85	4.6	4.55	4.6	4.1
26	5.35	4.95	4.3	4.45	4.5	4.55	4.6	4.0
27	5.25	5.15	4.35	4.35	4.25	4.55	4.4	4.2
28	4.9	5.25	4.45	4.15	4.2	4.55	4.05	4.2
29	5.0	5.2	4.45	4.35	4.25	4.35	4.1	4.4
30	5.05	5.25	4.5	4.25	4.3	4.05	4.25	4.5
31	5.2		4.45	4.3		4.5		4.7

NOTE.—Relation between gage height and discharge was probably not affected by ice during December.

MACHIAS RIVER.

GENERAL FEATURES OF AREA DRAINED.

Machias River is fairly representative of several of the smaller streams in Maine that discharge their waters into the ocean and are commonly referred to as "coastal rivers." It rises in the Machias Lakes, in the near vicinity of the Grand Lake system of the St. Croix, flows in a generally southeasterly direction to tidewater at Machias, a distance of some 50 miles, and its drainage area measures 495 square miles. At East Machias, near the mouth, it is joined by

East Machias River, a stream of similar characteristics rising in Pocamoonshine Lake, near Princeton, and draining about 345 square miles.

The Machias drainage basin is considerably broken with hills or low mountains, and attains an altitude in its northwestern portion of about 400 feet above sea level. Near the coast the prevailing rock is quartzite; farther inland granite is found; and near the headwaters mica schists prevail. The basin is generally forested.

The mean annual rainfall is probably about 42 inches, or a little greater than that of the St. Croix basin, and winter conditions are similar to those of the St. Croix.

In the whole Machias basin there are 53.88 square miles of lake surface which are, however, largely near the headwaters. They are utilized to a small extent for log driving.

There are good water-power sites on the Machias and its principal branch, and developments have been made at Machias, East Machias, and Whitneyville.

MACHIAS RIVER AT WHITNEYVILLE, MAINE.

This station was established October 17, 1903, and was originally located at the bridge of the Washington County Railroad, near Whitneyville, about 8 miles above the mouth of the river.

A chain gage is attached to the railroad bridge. On October 3, 1905, a vertical-staff gage was placed on a pier of the wooden highway bridge, about one-half mile upstream from the railroad bridge. Published gage heights, 1906–1909, refer to the staff gage. The present gage is a chain gage attached to the highway bridge August 10, 1910, and referred to the same datum as the staff gage. The relationship between the old gage on the railroad bridge and the present gage on the highway bridge has not been determined.

About 200 feet above the station is a storage dam which causes considerable fluctuations in the gage heights at low-water periods, owing to daily opening and closing of the gates. At the original location backwater from the dam at Machias, about 4 miles below, or from accumulations of logs, occurred during a considerable portion of the time, and some of the gage heights previous to October 3, 1905, are liable to very considerable errors. Discharge measurements are made from the railroad bridge.

During the winter months the discharge is often affected by ice, although operation of the dam above tends to prevent the formation of ice except during severe winters. Conditions for obtaining accurate measurements at the new location are fair, and a fair discharge rating curve has been developed, except at low stages, which are somewhat uncertain.

The discharge prior to 1909 has been computed for all years since the establishment of the station, and republished in Water-Supply Paper 241. The 1903–4 values as published in Water-Supply Paper 124 were revised on the basis of new and more accurate rating curves. The discharge is materially affected at times during the driving season by log jams.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Machias River at Whitneyville, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 13	F. E. Pressey	125	562	4.30	[a] 463
Mar. 10[b]	.....do	125	1,130	7.88	2,970
May 13	.....do	125	723	4.92	1,010
June 14[c]	W. E. Parsons	126	819	5.84	948
Aug. 10	.....do	126	628	3.71	420

[a] Low discharge due to anchor ice; ice at gaging section 1.10 feet thick.
[b] Temporary backwater caused by ice jam.
[c] Temporary backwater caused by log jam on right shore below bridge, the wing extending from a point 200 feet below bridge to the gage.

Daily gage height, in feet, of Machias River at Whitneyville, Maine, for 1910.

[Ira S. Albee, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.6	7.0	6.6	5.0	7.9	5.3	5.0	3.9	3.3	4.2	3.1	3.6
2	4.6	6.6	6.3	5.0	7.8	5.2	5.0	3.8	3.2	3.8	3.1	3.8
3	4.55	6.0	5.9	5.0	7.7	5.1	5.3	3.7	3.2	3.6	3.1	3.7
4	4.55	5.2	5.6	5.0	7.5	5.0	5.6	3.8	3.2	3.5	3.1	3.7
5	4.6	5.0	5.4	5.0	7.1	4.9	6.0	3.9	3.2	3.4	3.1	3.6
6	4.65	5.0	5.2	5.0	6.6	4.8	5.5	4.0	3.2	3.4	3.1	3.5
7	4.65	5.1	5.2	5.1	6.1	4.8	5.0	4.0	3.2	3.3	3.1	3.4
8	4.7	5.2	9.5	5.1	5.6	4.8	4.8	4.0	3.1	3.2	3.1	3.3
9	4.7	5.0	9.1	5.1	5.3	4.8	5.0	3.9	3.05	3.2	3.1	3.2
10	4.6	4.8	7.8	5.1	5.3	4.9	5.0	3.7	3.0	3.2	3.2	3.1
11	4.6	4.6	7.0	5.0	5.2	5.0	4.7	3.7	3.0	3.15	3.2	3.0
12	4.5	4.4	5.6	4.9	5.0	5.2	4.3	3.6	3.1	3.1	3.2	3.0
13	4.3	4.3	5.4	4.8	5.0	5.5	4.2	3.5	3.2	3.1	3.2	3.0
14	4.3	4.3	5.3	4.8	5.6	5.8	4.1	3.4	3.2	3.1	3.2	3.0
15	4.3	4.4	5.2	4.9	6.1	5.4	4.0	3.4	3.2	3.0	3.2	3.0
16	4.4	4.4	5.1	5.0	6.5	5.0	4.0	3.3	3.2	3.0	3.2	3.0
17	4.4	4.5	5.0	5.0	7.0	4.9	3.9	3.3	3.2	3.0	3.15	3.0
18	4.4	4.6	4.9	5.1	7.3	4.8	3.8	3.3	3.2	3.0	3.1	3.0
19	4.5	4.7	4.8	5.4	7.4	4.8	3.8	3.4	3.3	3.1	3.1	2.95
20	5.0	4.8	4.8	6.2	7.3	4.85	3.75	3.4	3.4	3.1	3.1	2.9
21	5.1	4.9	4.8	7.8	7.2	4.9	3.7	3.4	3.5	3.1	3.1	3.0
22	5.1	5.0	4.9	7.0	7.0	4.95	3.7	3.4	3.6	3.1	3.1	3.0
23	7.5	5.0	5.0	7.0	6.8	5.0	3.7	3.35	3.7	3.1	3.1	3.0
24	7.8	5.0	5.0	7.0	6.6	5.2	3.8	3.3	3.7	3.1	3.1	3.0
25	6.0	5.0	5.0	7.0	6.4	5.3	3.9	3.3	3.7	3.1	3.1	4.1
26	5.9	5.0	5.1	7.0	6.2	5.2	4.0	3.3	3.8	3.1	3.1	5.0
27	5.4	5.0	5.2	7.5	6.0	5.2	4.1	3.3	3.8	3.1	3.1	4.7
28	5.4	5.8	5.1	8.0	5.8	5.1	4.0	3.3	4.0	3.1	3.2	4.5
29	5.3	......	5.0	8.1	5.6	5.0	4.0	3.3	4.3	3.1	3.3	4.3
30	6.9	......	5.0	8.1	5.4	5.0	4.0	3.3	4.3	3.1	3.4	4.1
31	7.4	......	5.0	......	5.45	......	4.0	3.3	......	3.1	......	4.2

NOTE.—The river was probably not completely frozen over at the gage section during the winter, although more or less backwater was doubtless caused by ice below the gage. Backwater caused by ice jam existed from about Mar. 8 to 11, and from a log jam from about June 11 to 16. It is also probable that backwater from log jams occurred temporarily at other times during 1910.

Daily discharge, in second-feet, of Machias River at Whitneyville, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	814	2,650	2,290	1,070	3,480	1,280	1,070	433	191	587	132	300
2	814	2,290	2,040	1,070	3,380	1,210	1,070	387	161	387	132	387
3	784	1,800	1,720	1,070	3,280	1,140	1,280	343	161	300	132	343
4	784	1,210	1,490	1,070	3,100	1,070	1,490	387	161	260	132	343
5	814	1,070	1,350	1,070	2,740	1,000	1,800	433	161	224	132	300
6	844	1,070	1,210	1,070	2,290	937	1,420	482	161	224	132	260
7	844	1,140	1,210	1,140	1,880	937	1,070	482	161	191	132	224
8	875	1,210	......	1,140	1,490	937	937	482	132	161	132	191
9	875	1,070	......	1,140	1,280	937	1,070	433	118	161	132	161
10	814	937	......	1,140	1,280	1,000	1,070	343	105	161	161	132
11	814	814	......	1,070	1,210	......	875	343	105	146	161	105
12	755	698	1,490	1,000	1,070	......	642	300	132	132	161	105
13	642	642	1,350	937	1,070	......	587	260	161	132	161	105
14	642	642	1,280	937	1,490	......	534	224	161	132	161	105
15	642	698	1,210	1,000	1,880	......	482	224	161	105	161	105
16	698	698	1,140	1,070	2,200	......	482	191	161	105	161	105
17	698	755	1,070	1,070	2,650	1,000	433	191	161	105	146	105
18	698	814	1,000	1,140	2,920	937	387	191	161	105	132	105
19	755	875	937	1,350	3,010	937	387	224	191	132	132	93
20	1,070	937	937	1,960	2,920	968	365	224	224	132	132	81
21	1,140	1,000	937	3,380	2,830	1,000	343	224	260	132	132	105
22	1,140	1,070	1,000	2,650	2,650	1,040	343	224	300	132	132	105
23	3,100	1,070	1,070	2,650	2,470	1,070	343	208	343	132	132	105
24	3,380	1,070	1,070	2,650	2,290	1,210	387	191	343	132	132	105
25	1,800	1,070	1,070	2,650	2,120	1,280	433	191	343	132	132	534
26	1,720	1,070	1,140	2,650	1,960	1,210	482	191	387	132	132	1,070
27	1,350	1,070	1,210	3,100	1,800	1,210	534	191	387	132	132	875
28	1,350	1,640	1,140	3,580	1,640	1,140	482	191	482	132	161	755
29	1,280	......	1,070	3,680	1,490	1,070	482	191	642	132	191	642
30	2,560	......	1,070	3,680	1,350	1,070	482	191	642	132	224	534
31	3,010	......	1,070	......	1,380	......	482	191	......	132	......	587

NOTE.—Daily discharge determined from a rating curve which is well defined between discharges about 200 and 4,000 second-feet.

Monthly discharge of Machias River at Whitneyville, Maine, for 1910.

[Drainage area, 465 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,380	642	1,210	2.60	3.00	C.
February	2,650	642	1,110	2.39	2.49	C.
March	....	937	1,520	3.27	3.77	C.
April	3,680	937	1,770	3.81	4.25	B.
May	3,480	1,070	2,150	4.62	5.33	B.
June	1,280	937	1,050	2.26	2.52	B.
July	1,800	343	718	1.54	1.78	B.
August	482	191	283	.609	.70	D.
September	642	105	242	.520	.58	D.
October	587	105	172	.370	.43	D.
November	224	132	145	.312	.35	D.
December	1,070	81	293	.630	.73	D.
The year	....	81	888	1.91	25.93	

NOTE.—Mean discharge Mar. 8 to 11, estimated, 3,380 second-feet; mean discharge June 11 to 16, estimated 1,000 second-feet.

This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

UNION RIVER BASIN.

GENERAL FEATURES OF AREA DRAINED.

Union River is formed by the junction of its East and West branches.

The West Branch rises in the extreme northern part of Hancock County, in Tps. 39 and 40 MD, and flows in a general southerly direction for about 35 miles to its junction with the East Branch. In its course it passes through Brandy and Great ponds and receives the tributaries from a number of other ponds, the largest of which is Alligator Pond. The area contains little cultivated land, except near the town of Amherst. From Great Pond to Mariaville (17 miles) the fall of the river averages 10.6 feet per mile. This fall per mile is exceeded at several places, where the opportunities for power development are excellent.

The East Branch rises in the Lead Mountain Ponds, in T. 28 MD, flows southerly for 8 or 9 miles to Rocky Pond, then southwesterly to Spectacle Pond, then northerly and westerly some 10 miles to its junction with the West Branch about a mile above Jordan's bridge, in Waltham. The territory drained is practically all woodland, either recently cut or covered with second growth. The river is made up of flat stretches alternating with quick falls. Opportunities for power development are numerous. The East Branch receives only two important tributaries—Middle Branch, which rises in the town of Aurora, and Bog River, which rises in the town of Eastbrook.

From the junction of the two branches the river flows southward about 15 miles, meeting tidewater at Ellsworth. The valley in this distance is flat, wide, and fertile. At Ellsworth Falls there are two dams, with a total head of about 25 feet. At Ellsworth the new dam of the Bar Harbor & Union River Power Co. develops about a 60-foot head. The tributary streams entering from the west are the outlet of Floods Pond, Beach Hill Stream, Green Lake Stream, and Branch Lake Stream; from the east Webbs Brook is the only important tributary.

The average annual precipitation in this basin is probably about 48 inches. As a rule the winters are not severe, owing to the proximity of the ocean.

The following table shows the areas drained by a number of the tributaries and by the two larger lakes of the basin:

Drainage areas, in square miles, in Union River basin.

River or lake.	Location.	Drainage area.
Union River	Jordan's bridge, 0.75 mile below forks	312
Do	Ellsworth gaging station	537
West Branch	Amherst gaging station	140
Do	Mariaville, Goodwin's bridge	172
East Branch	Waltham	123
Webbs Brook	Old gaging station	50
Branch Lake	Outlet	31
Green Lake	do	47

RIVER AND LAKE SURVEYS IN UNION RIVER BASIN.

Special river and lake surveys have been made in the Union River basin by the United States Geological Survey in cooperation with the State of Maine.

The resulting maps from these surveys include:

Union River, Ellsworth to Great Pond	2 sheets.
Abraham Pond, Scammons Pond, Molasses Pond, Webbs Pond Outlet	1 sheet.
Alligator Pond, Rocky Pond, Spectacle Pond	1 sheet.
Great Pond, Green Lake Outlet, Branch Lake Outlet	1 sheet.

The river maps show not only the plan of the river with 5-foot contour along the banks, but also the profiles of the rivers. These maps are of value in studying developed and undeveloped water power sites, and in connection with the stream-gaging records they afford data for a close estimate of the total horsepower that can be developed at the unutilized falls and rips. The lake maps are valuable in computing the capacity of the lakes in cubic feet, if their use as storage reservoirs is contemplated.

The maps may be obtained free of charge by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Me.

The following table gives the areas of water surface of a number of lakes and ponds in the Union River basin, as measured from recent topographic sheets, and the maps of the special lake surveys:

Lake and pond areas, Union River drainage basin.

	Square miles.		Square miles.
Branch Lake	4.33	Abraham Pond	0.69
Green Lake	4.43	Scammons Pond	1.11
Mountain Pond	1.09	Molasses Pond	1.90
Floods Pond	1.01	Alligator Pond	1.73
Beech Hill Pond	2.09	Rocky Pond	.96
Great Pond	1.01	Spectacle Pond	2.74
Webbs Pond	1.43		

WEST BRANCH OF UNION RIVER AT AMHERST, MAINE.

This station, which is maintained in cooperation with the State of Maine, was established July 25, 1909, at Sumner's bridge, three-fourths of a mile west of Amherst post office, on the road to Bangor, and about 1 mile below the highway bridge at the old tannery dam. The drainage area is 140 square miles.

Discharge measurements are made from the downstream side of the bridge to which the chain gage is attached. The original gage was a staff gage. A chain gage was installed June 2, 1910.

Conditions favor the accurate determination of flow. All the dams above the station are partly or totally destroyed, hence the flow is not affected by storage. Anchor ice affects the winter flow. The gage datum was unchanged during the year. The discharge rating curve though incomplete is fairly well outlined for low stages. Estimates of discharge are withheld for the present, however, pending the completion of the rating curve to high stages.

Discharge measurements of West Branch of Union River at Amherst, Maine., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 12[a]	F. E. Pressey	43	154	8.05	106
Mar. 8[b]	.....do	42.5	349	11.70	1,010
9[b]	.....do	42.5	309	10.80	847
June 2	.....do	45	128	6.50	203
July 27	W. E. Parsons	37	81	5.40	39
27	.....do	37	78	5.40	37
Aug 30	.....do	28	71	5.30	37

[a] Ice present 1.37 feet thick

[b] Affected by backwater.

Daily gage height, in feet, of West Branch of Union River at Amherst, Maine, for 1910.

[Floyd Sumner, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.40	......	......	8.35	9.00	6.50	6.43	5.40	5.30	5.36	5.70	5.80
2	8.50	9.00	10.80	8.45	9.05	6.50	6.38	5.40	5.28	5.37	5.63	5.80
3	8.30	......	......	8.42	8.40	6.41	6.23	5.41	5.20	5.35	5.60	5.88
4	8.20	......	......	8.35	8.40	6.36	6.51	5.45	5.12	5.30	5.60	6.20
5	8.10	8.80	10.30	8.30	8.30	6.28	6.26	6.78	5.12	5.35	5.62	6.30
6	8.10	......	......	8.20	8.20	6.20	6.16	6.48	5.10	5.32	5.63	6.50
7	8.20	......	......	8.25	8.08	6.15	6.07	6.53	5.30	5.32	5.66	6.65
8	8.10	......	11.70	8.30	7.90	6.12	6.15	6.60	5.25	5.35	5.64	6.45
9	8.30	11.40	10.64	8.30	7.75	6.12	6.10	6.58	5.23	5.32	5.70	6.25
10	8.10	......	9.30	8.22	7.60	6.12	5.97	6.53	5.23	5.33	5.68	6.10
11	8.00	......	8.50	8.20	7.45	6.11	5.88	6.52	5.23	5.30	5.68	5.71
12	8.05	10.80	8.50	8.10	7.30	6.05	5.82	6.21	5.20	5.27	5.68	5.90
13	......	......	8.40	7.85	7.20	6.36	5.74	6.10	5.20	5.25	5.62	5.80
14	......	......	8.30	7.68	7.05	6.29	5.64	6.00	5.57	5.21	5.60	5.80
15	7.80	......	8.10	7.50	6.95	6.22	5.60	5.90	5.50	5.19	5.57	5.78
16	......	9.80	7.95	7.38	6.85	6.18	5.59	5.81	5.50	5.18	5.55	5.78
17	......	......	7.85	7.20	6.70	6.12	5.58	5.73	5.57	5.18	5.57	5.75
18	......	......	7.75	7.10	6.58	6.43	5.52	5.70	5.60	5.17	5.54	5.75
19	8.02	9.80	7.50	7.55	6.60	6.50	5.44	5.73	5.58	5.15	5.48	5.87
20	......	......	7.32	8.42	6.52	6.55	5.42	5.79	5.53	5.13	5.51	5.87
21	......	......	7.38	8.62	6.42	6.53	5.44	5.53	5.50	5.12	5.51	5.80
22	8.02	10.25	7.39	8.82	6.35	6.58	5.42	5.52	5.45	5.08	5.87	5.70
23	......	......	7.32	8.90	6.30	6.51	5.42	5.50	5.40	5.10	5.38	5.70
24	......	......	7.28	8.80	6.25	6.45	5.42	5.51	5.40	5.10	5.58	5.73
25	......	10.30	7.35	8.80	6.22	6.41	5.42	5.58	5.36	5.10	5.58	7.46
26	8.90	......	7.90	8.75	6.22	6.34	5.42	5.48	5.36	5.12	5.58	......
27	......	......	7.90	9.70	6.40	6.28	5.50	5.43	5.33	5.35	5.50	......
28	......	......	7.90	9.40	6.42	6.35	5.40	5.43	5.38	5.45	5.52	7.15
29	10.00	......	7.90	9.10	6.40	6.38	5.40	5.38	5.36	5.52	5.62	......
30	......	......	8.05	8.80	6.40	6.40	5.40	5.38	5.35	5.62	5.65	......
31	......	......	8.10	......	6.48	......	5.36	5.30	......	5.54	......	7.38

NOTE.—Gage heights affected by ice from Jan. 1 to Mar. 8, Dec. 14 to 31, and probably Dec. 1 to 13. Gage heights were probably taken to water surface. The ice thickness during January, February, and March, varied from about 1.2 feet to 1.8 feet; during December it attained a thickness of about 0.8 foot.

UNION RIVER AT ELLSWORTH, MAINE.

A concrete dam about 60 feet high and 360 feet long was constructed in 1908 at Ellsworth at the head of tide by the Bar Harbor & Union River Power Co. The power station generating electricity for use in the vicinity and at Bangor is located on the right bank. The equipment consists of two McCormick turbines, 33-inch and 36-inch, two runners on each wheel; an 18-inch single-runner wheel used for the exciters; two alternating-current generators, of 1,000 and 1,250 kilowatts, connected to the turbines; and two direct-current exciters of 75 kilowatts each, connected to the exciter wheel; only one of these being run at a time, however. The plant is run 24 hours a day, and there is no auxiliary steam power. The turbines were rated at the Holyoke testing flume.

The crest of the dam is very even. At times flashboards are used. The head of water at this plant ranges from 50 to 62 feet, and the tide seems to affect the tailrace readings 0.7 foot. Water can pass this gaging station over the dam, through the sluice gates (each 5 feet in diameter), at the base of the dam, through the wheels, through a

6-inch pipe reduced to 4-inch (used for cooling transformers), and through the waste weir and wasteway leading from the forebay.

A very complete daily record has been kept at this station since September 2, 1908. The pond and tailrace gages are read four times a day, at high tide and low tide. The gate openings and power readings are made hourly. A note is made when flashboards are put in place and of the time and amount of sluice-gate openings. The wasteway seldom carries any water.

A number of discharge measurements have been made at the highway bridge a short distance below the dam, for use in computing daily discharge, but the computations have not been made as more wheel tests are necessary at low heads to satisfactorily complete the record. The discharge measurements are referred to a reference point used to measure the distance to the water surface. The reference point is a white paint spot on the lower part of the downstream guard rail of the bridge, 15.8 feet from the right-hand iron post.

The drainage area at Ellsworth is 537 square miles.

GREEN LAKE AT GREEN LAKE, MAINE.

Green Lake is situated in the towns of Dedham and Ellsworth, about half its length and half its area being in each town. It lies in a general northwest-southeast direction, is nearly 6½ miles long, and broadens out about three-fourths of a mile at each end into a sort of basin about 1¼ miles wide. Its elevation is about 156 feet above sea level and the top of the dam at the north side of the gates is about 4 feet higher.

Most of the short inflowing streams drain small ponds. The stream entering the northwest end of the lake flows from Goose Pond, which has an area of 0.32 square mile, lies at an elevation of 307 feet above sea level, or 141 feet above the lake, and is distant from it about 3 miles. This stream is joined on its way to the lake by several other streams, and also receives the high-water overflow of Phillips Lake.

Brooks from Little Rocky Pond and Duck Pond enter on the southern shore, about 1½ miles from the western end of the pond and near each other. Little Rocky Pond covers an area of 0.10 square mile and is at an elevation of 229 feet above sea level, 73 feet above the lake, and about half a mile from it. Duck Pond, about one-eighth mile from the lake, lies 170 feet above sea level, or 14 feet above the lake, and covers an area of 0.08 square mile.

On the northern shore three streams enter—one about a mile from the western end; the second, the outlet of Burnt, Rocky, and Mountain ponds, about midway; and the third, the outlet of Muddy Pond, at Northeast Cove. Burnt Pond is 230 feet above sea level and is 0.11 square mile in area; Rocky Pond is 206 feet above sea level and 0.20 square mile in area. Muddy Pond is practically a marsh.

A station was established near Green Lake railroad station in the town of Dedham at the northwest end of the lake on July 1, 1909, to determine the height of the lake. The staff gage is fastened to the log abutment of the highway bridge about 600 feet from the railroad station.

The record at this station simply shows the fluctuations of the lake level and the station is not used for discharge measurements. The cooperative observer is Mr. H. F. Lord, of Green Lake, Maine.

Daily gage height, in feet, of Green Lake at Green Lake, Maine, for 1910.

[H. F. Lord, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	7.25	6.7	6.3	4.2	3.0	2.5	16	......	7.1	6.75	5.3	3.6	2.7	2.1
2	......	7.25	6.7	6.25	4.1	2.9	2.5	17	......	7.0	6.7	5.2	3.6	2.7	2.1
3	......	7.2	6.7	6.2	4.1	2.9	2.5	18	......	7.0	6.7	5.1	3.6	2.6	......
4	......	7.3	6.9	6.1	4.1	2.9	2.4	19	7.5	7.0	6.75	5.1	3.5	2.6	......
5	......	7.3	7.0	6.1	4.1	2.9	2.4	20	7.5	6.95	6.7	5.1	3.5	2.5	......
6	......	7.3	7.0	6.0	4.0	2.9	2.3	21	7.5	6.9	6.7	5.0	3.4	2.5	......
7	......	7.3	7.0	5.9	4.0	2.9	2.3	22	7.4	6.9	6.6	4.9	3.4	2.5	......
8	......	7.3	7.0	5.9	4.0	2.85	2.3	23	7.4	6.9	6.6	4.8	3.3	2.5	......
9	......	7.3	6.95	5.8	3.9	2.85	2.3	24	7.4	6.9	6.55	4.7	3.2	2.5	......
10	......	7.3	6.9	5.7	3.9	2.8	2.3	25	7.4	6.85	6.5	4.7	3.2	2.5	......
11	......	7.2	6.9	5.6	3.8	2.8	2.2	26	7.4	6.85	6.5	4.6	3.1	2.5	1.8
12	......	7.2	6.85	5.5	3.8	2.8	2.2	25	7.35	6.8	6.5	4.5	3.1	2.5	......
13	......	7.2	6.8	5.4	3.7	2.8	2.2	28	7.35	6.8	6.5	4.4	3.1	2.4	1.8
14	......	7.1	6.8	5.4	3.7	2.8	2.2	29	7.3	6.75	6.4	4.3	3.1	2.4	......
15	......	7.1	6.75	5.3	3.6	2.7	2.2	30	7.3	6.75	6.4	4.3	3.1	2.5	......
								31	......	6.75	6.3	......	3.1	......	......

GREEN LAKE STREAM AT LAKEWOOD, MAINE.

This station, which is located at a highway bridge in Lakewood, about half a mile downstream from the dam on Green Lake and 8 miles from Ellsworth, was established July 2, 1909.

The staff gage is fastened to the right-hand abutment of the bridge. Its datum has remained unchanged. A fair discharge rating curve has been developed and applied to 1909 and 1910 gage heights.

The station is maintained in cooperation with the State of Maine

Discharge measurements of Green Lake Stream at Lakewood, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 11	F. E. Pressey	34	59	2.92	80
Mar. 8	.....do	36	78	3.70	331
June 1	W. E. Parsons	38	63	2.90	110
July 27	.....do	32	47	2.70	50
Aug. 30	.....do	38	49	2.70	48

Daily gage height, in feet, of Green Lake Stream at Lakewood, Maine, for 1910.

[Martin A. Garland, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.98	3.35	3.05	3.30	3.52	2.98	2.75	2.70	3.00	2.65	2.70	3.20
2	2.95	3.35	3.35	3.30	3.50	2.95	2.75	2.70	3.00	2.65	2.70	3.20
3	2.92	3.35	3.05	3.30	3.50	2.92	2.75	2.70	3.00	2.65	2.70	3.20
4	2.90	3.35	3.00	3.28	3.50	2.90	2.75	2.70	2.95	2.65	2.70	3.20
5	2.90	3.35	3.00	3.28	3.50	2.90	2.75	2.75	2.90	2.65	2.70	3.20
6	2.90	3.35	3.05	3.25	3.50	2.90	2.75	2.78	2.90	2.65	2.70	3.20
7	2.90	3.32	3.50	3.25	3.45	2.90	2.75	2.78	3.40	2.65	2.70	3.20
8	2.90	3.30	3.70	3.22	3.40	2.90	2.75	2.78	3.40	2.65	2.70	3.20
9	2.90	3.28	3.80	3.22	3.38	2.90	2.78	2.78	3.40	2.65	2.70	3.15
10	2.90	3.25	3.80	3.20	3.32	2.88	2.80	2.78	3.40	3.20	2.70	3.10
11	2.90	3.25	3.75	3.20	3.30	2.88	2.80	2.75	3.10	3.15	2.70	3.05
12	2.90	3.25	3.75	3.18	3.25	2.85	2.80	2.75	3.10	3.00	2.70	3.00
13	2.90	3.25	3.60	3.12	3.18	2.85	2.80	2.72	3.10	3.00	2.70	3.00
14	2.90	3.22	3.55	3.10	3.15	2.82	2.78	2.72	3.10	2.98	2.70	2.98
15	2.90	3.22	3.50	3.08	3.10	2.80	2.78	2.70	3.10	2.95	2.70	2.98
16	2.90	3.20	3.45	3.05	3.10	2.80	2.78	2.70	3.10	2.92	2.70	2.95
17	2.88	3.20	3.45	3.02	3.05	2.80	2.75	2.70	3.10	2.92	2.70	2.95
18	2.85	3.18	3.40	3.00	3.05	2.80	2.72	2.70	3.10	2.90	2.70	2.95
19	2.85	3.15	3.35	3.15	3.02	2.80	2.72	2.70	3.10	2.90	2.70	2.95
20	2.85	3.15	3.30	3.15	3.02	2.80	2.72	2.70	3.10	2.90	2.68	2.95
21	2.88	3.12	3.30	3.20	3.00	2.78	2.70	2.70	3.08	2.90	2.68	2.92
22	3.00	3.12	3.25	3.25	3.00	2.78	2.70	2.70	3.08	2.88	2.65	2.90
23	3.20	3.10	3.20	3.30	3.00	2.78	2.70	2.70	3.08	2.85	2.65	2.90
24	3.20	3.08	3.20	3.35	3.00	2.78	2.70	2.90	3.08	2.82	2.65	2.40
25	3.20	3.05	3.20	3.38	3.00	2.78	2.70	2.90	3.08	2.80	2.65	2.40
26	3.20	3.05	3.20	3.40	3.00	2.75	2.70	2.90	3.08	2.80	2.65	2.40
27	3.25	3.05	3.20	3.50	3.00	2.75	2.70	2.90	3.08	2.80	2.65	2.40
28	3.30	3.08	3.20	3.50	3.00	2.75	2.70	2.70	3.00	2.75	2.62	2.40
29	3.30	......	3.20	3.55	3.00	2.75	2.70	2.70	3.00	2.72	2.62	2.40
30	3.40	......	3.20	3.55	3.00	2.75	2.70	2.70	3.00	2.70	2.60	2.40
31	3.38	......	3.20	......	3.00	......	2.70	3.00	......	2.70	......	2.40

NOTE.—Gage heights at this station not affected by ice during 1910.

Daily discharge, in second-feet, of Green Lake Stream at Lakewood, Maine, for 1909–10.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.							1909.						
1	38	47	177	26	16	16	16	38	59	96	21	12	96
2	38	47	177	26	16	19	17	44	59	92	21	12	119
3	38	47	177	26	16	28	18	47	59	86	19	10	119
4	44	47	177	26	16	24	19	47	59	81	19	7	119
5	44	47	171	26	16	19	20	47	59	77	19	7	114
6	44	47	171	24	16	28	21	47	59	77	19	7	108
7	44	47	162	24	16	38	22	47	146	74	24	7	101
8	38	146	162	24	13	44	23	47	331	74	24	7	96
9	38	146	146	24	13	56	24	47	310	74	24	7	96
10	38	141	146	24	13	70	25	47	288	74	24	19	96
11	38	141	119	24	12	70	26	47	44	74	24	16	96
12	38	44	108	21	12	77	27	47	44	86	21	12	96
13	38	44	96	21	12	81	28	47	44	146	19	12	96
14	38	44	96	21	12	86	29	47	44	162	18	13	96
15	38	59	96	21	12	92	30	47	177	96	18	16	96
							31	47	177	......	16	......	96

Daily discharge, in second-feet, of Green Lake Stream at Lakewood, Maine, for 1909–10—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	92	194	108	177	256	92	56	49	96	44	49	146
2	86	194	194	177	248	86	56	49	96	44	49	146
3	81	194	108	177	248	81	56	49	96	44	49	146
4	77	194	96	171	248	77	56	49	86	44	49	146
5	77	194	96	171	248	77	56	56	77	44	49	146
6	77	194	108	162	248	77	56	59	77	44	49	146
7	77	184	248	162	230	77	56	59	211	44	49	146
8	77	177	331	152	211	77	56	59	211	44	49	146
9	77	171	376	152	204	77	59	59	211	44	49	132
10	77	162	376	146	184	74	62	59	211	146	49	119
11	77	162	354	146	177	74	62	56	119	132	49	108
12	77	162	354	141	162	70	62	56	119	96	49	96
13	77	162	288	124	141	70	62	52	119	96	49	96
14	77	152	268	119	132	65	59	52	119	92	49	92
15	77	152	248	114	119	62	59	49	119	86	49	92
16	77	146	230	108	119	62	59	49	119	81	49	86
17	74	146	230	101	108	62	56	49	119	81	49	86
18	70	141	211	96	108	62	52	49	119	77	49	86
19	70	132	194	132	101	62	52	49	119	77	49	86
20	70	132	177	132	101	62	52	49	119	77	47	86
21	74	124	177	146	96	59	49	49	114	77	47	81
22	96	124	162	162	96	59	49	49	114	74	44	77
23	146	119	146	177	96	59	49	49	114	70	44	77
24	146	114	146	194	96	59	49	77	114	65	44	19
25	146	108	146	204	96	59	49	77	114	62	44	19
26	146	108	146	211	96	56	49	77	114	62	44	19
27	162	108	146	248	96	56	49	77	114	62	44	19
28	177	114	146	248	96	56	49	49	96	56	40	19
29	177	......	146	268	96	56	49	49	96	52	40	19
30	211	......	146	268	96	56	49	49	96	49	38	19
31	204	......	146	......	96	......	49	96	......	49	......	19

NOTE.—Daily discharge for 1909 and 1910 determined from a discharge rating curve fairly well defined above 40 second-feet; below this point the curve is not well defined.
There was probably no backwater from ice during 1909 and 1910.

Monthly discharge of Green Lake Stream at Lakewood, Maine, for 1909–10.

[Drainage area, 47 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1909.						
July	47	38	43.0	0.915	1.05	B.
August	331	44	98.5	2.10	2.42	B.
September	177	74	118	2.51	2.80	B.
October	26	16	22.2	.472	.54	C.
November	19	7	12.5	.266	.30	D.
December	119	16	77.0	1.64	1.89	B.
1910.						
January	211	70	104	2.21	2.55	B.
February	194	108	152	3.23	3.36	B.
March	376	96	202	4.30	4.96	B.
April	268	96	166	3.53	3.94	B.
May	256	96	150	3.19	3.68	B.
June	92	56	67.4	1.43	1.60	B.
July	62	49	54.3	1.16	1.34	B.
August	96	49	56.6	1.20	1.38	B.
September	211	77	122	2.60	2.90	B.
October	146	44	68.2	1.45	1.67	B.
November	49	38	46.9	.998	1.11	B.
December	146	19	87.7	1.87	2.16	B.
The year	376	19	106	2.26	30.65	

BRANCH LAKE NEAR ELLSWORTH, MAINE.

Branch Lake lies in the town of Ellsworth, Maine, with its longer axis northwest-southeast. It is considered locally as consisting of three parts—the Mill Pond and the Lower and Upper lakes. The Mill Pond is formed by the dam at the lower end of the lake and is about 0.7 mile long and one-eighth mile in average width. It is connected with the Lower Lake by a narrow channel known as the "Outlet." The Lower Lake is about 2½ miles long and 0.6 mile in average width, and is connected with the Upper Lake by a comparatively narrow passage known as the "Narrows." The Upper Lake, 2½ miles long, widens out above the Narrows and attains its maximum width—nearly 2½ miles—at its extreme upper end. The total area of Branch Lake is 4.33 square miles. The total length of all three parts along what would be called the natural center line of the lake, which extends from the mouth of Dean Brook to the dam at the Mill Pond, is 5.9 miles; from the head of McGowans Cove to the dam the distance is 6.9 miles.

The elevation of the lake, as determined by the United States Geological Survey, is 236 feet above sea level, and this height was assumed as the height of the water surface at the time of the Union River survey reconnaissance. On this assumption the top of the dam is 240 feet above sea level. In most places the rise of the land is gradual and uniform, there being no lowland except at the northwest end around Lincompaw Brook. The 240-contour on the map represents a level about 30 feet back from the present lake, and the 250-foot is not far distant.

The shores are wooded to the water's edge, the growth being from 15 to 20 years' stand and comprising both hard and soft wood.

No large streams flow into the lake. Great Brook, which enters on the east shore of the lower lake, is about 2 miles long. At the head of the lake several streams enter, none being over 4 miles long. The largest, Lincompaw Brook, is the outlet of Harriman Pond, a pond 0.10 square mile in area and lying at an elevation of 536 feet above sea level, or 300 feet above Branch Lake. Rocky Pond, which has an area of 0.25 square mile and is situated about a mile from the lake and 117 feet above it, sends down a stream that enters on the south side, near the head of the lake.

In connection with the survey of the Union River basin, which was carried on in cooperation with the State of Maine, a station was established on the lake June 29, 1909.

The lake levels are taken on an 8½-foot staff gage nailed to the corner of the Branch Pond Lumber Co.'s mill near the intake of the wheels.

The gage readings indicate the height of the lake. No change has been made in the gage datum.

See also description for Branch Lake Stream near Ellsworth.

Daily gage height, in feet, of Branch Lake near Ellsworth, Maine, for 1910.

[H. B. Moor, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.5	7.45	7.5	7.8	8.3	7.2	6.15	5.2	4.4	3.65	2.5	1.75
2	6.5	7.45	7.55	7.75	8.3	7.15	6.1	5.15	4.3	3.65	2.5	1.75
3	6.45	7.45	7.6	7.75	8.25	7.1	6.05	5.15	4.3	3.6	2.5	1.8
4	6.45	7.45	7.6	7.75	8.25	7.05	6.05	5.15	4.3	3.55	2.5	1.8
5	6.45	7.5	7.55	7.8	8.2	7.0	6.0	5.1	4.2	3.5	2.45	1.8
6	6.45	7.5	7.55	7.8	8.2	6.95	5.95	5.1	4.15	3.5	2.4	1.8
7	6.45	7.55	7.65	7.8	8.15	6.9	5.95	5.2	4.15	3.5	2.35	1.8
8	6.45	7.55	8.05	7.8	8.15	6.85	5.95	5.2	4.1	3.5	2.35	1.75
9	6.45	7.55	8.1	7.8	8.1	6.8	5.9	5.2	4.1	3.5	2.35	1.75
10	6.45	7.5	8.05	7.8	8.1	6.75	5.9	5.15	4.1	3.5	2.3	1.75
11	6.45	7.5	8.0	7.8	8.05	6.75	5.9	5.15	4.1	3.5	2.3	1.75
12	6.45	7.5	8.0	7.75	8.0	6.7	5.9	5.1	4.1	3.45	2.25	1.7
13	6.45	7.5	8.0	7.75	7.9	6.7	5.85	5.05	4.1	3.45	2.2	1.7
14	6.45	7.5	7.9	7.7	7.85	6.7	5.8	5.05	4.05	3.35	2.2	1.65
15	6.4	7.5	7.85	7.7	7.85	6.65	5.75	5.0	4.05	3.2	2.2	1.65
16	6.4	7.45	7.85	7.65	7.8	6.6	5.65	4.95	4.05	3.15	2.2	1.65
17	6.4	7.45	7.85	7.65	7.75	6.55	5.65	4.95	4.05	3.1	2.2	1.65
18	6.4	7.45	7.8	7.65	7.7	6.55	5.6	4.9	4.05	3.05	2.15	1.65
19	6.4	7.45	7.8	7.65	7.7	6.55	5.6	4.85	4.0	3.0	2.1	1.6
20	6.4	7.45	7.8	7.7	7.7	6.5	5.55	4.8	3.9	2.95	2.05	1.6
21	6.6	7.4	7.8	7.75	7.65	6.45	5.5	4.8	3.9	2.9	2.0	1.6
22	6.8	7.4	7.8	7.85	7.6	6.45	5.45	4.75	3.9	2.85	1.95	1.6
23	7.0	7.4	7.75	7.85	7.55	6.45	5.4	4.75	3.85	2.8	1.9	1.6
24	7.05	7.35	7.75	7.9	7.5	6.45	5.4	4.7	3.8	2.8	1.85	1.6
25	7.1	7.35	7.75	8.0	7.5	6.4	5.4	4.7	3.8	2.75	1.85	1.6
26	7.15	7.35	7.75	8.05	7.45	6.4	5.4	4.65	3.7	2.75	1.85	1.9
27	7.15	7.45	7.8	8.2	7.4	6.4	5.35	4.65	3.65	2.7	1.8	2.1
28	7.2	7.45	7.8	8.3	7.4	6.35	5.3	4.6	3.65	2.65	1.8	2.15
29	7.2	....	7.8	8.25	7.35	6.3	5.25	4.55	3.65	2.6	1.8	2.15
30	7.3	....	7.8	8.25	7.3	6.2	5.25	4.5	3.65	2.55	1.75	2.2
31	7.4	....	7.8	....	7.25	....	5.25	4.45	....	2.55	....	2.25

BRANCH LAKE STREAM NEAR ELLSWORTH, MAINE.

This station, which is located at a small highway bridge about 100 feet below the mill of the Branch Pond Lumber Co., at the outlet of Branch Lake, 5 miles from Ellsworth, was established July 2, 1909, in connection with the survey of Union River made in cooperation with the State of Maine. The records indicate the amount of water flowing from the pond.

The gage readings are taken on a 7-foot staff gage nailed to the right abutment downstream side of the bridge. No change has been made in the datum of the gage since its establishment.

Discharge measurements are made from the highway bridge. The water level at this point fluctuates considerably, but fair computations of discharge can be made from the detailed readings of the time and openings of the gates of the mill wheels. The actual discharge through the wheels is not computed, and the mill records are simply used to determine the lengths of time that the readings on the gage at the bridge apply.

The daily gage heights are not a correct index of the mean daily discharge and hence are not published.

The mill is equipped with a 3-foot and a 6-foot wheel. Ordinarily the 3-foot wheel is used 10 hours a day, the 6-foot wheel being used at irregular intervals. Water is also provided for the woolen mills 2½ miles below, the waste gates being opened during the night for a usual period of 14 hours. Record is made of the wheels and the number of hours they are run, of the gage height corresponding to the flow through the wheels, and also of the gage heights representing the water furnished to the woolen mill. In periods of low water, when neither mill is running, the discharge amounts only to the leakage through the dam and wheels.

Conditions at this station have been very unsatisfactory during 1910, and the discharge measurements plot erratically. It has been assumed the relation of gage height to discharge at this point is not materially affected by ice.

The excessive run-off depth in inches for 1910 is partially explained by the purchase of water from Branch Lake in the fall of the year by the Bar Harbor & Union River Power Co., and a resulting heavy draft on the lake storage.

The cooperative observer is Mr. H. B. Moor, Ellsworth, Maine.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Branch Lake Stream near Ellsworth, Maine, for 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 10	F. E. Pressey	24	58	3.90	27
Mar. 8	.....do	27	92	5.25	200
June 3	.....do	28	103	5.45	266
July 28	W. E. Parsons	25	76	4.70	93

Daily discharge, in second-feet, of Branch Lake Stream near Ellsworth, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	51	30	108	90	154	135	46	56	59	1	45	45
2	51	30	110	94	223	139	46	56	118	1	56	80
3	51	30	112	38	142	135	26	56	59	34	45	45
4	51	30	112	94	117	85	26	112	45	26	56	26
5	51	34	103	97	117	42	51	56	82	26	56	45
6	67	34	57	97	117	110	51	56	59	22	93	93
7	88	34	175	97	113	79	46	35	59	10	93	45
8	27	34	293	97	51	79	46	118	82	1	56	45
9	27	34	275	97	109	135	46	118	118	1	50	45
10	27	81	198	38	109	79	18	118	59	46	45	45
11	27	81	195	97	113	79	38	62	12	22	45	45
12	27	34	195	97	128	34	38	65	12	10	45	45
13	27	34	195	97	128	75	110	118	59	1	45	45
14	27	81	183	94	113	71	110	40	80	93	45	40
15	27	81	180	94	51	122	110	82	59	93	45	40
16	27	81	38	94	88	71	110	118	59	93	45	40
17	27	81	42	34	88	118	18	62	59	93	56	40
18	27	34	42	92	88	34	116	62	28	56	68	40
19	77	81	42	92	88	34	53	118	114	49	68	35
20	77	34	42	92	88	65	53	118	57	49	45	35
21	77	81	96	92	107	91	53	45	54	93	68	35
22	77	81	96	95	46	65	53	118	54	93	93	35
23	27	81	96	95	134	65	53	62	54	93	93	35
24	77	81	96	34	134	65	35	62	54	93	93	35
25	77	78	96	101	134	65	56	62	12	76	80	35
26	34	56	96	101	138	34	116	62	109	80	80	35
27	55	30	42	163	138	65	56	62	52	86	80	35
28	30	79	92	220	138	118	59	40	52	93	45	35
29	30	......	92	217	46	65	59	62	27	96	45	35
30	30	......	92	217	92	91	59	62	1	100	93	35
31	30	......	92	......	139	......	35	62	......	45	......	35

NOTE.—Daily discharge computed from gage heights and observer's additional notes of time to which gage heights apply, depending on the operation of the two units at the lumber mill above. Two fairly well defined discharge rating curves have been used, one applicable for the first half of the year and the other applicable for the second half of the year.

Monthly discharge of Branch Lake Stream near Ellsworth, Maine, for 1910.

[Drainage area, 31 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	88	27	45.3	1.46	1.68	D.
February	81	30	55.7	1.80	1.87	D.
March	293	38	119	3.84	4.43	D.
April	220	34	102	3.29	3.67	D.
May	223	46	112	3.61	4.16	D.
June	139	34	81.5	2.63	2.93	D.
July	116	18	57.8	1.86	2.14	D.
August	118	35	75.0	2.42	2.79	D.
September	118	1	58.3	1.88	2.10	D.
October	100	1	54.0	1.74	2.01	D.
November	93	45	62.4	2.01	2.24	D.
December	93	26	42.1	1.36	1.57	D.
The year	293	1	72.2	2.33	31.59	

NOTE.—These estimates of discharge should be used with caution.

PENOBSCOT RIVER.[1]

GENERAL FEATURES OF AREA DRAINED.

Penobscot River is formed by the union of its East and West branches. The West, or principal branch, rises in the mountainous region of northwestern Maine, near the Canadian Boundary, and flows in a general southeasterly direction to its junction with the East Branch of the river at Medway, a distance of over 100 miles. From the mouth of the East Branch to tidewater at Bangor is about 75 miles, this latter point being 27 miles from the mouth of the river at Fort Point at the head of Penobscot Bay. The total length of the river is, therefore, about 200 miles. The drainage basin has an extreme breadth of about 115 miles and comprises 8,500 square miles, or more than one-fourth the entire State.

The important tributaries of the Penobscot in the order of their confluence from the source of the river are as follows:

Tributaries of Penobscot River.

River.	Enters Penobscot at—	Drainage area (square miles).
East Branch of Penobscot River	Medway	1,130
Mattawamkeag River	Mattawamkeag	1,500
Piscataquis River	Howland	1,500

The basin lies in general somewhat lower than that of Kennebec River, for the latter is nearer the summit of the mountain range on the western boundary of the State. As a whole, it is rather uniform in its topographic features. Hills and low mountains stretch from the region near the sea to a point above Bangor; farther north the surface is an undulating plain, and westward it becomes more broken and is generally diversified by hills, detached peaks, lakes, ponds, and swamps. The headwaters of the Kennebec, Penobscot, and St. John are all in the same vicinity, a highland region intermingled with swamps and lagoons. Mount Katahdin, the highest peak of which is 5,273 feet above mean tide and the highest mountain in the State, lies in a detached range of mountains between the West and East branches of the Penobscot.

The predominant rocks of the Penobscot basin are shales, slates, and schists. In the Mount Katahdin region and near the mouth of the river granite also occurs in considerable areas. The character of the river valley is determined largely by the prevailing rocks. Thus, for many miles above Bangor the river flows through an area where

[1] All available data pertaining to the Penobscot River drainage basin collected prior to 1910 have been assembled and published in "Water resources of the Penobscot River basin," Water-Supply Paper U. S. Geol. Survey No. 279, 1912.

the rocks are relatively soft shales, slates, and schists, and its valley here is broad. Between Hampden and Bucksport, however, where harder granites and schists are found, the valley is narrow with steep walls, and a short distance below Ripogenus Lake some of the finest river scenery in the country is found.

Chesuncook Lake lies near the center of the basin at an elevation of 930 feet above sea level. From this point to tide water the distance along the river is 126 miles, or an average fall of 7.4 feet per mile.

Nearly two-thirds of the Penobscot River basin consists of timber land. Spruce prevails, although white pine, cedar, and white birch are also produced in considerable quantities.

The mean annual precipitation ranges from about 43 inches near the coast to less than 35 inches in the northern portions, the mean for the whole basin being about 39 inches, slightly less than that of the Kennebec.

The river freezes over during the winter and snow accumulates in large quantities.

The natural storage facilities of the Penobscot, with its total lake and pond surface of 407 square miles, are surpassed only by those of the Kennebec and Androscoggin basins. On the West Branch some 30 billion cubic feet of storage in the Twin and Chesuncook Lake systems is utilized in connection with the developments of the Great Northern Paper Co., at and near Millinocket, with marked effect upon the regimen of flow. On the East Branch, Chamberlain and Allagash lakes and a number of others are capable of storing much of the flow. Mattawamkeag and Piscataquis rivers all afford good storage sites, and 80 or 90 billion cubic feet of water could probably be economically stored in the various portions of the Penobscot basin. Storage on the West Branch of the river is very efficiently controlled by the Great Northern Paper Co., but in all other localities the stored water is used only for log driving, and a systematic regulation of stored flow would be of great benefit to present and future users of power.

Log driving is an important industry on the Penobscot, and the annual drive amounts to over 200,000,000 feet b. m. The river is navigable to Bangor except during the winter months.

Considerable power has been developed on the Penobscot, notably for the pulp and paper mills at Oldtown, West Enfield, and Millinocket, but there is a very large amount of undeveloped power both on the main river and its principal tributaries.

The longest run-off record in the Penobscot basin is that at Millinocket, beginning in 1901. The driest year at that point since 1900 was 1904, and the wettest was 1902, the total flow during these two years being in the ratio of 1 to 2.08. Storage on the West Branch has very materially changed the regimen of flow since 1901.

RIVER SURVEYS IN PENOBSCOT RIVER BASIN.

The results of river and lake surveys made in the Penobscot River basin by the United States Geological Survey in cooperation with the State of Maine are represented by maps of the following list:

River and lake maps of Penobscot River drainage area.

	Sheets.
Penobscot River, Bangor to North Twin Lake	5
West Branch of Penobscot River, Chesuncook Lake to Ambejejus Lake	3
West Branch of Penobscot River, Chesuncook Lake to Seeboomook.	2
East Branch of Penobscot River, First Grand Lake to Medway	3
Chamberlain Lake, Webster Lake, Round Pond	1
Baskahegan Lake, First Grand Lake, Second Grand Lake, Allagash Lake	1
Mattawamkeag River, mouth to North Bancroft	3
Schoodic Lake, Seboois Lake, Endless Lake, Mattawamkeag Lake, Pleasant Pond	1
Piscataquis River drainage basin	11

The river maps show not only the plan of the river with 5-foot contours along the banks, but also the profiles of the rivers, and are of value in studying both developed and undeveloped water-power sites, as in connection with the stream gaging records they afford data for close estimates of the total horsepower that can be developed at the various falls and rips. The lake maps are of value in computing the capacity of the various lakes in cubic feet, if their use as storage reservoirs is contemplated.

These maps may be had without charge by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Maine.

WEST BRANCH OF PENOBSCOT RIVER AT MILLINOCKET, MAINE.

The discharge of Penobscot River at the Millinocket mill of the Great Northern Paper Co. has been computed, and the data furnished since 1901 by H. S. Ferguson, engineer for the company. The development at Millinocket was made by placing a concrete dam on the Penobscot at the outlet of Quakish Lake, a little over a mile from the mill site on Millinocket Stream, which enters the Penobscot about 4½ miles below Quakish Lake. Millinocket Stream has only a slight fall, though the main river drops some 112 feet in this vicinity, and by utilizing the former for a tailrace a head of about 110 feet has been obtained.

About 3 miles above the Quakish Lake dam is the North Twin Lake dam—a comparatively new storage dam affording about 14,500,000,000 cubic feet of storage.

Records are obtained by considering the flow through the wheels, the flow over the dam, and water used from time to time by the log sluice, filters, etc. The wheels were rated at Holyoke, Mass., before being placed in position. As the head under which they work, averaging about 110 feet, is much greater than the head under which they were tested, numerous tube-float measurements of flow in the canal leading to the mill have been made by Mr. Ferguson, in order to determine just how much water the mill used under different conditions of gate openings. In addition to this, during 1904, a series of current-meter measurements were made by the United States Geological Survey to check results as obtained by the floats and to obtain a suitable coefficient for use with the float measurements. It is believed that by means of these various checks on the measurements a very good estimate has been made of the flow through the wheels.

An automatic recording gage of the Friez type is installed at the Quakish Lake dam and flow is computed by the formula $Q=cbh^{\frac{3}{2}}$, in which c is a variable coefficient obtained (1) from the results of weir measurements made by Mr. Ferguson on a 10-foot portion of the dam, and (2) from a study of the results of experiments made by George W. Rafter at the Cornell testing flume.

When the flow of the river is less than 2,500 second-feet all the water is generally used through the mill; flow over the flashboards, which are used much of the time, is computed by use of the formula $Q=3.33\ bh^{\frac{3}{2}}$. The Quakish Lake dam is at an elevation of 456.3 feet above mean sea level, as determined by the Penobscot River survey of 1904.

Several storage dams, including the North Twin dam previously mentioned, which have been constructed at points in the basin above this mill, store water on a surface of about 65 square miles, with a capacity of about 30,000,000,000 cubic feet. Except during the time (usually in August) that excess water has to be supplied for log driving on the river below Millinocket and for a short time in the spring, the run-off is regulated by storage. Further storage capacity, sufficient to practically control the run-off from the drainage area above Millinocket, is contemplated by the Great Northern Paper Co. Millinocket Lake is now being used for power storage at the new mills of the company at East Millinocket and Dolby. It has been utilized for log driving for many years in the past.

The records of discharge at Millinocket are under the personal supervision of Mr. Ferguson, are carefully kept, and are rated as excellent. No difficulty is experienced in winter on account of ice affecting the estimates of discharge or the running of the wheels. Ferguson Pond, just above the entrance to the canal, eliminates effect from anchor ice.

The maximum daily discharge since the beginning of the records occurred April 1 and 2, 1903, and was a flow of 24,250 second-feet. The minimum weekly discharge at this point, not considering periods when water was not in use at the mill, was 291 second-feet, occurring January 28 to February 3, 1904.

The Millinocket mill of the Great Northern Paper Co., with nearly 25,000 horsepower of wheel installation, has a daily output of about 300 tons of pulp and 300 tons of paper, and is doubtless the largest mill in the world. At East Millinocket and Dolby, about 10 miles down river, are other mills of this company, constructed during 1907, and utilizing over 15,000 horsepower of wheels, with a daily capacity of about 180 tons of pulp and 130 tons of paper. This is, therefore, an important district in the manufacture of pulp and paper.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of West Branch of Penobscot River at Millinocket, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,173	2,120	4,350	3,155	[a]1,940	6,455	3,980	1,750	2,650	2,205	2,265	2,265
2	[a]2,189	2,130	4,280	3,155	1,492	6,146	3,975	2,250	2,605	[a]2,265	2,260	2,265
3	2,175	2,160	4,287	[a]3,180	2,350	4,660	[a]4,680	2,255	2,605	2,025	2,260	2,265
4	2,173	2,120	4,275	2,760	1,900	5,390	3,950	2,260	[a]2,635	2,260	2,260	[a]2,230
5	2,237	2,155	4,085	2,735	5,270	[a]6,075	4,075	2,255	2,795	2,265	2,250	1,870
6	2,213	[a]2,182	[a]4,137	2,691	9,290	6,225	4,280	2,255	2,795	2,265	[a]2,255	2,265
7	2,174	3,975	4,263	2,679	10,465	7,445	4,135	[a]2,260	2,370	2,265	1,030	2,265
8	2,237	4,870	4,195	2,735	[a]9,090	7,460	3,255	1,535	2,255	2,265	2,260	2,160
9	[a]2,237	5,280	4,083	2,810	8,700	6,565	2,985	2,260	2,260	[a]2,275	2,255	2,265
10	2,092	5,385	4,208	[a]2,868	8,650	6,820	[a]2,735	2,255	2,260	2,045	2,250	2,255
11	2,238	5,260	4,278	2,849	8,110	8,165	2,290	2,260	[a]2,260	2,260	2,265	[a]2,240
12	2,139	5,130	4,320	2,940	6,925	[a]6,220	2,890	2,260	2,035	2,260	2,265	1,970
13	2,161	[a]5,140	[a]4,340	2,820	6,865	4,690	2,675	2,250	2,265	2,260	[a]2,255	2,240
14	2,214	4,735	4,441	2,330	6,890	4,780	2,610	[a]2,255	2,265	2,260	1,240	2,220
15	2,238	4,685	4,258	2,240	[a]6,920	5,775	2,560	1,830	2,230	2,265	2,260	2,025
16	[a]2,238	4,610	4,260	2,250	6,320	4,890	2,409	2,255	2,170	[a]2,260	2,265	2,265
17	2,218	4,555	4,360	[a]2,260	5,800	4,785	[a]2,425	2,370	2,255	2,025	2,265	2,265
18	2,151	4,480	4,475	2,035	4,590	4,720	2,184	2,615	[a]2,220	2,260	2,265	[a]2,265
19	2,191	4,410	4,360	2,210	4,010	[a]5,165	2,316	2,610	2,055	2,260	2,260	1,810
20	2,186	[a]4,300	[a]4,345	2,245	4,775	4,000	2,273	2,250	2,265	2,260	[a]2,260	2,265
21	2,181	4,250	4,476	2,240	5,200	3,530	2,321	[a]2,265	2,265	2,260	1,840	1,960
22	1,937	4,235	4,235	2,245	[a]5,230	4,040	2,365	1,710	2,250	2,260	2,260	2,015
23	[a]1,988	4,290	4,195	2,250	4,775	4,780	2,352	2,250	2,505	[a]2,280	2,270	2,265
24	1,810	4,320	4,135	[a]2,350	4,130	4,790	[a]2,303	2,150	2,600	1,845	2,265	2,165
25	1,835	4,365	4,147	2,090	3,970	5,060	2,949	2,295	[a]2,640	2,260	2,260	[a]2,010
26	2,190	4,305	3,562	2,190	4,530	[a]4,070	2,250	2,550	2,035	2,260	2,265	1,795
27	1,992	[a]4,215	[a]3,348	2,250	4,030	3,790	2,250	2,745	2,265	2,265	[a]2,270	1,740
28	2,185	4,210	2,870	2,315	4,260	5,900	2,250	[a]2,725	2,180	2,260	1,695	2,250
29	2,063	....	3,045	2,224	[a]6,650	5,230	2,250	2,440	2,200	2,260	2,225	2,180
30	[a]1,962	....	2,925	2,265	7,125	3,820	2,250	3,315	2,255	[a]2,260	2,265	2,145
31	2,143	....	3,075	....	6,625	....	[a]2,260	2,715	....	1,770	....	2,255

[a] Sunday.

Monthly discharge of West Branch of Penobscot River at Millinocket, Maine, for 1910.

[Drainage area, 1,880 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	2,238	1,810	2,134	1.14	1.31
February	5,385	2,120	4,067	2.16	2.25
March	4,476	2,870	4,052	2.16	2.49
April	3,180	2,035	2,512	1.34	1.50
May	10,465	1,492	5,706	3.03	3.49
June	8,165	3,530	5,381	2.86	3.19
July	4,280	2,184	2,854	1.52	1.75
August	3,315	1,535	2,305	1.23	1.42
September	2,795	2,035	2,348	1.25	1.40
October	2,280	1,770	2,209	1.18	1.36
November	2,270	1,030	2,152	1.14	1.27
December	2,265	1,740	2,144	1.14	1.31
The year	10,465	1,030	3,148	1.68	22.74

PENOBSCOT RIVER AT WEST ENFIELD, MAINE.

This station, which is located at the steel highway bridge about 1,000 feet below the mouth of Piscataquis River and 1 mile below West Enfield, was established November 5, 1901, and prior to 1904 was designated as being at Montague, Maine. In 1904 the name of this village was changed to West Enfield.

There is a dam on Piscataquis River near its entrance into the Penobscot, and about a mile above the station is the dam of the International Paper Co., on the main river. During low water daily gage heights show considerable fluctuations caused by variations in wheel-gate openings at the mills above.

The datum of the chain gage has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge data during the open-water season are good, and a fairly good discharge rating curve has been developed for 1910. The plotting of discharge measurements at this station indicates considerable variation in the conditions of flow from year to year, thus requiring new discharge rating curves after each high-water period.

The regimen of flow of Penobscot River has been considerably affected by storage, principally in the lakes tributary to the West Branch, since about 1900.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Penobscot River at West Enfield, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 24[a]	F. E. Pressey	868	5,000	5.40	10,400
Apr. 27	H. S. Boardman	886	9,360	10.02	33,600
May 25	F. E. Pressey	860	4,810	5.00	11,200
Sept. 29	University of Maine students, under direction of Prof. H. S. Boardman	658	2,530	2.22	3,900
29	.....do	658	2,520	2.22	3,750
Oct. 1	.....do	645	2,460	2.15	3,510
1	.....do	645	2,450	2.15	3,300
5	.....do	641	2,480	2.10	3,570
5	.....do	641	2,400	2.10	2,700
8	.....do	631	2,390	2.03	3,460
8	.....do	631	2,360	2.03	3,310
13	.....do	658	2,550	2.22	3,930
15	.....do	634	2,400	2.04	3,360
15	.....do	634	2,420	2.04	3,370
18	.....do	603	2,160	1.68	3,650
18	.....do	603	2,160	1.68	2,590
19	.....do	628	2,350	1.99	3,300
19	.....do	628	2,360	1.99	3,100
28	.....do	705	2,750	2.71	4,860
Nov. 2	.....do	685	2,700	2.48	4,580
2	.....do	685	2,720	2.48	4,280

[a] Backwater due to ice jam.

Daily gage height, in feet, of Penobscot River at West Enfield, Maine, in 1910.

[A. H. Hanson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.9	8.2	7.05	8.25	8.6	7.15	5.75	2.65	3.3	2.1	2.15	2.3
2	4.9	7.8	7.2	9.2	8.35	7.9	5.55	2.9	3.25	2.15	2.35	2.4
3	4.9	7.35	7.3	9.5	8.05	6.95	5.4	3.1	2.9	2.05	2.4	2.4
4	4.95	7.15	7.25	9.5	8.45	6.65	5.4	3.25	2.8	2.0	2.3	2.55
5	4.9	6.85	7.2	9.2	9.05	6.5	5.65	3.6	2.85	2.1	2.3	2.65
6	4.9	7.1	7.05	9.45	9.3	6.45	5.95	3.85	3.0	2.05	2.2	2.5
7	5.7	7.2	7.0	10.1	9.25	6.7	6.25	3.65	2.9	2.0	2.35	2.9
8	5.7	7.25	7.3	10.6	9.0	7.0	6.5	3.5	2.75	2.3	2.75	2.9
9	5.6	7.25	7.75	10.35	8.6	7.05	5.35	3.4	2.6	2.0	3.0	2.85
10	5.7	7.1	7.85	9.95	8.25	6.85	5.0	3.25	2.5	1.9	2.9	2.85
11	5.8	7.0	7.5	9.45	7.95	6.65	4.3	3.2	2.4	1.65	2.8	2.9
12	5.8	6.9	7.15	9.2	7.75	6.55	4.0	3.1	2.3	1.95	2.7	2.8
13	5.7	6.8	6.8	8.6	7.45	6.5	4.05	3.1	2.25	2.2	2.6	2.15
14	5.6	6.9	6.45	8.05	7.2	6.7	3.85	3.2	2.4	2.25	2.6	2.7
15	5.7	7.0	6.3	7.55	6.75	6.35	3.65	3.1	2.55	2.1	2.45	2.7
16	5.6	6.9	6.2	7.2	7.45	6.15	3.3	3.2	2.4	2.05	2.25	3.0
17	5.45	6.9	6.15	6.8	6.3	6.1	3.0	3.15	2.4	1.95	2.6	3.1
18	5.4	6.8	6.0	6.25	6.15	6.6	2.6	3.1	2.25	1.75	2.6	3.1
19	5.5	7.05	6.2	6.15	6.0	6.95	2.85	3.2	2.0	2.0	2.45	2.95
20	5.5	7.05	6.45	7.0	6.1	6.75	3.1	3.3	2.2	2.05	2.15	2.55
21	5.4	7.0	6.65	7.85	6.1	6.6	3.1	3.25	2.4	2.0	2.0	2.85
22	5.5	6.55	6.75	8.45	5.85	6.5	3.2	3.45	2.3	2.0	2.15	2.75
23	7.7	7.75	6.45	9.05	5.6	6.65	3.25	3.4	2.3	1.7	2.3	2.6
24	10.3	6.9	5.45	9.25	5.4	6.45	2.8	3.5	2.3	1.75	2.3	2.55
25	9.85	6.9	5.5	9.45	5.45	6.1	2.4	3.4	2.15	1.6	2.25	2.8
26	9.4	7.0	6.0	9.7	6.1	5.9	2.75	3.4	2.1	2.2	2.3	2.
27	9.95	6.9	6.3	10.05	6.4	6.0	3.2	3.45	2.15	2.45	2.2	2.9
28	9.5	6.75	6.3	10.8	6.5	6.1	3.2	3.45	2.3	2.75	2.1	2.9
29	9.1	....	6.35	9.9	6.6	6.25	3.25	3.4	2.3	2.5	2.2	2.85
30	8.7	....	6.75	9.15	6.7	6.4	3.15	3.4	2.2	2.35	2.35	3.75
31	8.45	....	7.7	....	6.85	....	2.95	3.2	....	2.05	....	4.05

NOTE.—Ice existed from Jan. 1 to Apr. 1 and from about Dec. 4 to 23. During much of the time in these two periods the river was open at the gage, but backwater was caused by the collection of ice on bars below. The thickness of ice at the gage during January and February varied from about 0.2 foot to 1.0 foot. Gage heights during the winter months were probably read to water surface.

Daily discharge, in second-feet, of Penobscot River at West Enfield, Maine, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	a21,800	26,000	19,100	13,500	4,620	6,140	3,430	3,530	3,840
2	29,300	24,700	22,500	12,800	5,190	6,020	3,530	3,950	4,060
3	31,000	23,200	18,200	12,300	5,650	5,190	3,330	4,060	4,060
4	31,000	25,200	17,000	12,300	6,020	4,960	3,230	3,840	....
5	29,300	28,500	16,400	13,200	6,910	5,080	3,430	3,840	....
6	30,700	29,800	16,200	14,300	7,580	5,420	3,330	3,630	....
7	34,400	29,600	17,200	15,400	7,040	5,190	3,230	3,950	....
8	37,400	28,200	18,400	16,400	6,650	4,840	3,840	4,840	....
9	36,000	26,000	18,600	12,100	6,390	4,500	3,230	5,420	....
10	33,600	24,200	17,800	11,000	6,020	4,280	3,040	5,190	....
11	30,700	22,700	17,000	8,830	5,890	4,060	2,560	4,960	....
12	29,300	21,800	16,600	7,980	5,650	3,840	3,140	4,730	....
13	26,000	20,400	16,400	8,120	5,650	3,740	3,630	4,500	....
14	23,200	19,300	17,200	7,580	5,890	4,060	3,740	4,500	....
15	20,800	17,400	15,800	7,040	5,650	4,390	3,430	4,170	....
16	19,300	20,400	15,000	6,140	5,890	4,060	3,330	3,740	....
17	17,600	15,600	14,800	5,420	5,770	4,060	3,140	4,500	....
18	15,400	15,000	16,800	4,500	5,650	3,740	2,760	4,500	....
19	15,000	14,400	18,200	5,080	5,890	3,230	3,230	4,170	....
20	18,400	14,800	17,400	5,650	6,140	3,630	3,330	3,530	....
21	22,200	14,800	16,800	5,650	6,020	4,060	3,230	3,230	....
22	25,200	13,900	16,400	5,890	6,520	3,840	3,230	3,530	....
23	28,500	13,000	17,000	6,020	6,390	3,840	2,660	3,840	....
24	29,600	12,300	16,200	4,960	6,650	3,840	2,760	3,840	4,390
25	30,700	12,500	14,800	4,060	6,390	3,530	2,470	3,740	4,960
26	32,100	14,800	14,100	4,840	6,390	3,430	3,630	3,840	4,960
27	34,200	16,000	14,400	5,890	6,520	3,530	4,170	3,630	5,190
28	38,600	16,400	14,800	5,890	6,520	3,840	4,840	3,430	5,190
29	33,300	16,800	15,400	6,020	6,390	3,840	4,280	3,630	5,080
30	29,000	17,200	16,000	5,770	6,390	3,630	3,950	3,950	7,300
31	....	17,800	....	5,300	5,890	....	3,330	....	8,120

a Discharge estimated; ice present.

NOTE.—Daily discharge obtained from a well-defined discharge rating curve.

Monthly discharge of Penobscot River at West Enfield, Maine, for 1910.

[Drainage area, 6,600 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			7,400	1.12	1.29	D.
February			8,600	1.30	1.35	D.
March			11,800	1.79	2.06	D.
April	38,600	15,000	27,800	4.21	4.70	A.
May	29,800	12,300	19,800	3.00	3.46	A.
June	22,500	14,100	16,800	2.55	2.84	A.
July	16,400	4,060	8,380	1.27	1.46	A.
August	7,580	4,620	6,140	.930	1.07	A.
September	6,140	3,230	4,260	.645	.72	A.
October	4,840	2,470	3,370	.511	.59	A.
November	5,420	3,230	4,070	.617	.69	A.
December	8,120		4,000	.606	.70	C.
The year	38,600	2,470	10,200	1.55	20.93	

NOTE.—The mean monthly discharge for January, February, March, and December has been determined from the summation of the discharge at the four stations above West Enfield, namely, Millinocket, Grindstone, Mattawamkeag, and Foxcroft, plus an inflow below these 4 stations and above West Enfield. This inflow has been assumed equal to about the average rate of run-off per square mile above the Foxcroft and Mattawamkeag stations.

Mean discharge Dec. 4 to 23 estimated 3,340 second-feet.

This table supersedes tables published in the first annual report of the Maine State Water Storage Commission.

EAST BRANCH OF PENOBSCOT RIVER AT GRINDSTONE, MAINE.

The East Branch of the Penobscot originally had its headwaters in Webster and East Branch streams, in the north-central part of Maine, but since 1845 about 270 square miles of additional territory, draining to Chamberlain Lake, has contributed in part to the flow of this stream, as explained in more detail in the description of the St. John drainage basin (p. 27). The basin of the East Branch, which, including the 270 square miles of the St. John area, comprises an area of 1,100 square miles, is completely forested and largely wild, has much undeveloped water power, and affords excellent opportunities for water storage.

The gaging station, which was established October 23, 1902, is located at the Bangor & Aroostook Railroad bridge, half a mile south of the railroad station at Grindstone, one-eighth mile above Grindstone Falls, and about 8 miles above the junction of the East Branch with the Penobscot at Medway. No water power is used on the river above the station, but dams are maintained at the outlets of several lakes and ponds near the source of the river, and the impounded water is used for log driving.

The datum of the chain gage has remained the same during the maintenance of the station.

Discharge measurements are made from the railroad bridge.

The discharge is affected by ice during the winter months, and in the log-driving season jams at the station and at Grindstone Falls immediately below are liable to materially vitiate the published results of discharge. When the flow is not affected by ice or by logs, conditions for obtaining accurate discharge data are good, except at low stages, when the current becomes very sluggish. A good discharge rating curve has been developed, although more measurements are required at extreme low and extreme high stages.

Data prior to 1910 have been compiled in Water-Supply Paper 279

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of East Branch of Penobscot River at Grindstone, Maine, in 1910

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 17 [a]	F. E. Pressey	252	1,320	5.26	462
June 8 [b]	.....do	274	2,660	8.90	4,710
20	W. E. Parsons	264	2,180	7.15	3,610
July 26	.....do	257	1,590	5.30	782

[a] Gage height to top of ice, 5.36 feet; ice 1.23 feet thick.

[b] Backwater caused by logs.

Daily gage height, in feet, of East Branch of Penobscot River at Grindstone, Maine, for 1910.

[George H. Goddard, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					7.80	8.65	6.60	5.30	4.10	3.95	4.25	4.60
2		5.90	6.10		7.70	8.75	6.55	5.20	4.10	3.95	4.25	
3					7.65	9.05	6.45	5.28	4.10	3.95	4.20	
4					7.40	9.30	6.60	5.35	4.10	3.95	4.22	4.45
5	5.60	6.00	5.70	7.95	7.40	9.05	7.00	5.55	4.10	3.95	4.38	
6				8.65	7.30	9.00	6.85	5.45	4.10	3.95	4.85	
7				9.25	7.20	9.00	6.65	5.25	4.75	3.95	4.95	4.30
8				9.20	7.15	8.95	6.40	5.15	4.98	3.90	4.80	
9		5.80	5.50	9.00	7.10	8.75	6.70	5.08	4.68	3.90	4.68	
10	5.60			8.85	7.10	8.55	6.45	5.00	4.58	3.90	4.60	
11				8.65	7.10	7.75	6.40	4.98	4.55	3.90	4.50	
12			5.40	8.20	6.90	7.30	6.25	4.90	4.38	3.88	4.50	
13		5.70		7.85	6.75	7.80	6.10	4.90	4.32	3.85	4.50	4.20
14	5.30			7.65	6.65	7.30	5.95	4.90	4.30	3.85	4.48	
15				7.50	6.45	6.65	5.75	4.80	4.30	3.85	4.42	
16		5.40	5.40	7.15	6.40	6.50	5.60	4.78	4.22	3.92	4.40	
17	5.30			6.85	6.80	7.00	5.55	4.68	4.20	4.02	4.40	
18				6.80	7.35	7.30	5.50	4.62	4.15	4.18	4.35	
19	6.80	5.40	5.30	7.15	7.60	7.60	5.35	4.52	4.15	4.05	4.52	
20				7.90	7.85	7.22	5.30	4.48	4.15	4.00	4.78	
21				8.30	8.00	7.10	5.30	4.40	4.15	4.00	4.80	4.10
22				8.30	6.30	7.20	5.20	4.32	4.15	4.00	4.78	
23	9.30	5.30	5.30	8.60	6.30	7.28	5.20	4.38	4.10	4.00		
24				8.80	6.30	7.35	5.20	4.32	4.10	4.00		4.10
25				8.80	6.55	7.30	5.20	4.28	4.10	4.00	4.70	
26				8.80	7.40	7.00	5.30	4.20	4.08	4.18		
27	7.10	5.40		8.75	8.20	6.90	5.30	4.20	4.05	4.52		5.10
28		6.30	6.10	8.40	8.25	6.90	5.35	4.15	4.05	4.62	4.65	
29				8.15	8.30	6.82	5.50	4.15	4.00	4.70		5.10
30			6.60	7.90	8.60	6.72	5.50	4.10	3.98	4.58		
31					8.70		5.40	4.10		4.38		

NOTE.—Ice existed at this station from Jan. 1 to Apr. 4, and from about Nov. 21 to Dec. 31. Gage readings to water surface for Jan. 14, 17, 27, Feb. 2, 9, 16, 23, Mar. 2, 9, 16, and 23.

Gage heights to top of ice for Jan. 19, 23, Feb. 19, 27, 28, Mar. 5, 12, 19, Nov. 22, 25, 28, Dec. 1, 4, and 29.

It is not definitely known whether the remaining gage readings during the winter were to water surface or to top of ice.

The ice ranged in thickness from about 1.1 feet to 1.7 feet during January, February, and March, and attained a thickness of about 1.3 feet in December.

Daily discharge, in second-feet, of East Branch of Penobscot River at Grindstone, Maine, for 1910.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		4,910	6,780	2,620	830	210	172	258	
2		4,700	7,000	2,540	750	210	172	258	
3		4,600	7,700	2,360	814	210	172	240	
4		4,090	8,290	2,620	875	210	172	247	
5	5,220	4,090	7,700	3,320	1,080	210	172	307	
6	6,780	3,890	7,580	3,050	970	210	172	532	
7	8,170	3,700	7,580	2,700	790	480	172	590	
8	8,050	3,600	7,460	2,280	715	608	160	505	
9	7,580	3,510	7,000	2,790	668	445	160	445	
10	7,240	3,510	6,540	2,360	620	396	160	405	
11	6,780	3,510	4,800	2,280	608	382	160	360	
12	5,770	3,140	3,890	2,040	560	307	156	360	
13	5,020	2,880	4,910	1,810	560	283	150	360	
14	4,600	2,700	3,890	1,590	560	275	150	351	
15	4,290	2,360	2,700	1,320	505	275	150	324	
16	3,600	2,280	2,450	1,130	495	247	165	315	
17	3,050	2,960	3,320	1,070	445	240	190	315	
18	2,960	3,990	3,890	1,020	415	225	234	295	
19	3,600	4,490	4,490	875	369	225	198	369	
20	5,120	5,020	3,740	830	351	225	185	495	

Daily discharge, in second-feet, of East Branch of Penobscot River at Grindstone, Maine, for 1910—Continued.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	5,990	5,330	3,510	830	315	225	185	505	....
22	5,990	2,120	3,700	750	283	225	185	495	....
23	6,660	2,120	3,850	750	307	210	185	495	....
24	7,120	2,120	3,990	750	283	210	185	455	....
25	7,120	2,540	3,890	750	268	210	185	455	....
26	7,120	4,090	3,320	830	240	205	234	455	....
27	7,000	5,770	3,140	830	240	198	369	430	....
28	6,210	5,880	3,140	875	225	198	415	430	....
29	5,660	5,990	3,000	1,020	225	185	455	430	....
30	5,120	6,660	2,820	1,020	210	180	396	405	....
31	....	6,890	....	920	210	....	307	....	....

NOTE.—Daily discharge determined from discharge rating curve fairly well defined between 400 and 10,000 second-feet. For November 21 to 30 the discharge has been assumed to be unaffected by the ice which existed during that period.

Monthly discharge of East Branch of Penobscot River at Grindstone, Maine, for 1910.

[Drainage area, 1,100 [a] square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	....	....	1,070	0.973	1.12	D.
February	....	....	591	.537	.56	D.
March	....	....	663	.603	.70	D.
April	8,170	....	5,510	5.01	5.59	C.
May	6,890	2,120	3,980	3.62	4.17	B.
June	8,290	2,450	4,870	4.43	4.94	A.
July	3,320	750	1,610	1.46	1.68	A.
August	1,080	210	509	.463	.53	A.
September	608	180	264	.240	.27	C.
October	455	150	210	.191	.22	C.
November	595	240	396	.360	.40	B.
December	....	....	278	.253	.29	D.
The year	8,290	150	1,660	1.51	20.47	

[a] Includes Chamberlain Lake drainage of 270 square miles.

NOTE.—Discharge for the periods during which ice was present was estimated from the result of 1 discharge measurement made Jan. 17, with ice present, on climatological records and on the discharge from adjacent drainages. Mean discharge Apr. 1 to 4 estimated 3,380 second-feet.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

MATTAWAMKEAG RIVER AT MATTAWAMKEAG, MAINE.

Mattawamkeag River rises near the eastern boundary of Maine and drains a country that is generally low and swampy, although there are on the river a few good power sites, none of which has been utilized. Dams are maintained at the outlets of several large lakes and ponds in this drainage basin, but the stored water is used merely for log driving. The total area of the basin is about 1,500 square miles.

The gaging station, which was established August 26, 1902, is located at the Maine Central Railroad bridge in the village of Mattawamkeag, about half a mile from the mouth of the river.

The datum of the chain gage has remained the same during the maintenance of the station.

Discharge measurements are made from the railroad bridge, which is slightly oblique to the thread of the stream. Low-water measurements are made by wading about 1 mile above the gage. The discharge is affected by ice during the winter, and also occasionally affected by log jams for short periods in the log-driving season. When the channel is unobstructed, conditions are good for obtaining accurate discharge data. A very good discharge rating curve has been developed.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Mattawamkeag River at Mattawamkeag, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 23	F. E. Pressey	383	1,010	5.51	2,550
Aug. 12	W. E. Parsons [a]	162	228	3.92	530

[a] Made by wading about 1 mile above the gage.

Daily gage height, in feet, of Mattawamkeag River at Mattawamkeag, Maine, for 1910.

[W. T. Mincher, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	6.85	8.45	6.4	4.65	4.2	3.3	2.6	3.7	3.8
2	7.1	......	......	7.4	8.25	6.4	4.45	4.2	3.3	2.6	3.7	3.8
3	......	......	......	7.7	7.95	6.4	4.4	4.2	3.3	2.6	3.8	3.95
4	......	......	......	8.05	7.7	6.4	4.55	4.2	3.2	2.6	3.8	4.1
5	......	......	......	8.2	7.75	6.15	4.85	4.3	3.2	2.6	3.9	4.1
6	......	7.4	7.4	8.4	8.0	5.9	5.25	4.2	3.2	2.6	4.05	4.1
7	......	......	......	8.55	8.1	5.8	5.55	4.1	3.2	2.6	4.35	4.1
8	......	......	......	8.95	7.85	5.8	5.35	4.2	3.3	2.6	4.75	4.1
9	6.6	......	......	9.15	7.6	5.8	5.15	4.1	3.35	2.6	4.7	4.0
10	......	......	......	9.2	7.4	5.7	4.85	4.0	3.5	2.6	4.7	......
11	......	......	......	9.05	7.2	5.7	4.7	4.0	3.5	2.6	4.55	......
12	......	7.5	......	8.85	7.1	5.8	4.6	3.9	3.4	2.6	4.4	......
13	......	......	7.6	8.65	7.0	5.85	4.5	3.8	3.4	2.6	4.35	......
14	......	......	......	8.3	6.75	6.05	4.5	3.7	3.4	2.5	4.3	......
15	......	......	......	7.9	6.55	6.2	4.5	3.7	3.4	2.5	4.2	......
16	6.3	......	......	7.5	6.35	6.1	4.5	3.7	3.4	2.5	4.1	......
17	......	......	......	6.95	6.15	6.0	4.4	3.7	3.5	2.5	4.0	......
18	......	......	......	6.7	5.85	6.0	4.3	3.7	3.4	2.6	4.0	......
19	......	......	......	6.65	5.8	6.1	4.3	3.6	3.2	2.6	4.0	......
20	......	7.3	6.5	6.85	5.8	6.2	4.2	3.6	3.2	2.6	3.9	......
21	......	......	......	7.75	5.7	6.4	4.1	3.5	3.2	2.6	3.8	......
22	......	......	......	8.5	5.6	6.6	4.0	3.5	3.2	2.6	3.7	......
23	7.9	......	......	8.95	5.6	6.45	4.0	3.4	3.1	2.6	3.7	......
24	......	......	......	9.15	5.6	5.9	3.9	3.4	3.0	2.7	3.8	......
25	......	......	6.0	9.35	5.7	5.45	3.8	3.5	3.0	2.7	3.8	......
26	......	......	6.15	9.25	5.85	5.4	3.7	3.5	2.9	2.9	3.7	4.9
27	......	6.8	6.2	9.2	6.05	5.4	3.85	3.5	2.9	3.15	3.7	......
28	......	......	6.2	9.1	6.2	5.3	4.1	3.4	2.9	3.3	3.6	......
29	......	......	6.2	8.95	6.3	5.1	4.1	3.3	2.8	3.55	3.6	......
30	8.5	......	6.35	8.7	6.4	4.8	4.2	3.3	2.7	3.6	3.6	......
31	......	......	6.35	......	6.4	......	4.2	3.3	......	3.6	......	5.4

NOTE.—Ice prevailed at this station from Jan. 1 to Mar. 24 and from about Dec. 3 to 31. Gage heights were taken to water surface except Jan. 23 and 30, which were taken to top of ice. The thickness of ice from January to March varied from about 0.6 foot to about 1.7 feet

Daily discharge, in second-feet, of Mattawamkeag River at Mattawamkeag, Maine, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		4,780	8,360	3,900	1,260	818	295	100	470	525
2		5,920	7,870	3,900	1,050	818	295	100	470	525
3		6,580	7,100	3,900	1,000	818	295	100	525	
4		7,390	6,580	3,900	1,100	818	258	100	525	
5		7,750	6,700	3,430	1,500	906	258	100	590	
6		8,230	7,270	2,980	2,020	818	258	100	698	
7		8,600	7,510	2,820	2,430	736	258	100	953	
8		9,620	6,920	2,820	2,150	818	295	100	1,380	
9		10,100	6,360	2,820	1,880	736	314	100	1,320	
10		10,300	5,920	2,660	1,500	660	375	100	1,320	
11		9,880	5,490	2,660	1,320	660	375	100	1,160	
12		9,360	5,280	2,820	1,210	590	334	100	1,000	
13		8,860	5,080	2,900	1,100	525	334	100	953	
14		7,990	4,580	3,250	1,100	470	334	86	906	
15		7,040	4,180	3,520	1,100	470	334	86	818	
16		6,140	3,800	3,340	1,100	470	334	86	736	
17		4,980	3,430	3,160	1,000	470	375	86	660	
18		4,480	2,900	3,160	906	470	334	100	660	
19		4,380	2,820	3,340	906	420	258	100	660	
20		4,780	2,820	3,520	818	420	258	100	590	
21		6,700	2,660	3,900	736	375	258	100	525	
22		8,480	2,500	4,280	660	375	258	100	470	
23		9,620	2,500	4,000	660	334	223	100	470	
24		10,100	2,500	2,980	590	334	190	114	525	
25	3,160	10,700	2,660	2,290	525	375	190	114	525	
26	3,430	10,400	2,900	2,220	470	375	160	160	470	
27	3,520	10,300	3,250	2,220	558	375	160	240	470	
28	3,520	10,000	3,520	2,080	736	334	160	295	420	
29	3,520	9,620	3,710	1,820	736	295	134	398	420	
30	3,800	8,980	3,900	1,440	818	295	114	420	420	
31	3,800		3,900		818	295		420		

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Monthly discharge of Mattawamkeag River at Mattawamkeag, Maine, for 1910.

[Drainage area, 1,500 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			1,800	1.20	1.38	D.
February			1,650	1.10	1.14	D.
March	3,800		2,250	1.50	1.73	D.
April	10,700	4,380	8,070	5.38	6.00	B.
May	8,360	2,500	4,680	3.12	3.60	B.
June	4,280	1,440	3,070	2.05	2.29	A.
July	2,430	470	1,090	.727	.84	A.
August	906	295	538	.359	.41	A.
September	375	114	267	.178	.20	A.
October	420	86	142	.095	.11	A.
November	1,380	420	704	.469	.52	A.
December			648	.432	.50	D.
The year	10,700	86	2,070	1.38	18.72	

NOTE.—Discharge during the winter periods is based on climatologic records and the discharge from adjacent drainages. Mean discharge Mar. 1 to 24 estimated 1,880 second-feet.
This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

PISCATAQUIS RIVER NEAR FOXCROFT, MAINE.

Piscataquis River rises in the hilly and mountainous region south and east of Moosehead Lake, flows for about 50 miles in an easterly direction, and enters the Penobscot at Howland. Its slopes and valleys are generally steep and the regimen of flow is therefore variable. Sebec, Schoodic, and Seboois streams, all outlets of large lakes having the same names, are the principal tributaries.

The gaging station, which was established August 17, 1902, is located at Low's bridge, about halfway between the villages of Guilford and Foxcroft. It is about three-fourths of a mile above the mouth of Black Stream and about 3 miles below Mill Stream. Water power is used at several manufacturing plants within a few miles above the station, and the river fluctuates considerably at the gage during low stages. There is little storage on the river above this point.

The staff gage datum has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge or by wading.

During the winter the discharge is affected by ice.

Conditions for obtaining accurate discharge data are good and a good discharge rating curve has been developed for medium stages. At high and low stages the curve is not yet accurately defined.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Piscataquis River near Foxcroft, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Jan. 22[a]	F. E. Pressey	115	332	4.08	513
Apr. 12	.....do	128	367	4.27	1,440
May 7	.....do	128	393	4.03	1,250

[a] Affected by backwater.

Daily gage height, in feet, of Piscataquis River near Foxcroft, Maine, for 1910.

[A. F. D. Harlow, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.65	3.95	3.8	5.9	4.2	3.2	2.6	1.9	2.05	2.0	1.8	1.85
2	2.5	3.75	3.8	6.25	4.2	3.7	2.5	2.15	2.05	1.9	1.7	1.85
3	2.5	3.75	3.7	5.95	4.2	3.5	2.5	2.3	2.05	1.9	1.7	1.9
4	2.7	3.65	3.6	5.7	4.15	3.4	2.6	2.55	1.8	1.85	1.7	1.9
5	2.7	3.65	3.6	5.55	4.05	3.0	2.6	2.8	2.0	1.85	1.7	1.9
6	2.95	3.75	3.6	6.0	4.2	2.9	2.7	2.8	2.25	1.85	1.5	1.9
7	3.0	4.00	3.55	6.0	4.1	3.15	2.65	2.6	2.25	1.85	1.7	1.9
8	3.0	4.00	3.5	5.7	3.7	3.3	2.4	2.65	2.3	1.8	1.9	1.9
9	3.0	3.7	3.45	5.4	3.5	3.35	2.3	2.4	2.3	1.8	1.9	1.85
10	3.0	3.6	3.4	4.95	3.45	3.15	2.2	2.2	2.2	1.85	1.9	1.75

Daily gage height, in feet, of Piscataquis River near Foxcroft, Maine, for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	3.0	3.5	3.35	4.65	3.35	3.1	2.4	2.2	1.8	1.85	1.9	1.7
12	2.95	3.4	3.35	4.6	3.35	3.1	2.25	2.5	2.0	1.85	1.7	1.7
13	2.95	3.3	3.55	4.3	2.9	3.65	2.25	2.7	2.25	1.85	1.6	1.7
14	3.05	3.4	3.55	4.45	2.8	3.4	2.25	2.7	2.25	1.85	1.85	1.75
15	3.15	3.5	3.55	3.9	2.8	3.4	2.25	2.55	2.25	1.8	1.9	1.65
16	2.95	3.7	3.55	3.9	2.75	3.3	2.25	2.55	2.1	1.6	1.9	1.6
17	2.95	3.6	3.55	4.1	2.6	3.2	2.25	2.55	1.95	1.75	1.9	1.6
18	2.95	3.6	3.55	4.1	2.6	4.0	2.15	2.35	1.9	1.75	1.9	1.6
19	2.95	3.4	3.55	4.15	2.7	3.7	2.1	2.3	1.95	1.85	1.9	1.45
20	3.25	3.4	3.00	3.95	2.9	3.4	2.05	2.3	1.95	1.85	1.65	1.45
21	3.75	3.35	2.85	3.95	2.8	3.35	2.05	2.1	1.95	1.85	1.75	1.5
22	4.0	3.35	2.85	4.4	2.65	4.35	2.15	2.3	1.95	1.85	1.7	1.5
23	7.9	3.25	2.85	4.7	2.65	4.2	2.3	2.3	1.95	1.6	1.7	1.5
24	6.8	3.25	2.85	4.4	2.65	3.8	2.2	2.25	1.95	1.85	1.7	1.7
25	5.65	3.35	3.1	4.7	2.65	3.15	2.35	2.2	1.9	1.85	1.8	2.05
26	4.85	3.4	4.3	4.55	2.65	3.0	2.2	2.05	1.95	1.65	1.8	3.3
27	4.6	2.9	4.65	5.25	2.65	3.0	2.2	2.0	2.2	1.6	1.8	2.95
28	4.2	3.0	4.65	4.95	2.8	2.95	2.25	1.8	2.2	1.7	1.8	3.05
29	4.05	....	4.9	4.65	2.6	2.9	2.15	2.05	2.2	1.7	1.8	3.0
30	3.9	....	5.3	4.65	2.6	2.6	2.15	2.05	2.15	1.75	1.8	3.05
31	4.0	....	5.3	....	2.65	....	2.15	2.05	....	1.8	....	3.05

NOTE.—Gage heights for the winter period taken to water surface. The river did not freeze over at the gage section, but was probably considerably affected by backwater from ice below the station from about Jan. 1 to about Mar. 20. The relation of gage height to discharge was probably little affected by ice during December.

Daily discharge, in second-feet, of Piscataquis River near Foxcroft, Maine, for 1910.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	3,790	1,400	569	220	51	72	64	40	46
2	....	4,430	1,400	938	180	90	72	51	31	46
3	....	3,880	1,400	782	180	123	72	51	31	51
4	....	3,440	1,350	709	220	200	40	46	31	51
5	....	3,180	1,260	437	220	318	64	46	31	51
6	....	3,970	1,400	374	267	318	112	46	19	51
7	....	3,970	1,300	536	244	220	112	46	31	51
8	....	3,440	938	638	148	244	123	40	51	51
9	....	2,940	782	674	123	148	123	40	51	46
10	....	2,280	745	536	100	100	100	46	51	36
11	....	1,900	674	502	148	100	40	46	51	31
12	....	1,840	674	502	112	180	64	46	31	31
13	....	1,510	374	898	112	267	112	46	24	31
14	....	1,670	318	709	112	267	112	46	46	36
15	....	1,110	318	709	112	200	112	40	51	28
16	....	1,110	293	638	112	200	81	24	51	24
17	....	1,300	220	569	112	200	58	36	51	24
18	....	1,300	220	1,210	90	136	51	36	51	24
19	....	1,350	267	938	81	123	58	46	51	17
20	....	1,160	374	709	72	123	58	46	28	17
21	346	1,160	318	674	72	81	58	46	36	19
22	346	1,620	244	1,560	90	123	58	46	31	19
23	346	1,960	244	1,400	123	123	58	24	31	19
24	346	1,620	244	1,020	100	112	58	46	31	31
25	502	1,960	244	536	136	100	51	46	40	72
26	1,510	1,780	244	437	100	72	58	28	40	638
27	1,900	2,710	244	437	100	64	100	24	40	406
28	1,900	2,280	318	406	112	40	100	31	40	470
29	2,220	1,900	220	374	90	72	100	31	40	437
30	2,780	1,900	220	220	90	72	90	36	40	470
31	2,780	....	244	....	90	72	....	40	....	470

NOTE.—Daily discharge determined from a discharge rating curve well defined between about 20 and 4,000 second-feet.

Monthly discharge of Piscataquis River near Foxcroft, Maine, for 1910.

[Drainage area, 286 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			300	1.05	1.21	D.
February			300	1.05	1.09	D.
March	2,780		806	2.82	3.25	D.
April	4,430	1,110	2,280	7.97	8.89	A.
May	1,400	220	596	2.08	2.40	A.
June	1,560	220	688	2.41	2.69	A.
July	267	72	131	.458	.53	A.
August	318	40	146	.510	.59	A.
September	123	40	78.9	.276	.31	B.
October	64	24	41.5	.145	.17	C.
November	51	19	39.0	.136	.15	C.
December	638	17	122	.427	.49	B.
The year	4,430	17	459	1.60	21.77	

NOTE.—Discharges for period during which ice was present are based on the measurement made Jan. 22 with backwater existing, on climatological records, and on the discharge from adjacent drainages. Mean discharge, Mar. 1-20, estimated 500 second-feet.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

COLD STREAM POND AT ENFIELD AND LINCOLN, MAINE.

Cold Stream Pond is located mostly in the towns of Enfield and Lincoln and is tributary to Passadumkeag Stream. It consists really of a series of connected ponds, the largest covering an area of about 8 square miles. A gaging station was maintained on the outlet of this pond from 1904 to 1906. The drainage area of Cold Stream at its mouth is about 37 square miles.

The following table shows the dates of closing and opening, or disappearance of ice from the pond, the record being compiled by Charles E. Darling, superintendent of the State fish hatchery, Enfield, Maine.

Dates of closing and opening of Cold Stream Pond, Maine.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
	1900, Apr. 27			1906, May 8	
	1901, Apr. 23			1907, May 6	
	1902, Apr. 8			1908, Apr. 28	
	1903, Apr. 7			1909, May 3	
	1904, May 4		1909, Dec. 21	1910, Apr. 6	107
	1905, Apr. 23		1910, Dec. 12	1911, May 1	141

KENDUSKEAG STREAM NEAR BANGOR, MAINE.

This station, which was established September 15, 1908, is located at the wooden highway bridge about 6 miles northwest of the Bangor post office, and is just below Sixmile Falls, which affords the best unutilized power site of the lower stretch of the river.

The discharge at this point does not always represent the actual discharge from the original or natural drainage basin of Kenduskeag Stream. A number of years ago an artificial cut for use in log driving was made through a low divide between Souadabscook Stream and Black Stream, the latter a tributary of the Kenduskeag, entering it about 7 miles above the gaging station. During high stages in the Souadabscook a portion of its waters finds its way through the cut into Kenduskeag; at low stages in the Souadabscook all of the flow continues down its own channel. It is believed that all of the flow of Black Stream is into the Kenduskeag and none into the Souadabscook. The drainage area of Kenduskeag Stream above the mouth of Black Stream is 136 square miles; at the gaging station, including all of Black Stream but none of Souadabscook, it is 191 square miles; at the mouth, under the same conditions, it is 214 square miles. The drainage area of Black Stream itself is 40 square miles. The monthly discharge data show the conditions actually existing at the station. The estimates of discharge per square mile and depth in inches on the drainage area are not absolutely accurate on account of the conditions outlined above. There is no way of determining the actual area of the Souadabscook that contributes to the Kenduskeag discharge.

Gage heights are furnished by Fred Cort, of Bangor. The datum of the chain gage attached to the highway bridge has remained the same during the maintenance of the station. Discharge measurements are made from the highway bridge. During the winter months the relation between discharge and gage height is somewhat affected by ice. Conditions for obtaining accurate discharge data are good and a good discharge rating curve has been developed, although more measurements are needed at high stages.

Data prior to 1910 have been compiled in Water-Supply Paper 279.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Kenduskeag Stream near Bangor, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 8[a]	F. E. Pressey	75	56	2.48	56
Mar. 26	.....do	99	398	5.05	1,200
June 4	.....do	92	94	2.24	93

[a] Present gage height to top of ice, 2.48 feet; thickness of ice, 0.76 foot.

Daily gage height, in feet, of Kenduskeag Stream near Bangor, Maine, for 1910.

[Fred Cort, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	4.3	3.95	4.8	4.35	2.4	2.1	1.7	1.5	1.5	1.6	1.8
2	2.4	4.3	4.25	4.85	4.15	2.3	2.0	1.75	1.5	1.5	1.6	1.75
3	......	4.25	4.55	4.6	4.1	2.2	2.0	1.85	1.5	1.5	1.6	1.7
4	......	4.05	4.65	4.2	4.15	2.15	2.0	1.9	1.5	1.5	1.6	1.7
5	......	3.9	4.9	4.2	4.0	2.15	2.0	2.15	1.5	1.4	1.65	1.7
6	......	3.65	5.0	4.1	3.7	2.3	2.0	2.2	1.5	1.4	1.7	1.7
7	......	3.4	5.6	4.05	3.5	2.3	1.9	2.25	1.5	1.4	1.6	1.7
8	......	3.4	6.55	3.9	3.3	2.3	1.85	2.3	1.55	1.4	1.5	1.7
9	1.9	3.1	6.25	3.75	3.35	2.2	1.9	2.2	1.6	1.4	1.5	1.6
10	......	2.9	5.8	3.75	3.3	2.3	1.9	2.1	1.6	1.4	1.5	1.6
11	......	2.95	5.25	3.55	2.85	2.4	1.8	2.0	1.6	1.4	1.5	1.6
12	......	2.7	4.8	3.55	2.65	2.5	1.8	1.9	1.5	1.4	1.5	1.6
13	......	3.05	4.55	3.4	2.55	2.4	1.7	1.8	1.5	1.4	1.5	1.6
14	......	2.9	4.5	3.25	2.6	2.5	1.7	1.8	1.5	1.4	1.6	1.6
15	......	3.05	4.6	3.15	2.6	2.4	1.8	1.75	1.5	1.4	1.6	1.6
16	1.9	3.2	4.5	2.9	2.35	2.4	1.8	1.7	1.5	1.4	1.6	1.6
17	......	3.1	4.35	2.9	2.4	2.5	1.7	1.6	1.5	1.4	1.7	1.6
18	......	3.2	3.85	2.9	2.3	2.4	1.7	1.6	1.5	1.4	1.7	1.6
19	2.2	3.1	3.55	3.05	2.1	2.5	1.7	1.6	1.5	1.4	1.7	1.7
20	3.05	3.2	3.5	3.25	2.1	2.5	1.7	1.7	1.5	1.4	1.65	1.7
21	3.4	3.3	3.6	3.5	2.1	2.45	1.7	1.7	1.5	1.4	1.6	1.7
22	3.65	3.3	4.0	4.0	2.2	2.4	1.7	1.7	1.5	1.4	1.7	1.7
23	6.2	3.4	4.15	4.15	2.25	2.5	1.7	1.6	1.4	1.4	1.6	1.7
24	6.9	3.5	4.5	4.05	2.15	2.5	1.7	1.6	1.4	1.4	1.6	1.8
25	6.4	3.4	4.8	4.05	2.0	2.6	1.65	1.55	1.4	1.4	1.6	2.45
26	5.75	3.5	5.1	4.05	2.15	2.5	1.7	1.6	1.4	1.45	1.7	2.9
27	5.55	3.4	5.15	4.4	2.45	2.4	1.7	1.6	1.4	1.6	1.7	3.25
28	5.35	3.55	4.8	4.6	2.9	2.3	1.65	1.6	1.4	1.65	1.8	3.6
29	4.9	......	4.45	4.55	2.8	2.1	1.7	1.6	1.5	1.7	1.8	3.7
30	4.55	......	4.6	4.7	2.7	2.1	1.7	1.6	1.5	1.6	1.8	3.7
31	4.5	......	4.95	......	2.45	......	1.8	1.5	......	1.6	......	3.5

NOTE.—Gage heights affected by ice at this station from Jan. 1 to about Jan. 22. It is quite probable also that there was more or less backwater from ice during February, March, and December. All gage heights are probably to water surface. The thickness of ice during January was recorded as about 9 inches.

Daily discharge, in second-feet, of Kenduskeag Stream near Bangor, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	745	596	1,020	770	137	86	34	18	18	25	45
2	......	745	722	1,040	678	119	71	40	18	18	25	40
3	......	722	872	900	655	102	71	51	18	18	25	34
4	......	635	928	700	678	94	71	57	18	18	25	34
5	......	576	1,080	700	615	94	71	94	18	12	30	34
6	......	483	1,140	655	501	119	71	102	18	12	34	34
7	......	398	1,550	635	431	119	57	110	18	12	25	34
8	......	398	2,290	576	366	119	51	119	22	12	18	34
9	......	305	2,050	520	382	102	57	102	25	12	18	25
10	......	249	1,700	520	366	119	57	86	25	12	18	25
11	......	262	1,300	448	236	137	45	71	25	12	18	25
12	......	199	1,015	448	188	156	45	57	18	12	18	25
13	......	290	872	398	166	137	34	45	18	12	18	25
14	......	249	845	350	177	156	34	45	18	12	25	25
15	......	290	900	320	177	137	45	40	18	12	25	25
16	......	335	845	249	128	137	45	34	18	12	25	25
17	......	305	770	249	137	156	34	25	18	12	34	25
18	......	335	557	249	119	137	34	25	18	12	34	25
19	......	305	448	290	86	156	34	25	18	12	34	34
20	......	335	431	350	86	156	34	34	18	12	30	34
21	......	366	465	431	86	146	34	34	18	12	25	34
22	......	366	615	615	102	137	34	34	18	12	34	34
23	2,010	398	678	678	110	156	34	25	12	12	25	34
24	2,590	431	845	635	94	156	34	25	12	12	25	45
25	2,170	398	1,020	635	71	177	30	22	12	12	25	146
26	1,660	431	1,200	635	94	156	34	25	12	15	34	249
27	1,520	398	1,240	795	146	137	34	25	12	25	34	350
28	1,380	448	1,020	900	249	119	30	25	12	30	45	465
29	1,080	......	820	872	223	86	34	25	18	34	45	501
30	872	......	900	955	199	86	34	25	18	25	45	501
31	845	......	1,110	......	146	......	45	18	......	25	......	431

NOTE.—Daily discharge determined from a discharge rating curve well defined below about 1,800 second-feet. Open channel assumed Jan. 23 to Mar. 31 and during December.

Monthly discharge of Kenduskeag Stream near Bangor, Maine, for 1910.

[Drainage area 191 square miles.]

Month.	Discharge in second feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,590	56	538	2.82	3.25	D.
February	745	199	407	2.13	2.22	C.
March	2,290	431	994	5.20	6.00	C.
April	1,040	249	592	3.10	3.46	A.
May	770	71	273	1.43	1.65	A
June	177	86	132	.691	.77	A.
July	86	30	45.9	.240	.28	A.
August	119	18	47.7	.250	.29	A.
September	25	12	17.6	.092	.10	B.
October	34	12	15.4	.081	.09	B.
November	45	18	28.0	.147	.16	B.
December	501	25	113	.592	.68	B.
The year	2,590	12	266	1.39	18.95	

NOTE.—Mean discharge Jan. 1 to 22, estimated 116 second-feet, on the basis of one discharge measurement made Jan. 8, with ice present, and on climatological records.
This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

KENNEBEC RIVER.

GENERAL FEATURES OF AREA DRAINED.[1]

Kennebec River rises in Moosehead Lake in the west-central part of Maine, the headwaters being collected by Moose River, Roach River, and a number of smaller streams rising in the hilly forested areas east and west of the lake, and drains an area extending from the Canada line to the ocean. This area measures about 150 miles in length, ranges in width from 50 to 80 miles in the main part, and embraces a total area of 5,970 square miles—about one-fifth the total area of the State—of which 1,240 square miles are tributary to Moosehead Lake. The length of the river from Moosehead Lake to its entrance into Merrymeeting Bay, near Brunswick, including the more considerable windings, is about 140 miles.

The surface of the headwater region is broken by offsets from the White Mountains. Near Moosehead Lake most of the hills and highlands lie well back from the lake. Below the lake nearly to The Forks the river is a torrent, flowing in a narrow, rocky chasm with precipitous sides. Below the junction of Dead River at The Forks the Kennebec flows through a broader valley with gentler slopes. The general elevation of the basin is less than that of the Androscoggin, which adjoins it on the west, although near the center of the area Saddleback, Abraham, and Bigelow mountains rise as isolated peaks to an elevation higher than any mountains in the State except Katahdin.

[1] All available data pertaining to the Kennebec River drainage basin prior to 1907 have been published in Water-Supply Paper 198, "Water resources of the Kennebec River basin."

The extreme headwaters of the Kennebec at the Canadian line reach an elevation of approximately 2,000 feet above sea level. Moosehead Lake is about 1,026 feet above tidewater and distant from it 120 miles; the average descent of the river below the lake is therefore 8.55 feet per mile.

The area drained by the Kennebec presents considerable variety in its rock formations. In the northern part of the basin the rocks include sandstones, conglomerates, shales, slates, impure limestones, and some masses of volcanic rocks of which the rhyolite of Mount Kineo furnishes the most conspicuous exposure. In the central and southern portions of the basin extensive areas of granite appear. The quarries at Hallowell are located on one of the larger masses of pure granite. A notable characteristic of the rocks in the Kennebec basin is their compactness and hardness, which gives permanence to the present channels of the river. The surface materials are usually finely pulverized, and water-retaining sands and gravels, more abundant in the northern part of the area, are succeeded southward by a larger proportion of loam and clay.

The greater part of the Kennebec River basin is forested and the upper area is heavily timbered, although extensive cutting has been going on for many years. Spruce is most abundant, and large quantities of poplar, valuable in the production of the best grades of paper, are found. About one-third of all the lumber used in the State for pulp and paper comes from the Kennebec basin.

The mean annual precipitation in the Kennebec basin above Waterville is about 40 inches. It ranges from a little over 44 inches at Gardiner to probably not over 35 inches in the extreme northwestern part of the basin.

The river is generally frozen over during the winter, and the snow in the northern portions of the basin frequently accumulates to a depth of 3 feet (equivalent to 5 or 6 inches of water).

The basin affords excellent natural storage facilities. About 299 square miles of the area is lake and pond surface. Moosehead Lake, 115 square miles in area, is the largest lake in New England. It is about 35 miles in extreme length, 12 miles in maximum width, and of such depth that it is crossed by steamboats from end to end. It has been in use many years as a reservoir to store the spring flow for use in log driving and for power and is controlled by substantial log-crib dams at its two outlets. The east outlet stream is the more important and is joined by the west outlet stream at the upper end of Indian Pond, about 4 miles below the lake.

The present head of water at Moosehead Lake is about 7.5 feet, corresponding to about 23.5 billion cubic feet storage, but surveys and estimates made by the Kennebec Water Power Co. cover an additional depth of 2 feet, corresponding to approximately 1.6 square miles of additional water area. Property at Greenville and Kineo would be considerably damaged by this change, but an additional storage capacity of about 6.5 billion cubic feet would result. The lake could also be drawn down to a lower level by dredging at the outlet, which, however, would doubtless be objected to by the companies interested in navigation.

Other important but little used storage basins on Kennebec headwaters are Brassua Lake and Long, Wood, Attean, and Roach ponds. Economical storage in the headwaters up to 40 billion cubic feet capacity is possible, which, with that on Dead River and other tributaries should make the Kennebec River, with its large amount of of fall, one of the best power streams in the country.

Though the regimen of flow of the Kennebec has been much improved by storage in Moosehead Lake, systematic regulation of the use of stored water is greatly needed, for much of the stored water impounded by the lake at the present time is needlessly wasted during log driving and at other times for lack of an adequate system of measuring and recording the flow from the outlets.

The Kennebec has always been an important river for log driving, the annual drive at present amounting to about 150 million feet b. m.

Below Skowhegan practically all of the fall is utilized for power development, but above that point there is a large amount of unutilized fall. About 40 feet of fall in the vicinity of Madison has lately been developed by the Hollingsworth & Whitney Co. for a pulp and paper mill. Some of the important industries using water power on the main river are the cotton mills at Augusta and Waterville, the pulp and paper mills at Waterville, Skowhegan, Madison, and Solon, and numerous lumber mills.

The longest continuous run-off record on the main river is that at Waterville, beginning in 1893. The driest year since that time was 1908, and the wettest year 1907, the total flow in these two years being in the ratio of about 1 to 2.32.

RIVER SURVEYS IN KENNEBEC RIVER BASIN.

The results of river and lake surveys made in the Kennebec River basin by the United States Geological Survey in cooperation with the State of Maine are represented by the maps of the following list:

	Sheets.
Kennebec River, Skowhegan to The Forks	4
Kennebec River, The Forks to Moosehead Lake	1
Kennebec River, Profile, Tidewater to Moosehead Lake	1
Brassua Lake, Brassua Lake Outlet	1
Wood Pond, Wood Pond Outlet	1
Attean Pond	1
Holeb Pond, Long Pond, Moose River, Moosehead Lake to Brassua Lake	1

	Sheets.
Spring Lake, West Carry Lake, Spencer Ponds, Middle Roach Pond, Lower Roach Pond	1
Dead River	9
Sandy River	5

The river maps show not only the plan of the river, with 5-foot contours along the banks, but also the profiles, and are valuable in studying developed and undeveloped water-power sites, as, in connection with the stream-gaging records, they afford data for a close estimate of the total horsepower that can be developed at the falls and rips. The special lake maps are of value in computing the capacity of the lakes in cubic feet if their use as storage reservoirs is contemplated.

These maps may be had without charge by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Maine.

MOOSE RIVER NEAR ROCKWOOD, MAINE.

This station, which was established September 7, 1902, discontinued December 31, 1908, and reestablished May 16, 1910, is located about 2 miles from Rockwood, at a deserted cabin one-fourth mile above the farmhouse of Edilbert Arsenault, 2 miles above the mouth of the river and 4 miles west of Kineo, from which it may be reached by steamer or rowboat.

A standard chain gage is attached to trees on the right bank about 100 feet above the cable. Its datum is 1,023.46 feet above mean sea level and has remained unchanged, but a temporary staff gage was used from May 16 to 30, 1910, and also during low and winter periods in earlier years.

At high stages discharge measurements are made from a car suspended from a steel cable. Low-stage measurements are made by wading a short distance downstream from the cable.

Dams are maintained at the outlets of several lakes and ponds above the station, but all such stored water is used for log driving and the effect upon the regimen of flow is but temporary

Discharge during the winter months is affected by ice. Conditions for obtaining accurate discharge data are good, and a good rating curve has been developed except for extreme low stages, where it is somewhat uncertain. The 1908 rating curve has been used in computing the discharge for 1910, except as noted under the tables below.

Data prior to 1907 have been compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Moose River near Rockwood, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 16[a]	F. E. Pressey	245	1,150	4.94	2,390
30[a]	.....do	235	1,020	4.98	2,400
June 27[a]	W. E. Parsons	245	995	4.32	1,820
Aug. 3	.....do	140	169	2.13	266
3	.....do	140	168	2.10	264

[a] The measurements of May 16, May 30, and June 27 plot uniformly about 360 second-feet in excess of the regular open channel discharge rating curve, due to some unknown cause. Log jams existed at the time these measurements were made.

Daily gage height, in feet, of Moose River, near Rockwood, Maine, for 1910.

[Edilbert Arsenault, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		4.95	4.55	2.1	1.8	2.0	2.3	2.5
2		5.55	4.65	2.1	1.75	2.1	2.2	2.5
3		5.95	4.7	2.15	1.7	2.1	2.2	2.5
4		6.2	4.75	2.2	1.7	2.1	2.3	2.6
5		5.75	4.55	2.3	1.65	2.1	2.4	2.6
6		6.0	3.9	2.2	1.75	2.1	2.4	2.6
7		5.95	3.65	2.2	1.9	2.1	2.4	2.6
8		4.95	3.65	2.3	2.0	2.0	2.4	2.6
9		4.95	3.7	2.2	2.0	2.0	2.4	2.6
10		5.0	3.55	2.2	2.05	2.0	2.4	2.6
11		4.85	3.5	2.2	2.05	2.0	2.5	2.6
12		4.65	3.3	2.2	2.05	2.0	2.5	2.6
13		4.7	3.2	2.2	2.2	2.0	2.5	2.6
14		4.7	3.2	2.2	2.2	1.9	2.6	2.5
15		4.7	3.05	2.2	2.2	1.9	2.7	2.5
16	4.9	4.55	2.95	2.2	2.2	1.9	2.8	2.5
17	4.65	4.45	2.9	2.2	2.1	1.9	2.8	2.5
18	4.35	4.55	2.75	2.2	2.1	1.8	2.8	2.5
19	4.35	4.4	2.7	2.1	2.1	1.8	2.8	2.9
20	4.25	4.35	2.6	2.1	2.1	1.8	2.5	2.7
21	4.25	4.4	2.6	2.1	2.1	1.9	2.3	2.6
22	4.2	4.5	2.6	2.1	2.1	1.9	2.9	2.4
23	4.25	4.5	2.6	2.0	2.0	1.9	2.8	2.3
24	4.25	4.6	2.55	2.0	2.0	1.9	2.7	2.45
25	4.25	4.4	2.45	2.0	2.0	1.9	2.7	2.45
26	4.25	4.35	2.4	2.0	2.0	2.0	2.7	2.7
27	4.4	4.35	2.4	2.0	2.0	2.0	2.7	2.55
28	4.65	4.3	2.35	2.0	2.0	2.0	2.6	2.4
29	4.7	4.25	2.25	2.0	2.0	2.1	2.5	2.55
30	4.9	4.5	2.2	1.95	2.0	2.2	2.5	2.6
31	5.0		2.2	1.8		2.3		2.7

NOTE.—A temporary gage was used May 16 to 30. The gage heights for this period have been reduced to the original gage datum.

The gage heights were more or less affected by log jams from May to July. See, also, footnote to daily discharges.

Backwater caused by ice prevailed during December. Gage readings during December were probably to water surface.

Daily discharge, in second-feet, of Moose River near Rockwood, Maine, for 1910.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	....	2,380	2,020	270	177	228	338
2	....	2,9[illegible]0	2,100	270	162	270	303
3	....	3,310	2,150	286	148	270	303
4	....	3,560	2,200	303	148	270	338
5	....	3,120	2,020	338	134	270	375
6	....	3,360	1 340	303	162	270	375
7	....	3,310	1,110	303	207	270	375
8	....	2,380	1,110	338	238	238	375
9	....	2,380	1,180	303	238	238	375
10	....	2,420	937	303	254	238	375
11	....	2,280	906	303	254	238	414
12	....	2,100	788	303	254	238	414
13	....	2,150	733	303	303	238	414
14	....	2,150	733	303	303	207	454
15	....	2,150	656	303	303	207	496
16	2,330	2,020	608	303	303	207	539
17	2,100	1,930	584	303	270	207	539
18	1,850	2,020	518	303	270	177	539
19	1,850	1,890	496	270	270	177	539
20	1,770	1,850	454	270	270	177	414
21	1,770	1,890	454	270	270	207	338
22	1,730	1,980	454	270	270	207	584
23	1,770	1,980	454	238	238	207	539
24	1,770	2,060	434	238	238	207	496
25	1,770	1,890	394	238	238	207	496
26	1,770	1,850	375	238	238	238	496
27	1,890	1,850	375	238	238	238	496
28	2,100	1,810	356	238	238	238	454
29	2,150	1,770	320	238	238	270	414
30	2,330	1,980	303	222	238	303	414
31	2,420	....	303	177	....	338	....

NOTE.—Measurements made May 16, May 30, and June 27 indicate abnormal conditions. An auxiliary discharge rating curve about 360 second-feet in excess of the regular free-flow rating curve was passed through these measurements and used until July 5. From July 6 to 10 a transition curve was used merging with the free-flow curve at gage height 3.5 feet. From July 11 to Nov. 30 the daily discharge is obtained from the rating curve used during 1907-8 and well defined except below 150 second-feet.

Monthly discharge of Moose River near Rockwood, Maine, for 1910.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
May 16-31	2,420	1,730	1,960	2.88	1.71	B.
June	3,560	1,770	2,290	3.37	3.76	B.
July	2,200	303	867	1.28	1.48	B.
August	338	177	277	.407	.47	A.
September	303	134	237	.349	.39	A.
October	338	177	236	.347	.40	A.
November	584	303	434	.638	.71	A.
December	....	....	200	.294	.34	D.

NOTE.—The discharge for December, which was affected by ice, was estimated from climatological records, studies of the effect of storage at Moosehead Lake, and consideration of conditions of run-off at other stations in the Kennebec River drainage.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

MOOSEHEAD LAKE AT EAST OUTLET, MAINE.

The record of gage heights of Moosehead Lake level has been kept since April, 1895, by the Hollingsworth & Whitney Co. This record, supplemented by gage readings at Greenville for a part of the time, has been furnished for publication by the company.

The drainage area at the east outlet comprises 1,240 square miles.

A staff gage is attached at end of boat landing wharf on east outlet of lake, about 8 miles from Kineo. The zero of the gage is at the sill of the outlet gates.

Two gage datums have been used at the east outlet; the first or original datum is at elevation 1,011.30 feet above mean sea level, and approximately 10 feet below gate sills; the other is 10 feet higher, that is, zero at the sill of the gates, all gage readings referred to this latter datum. There are 35 gates in the dam, 15 old gates with sills at gage height (original datum) 10 feet; and 20 new gates, with sills at gage height (original datum) 8 feet. There is a bar above the dam at approximate gage height (original datum) of 9 feet and this bar and not the gates controls the flow at extreme low water.

Gage readings prior to 1907 have been compiled in Water-Supply Paper 198.

The following table gives the available dates of opening and closing of Moosehead Lake due to ice:

Dates of opening and closing of Moosehead Lake.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
	1881, May 9			1897, May 10	
	1882, May 19			1898, May 3	
	1883, May 13			1899, May 6	
	1884, May 16			1900, May 14	
	1885, May 16			1901, May 1	
	1886, May 2			1902, Apr. 29	
	1887, May 12			1903, Apr. 28	
	1888, May 21			1904, May 10	
	1889, Apr. 29			1905, May 3	
	1890, May 8			1906, May 13	
	1891, May 14		1906, Dec. 2	1907, May 14	164
	1892, May 4		1907, Dec. 2	1908, May 11	162
	1893, May 19		1908, Dec. 5	1909, May 13	160
	1894, Apr. 29		1909, Dec. 11	1910, Apr. 20	131
	1896, May 9				

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily gage height, in feet, of Moosehead Lake at East Outlet, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			3.65	4.00		7.60	7.50	6.05				
2					7.45				4.65		2.45	1.85
3	4.25					7.60				3.75		
4		3.75	3.65	4.40	7.55		7.55	6.00			2.35	1.75
5	4.25							5.90	4.60	3.65		
6				4.70	7.55	7.60	7.55					
7		3.85	3.65						4.60	3.60	2.40	1.70
8	4.10			5.20		7.55	7.55	5.80				
9		3.80	3.65						4.55			1.70
10	3.95					7.60		5.60		3.50	2.30	1.55
11		3.80	3.65	5.75	7.65		7.40				2.30	
12	3.90							5.60	4.50	3.40		
13				6.10	7.50	7.55	7.20					
14	3.85	3.80	3.65						4.45	3.20	2.20	1.55
15				6.35		7.55	7.05	5.45				
16		3.80	3.55		7.45				4.35		2.10	1.35
17	3.75					7.55		5.35		3.10		
18		3.80	3.50	6.65	7.45		6.95				2.05	
19	3.80							5.25	4.15	3.00		1.40
20				6.80	7.40	7.55	6.85					
21	3.75	3.80	3.50						4.15	2.90	2.05	1.40
22				7.05		7.80	6.70	5.15				
23		3.75	3.70		7.30				4.10		2.00	1.35
24	3.75				7.40	7.65		5.00		2.80		
25		3.75	3.70	7.30			6.75	4.80			2.00	
26	3.75								4.00	2.70		1.30
27				7.40	7.55	7.60	6.40					
28	3.75	3.65	3.70						3.95	2.65	1.95	1.30
29				7.40		7.60	6.30	4.80				
30			3.80		7.55				3.80		1.95	1.30
31	3.80							4.70		2.55		

KENNEBEC RIVER AT THE FORKS, MAINE.

This station, which was established September 28, 1901, is located at the wooden highway bridge across the Kennebec at The Forks, about 2,000 feet above the mouth of Dead River.

The nearest dam used for storage is about 12 miles above the station, at the outlet of Indian Pond. From about May 1 to July 31 fluctuations in gage height ranging from 2 to over 5 feet, are caused each day for regulation of flow for log driving.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station. Its elevation above mean sea level, revised July, 1906, is 565.44 feet.

Discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge data during conditions of free flow are fairly good and a good discharge rating curve has been developed. High water in Dead River occurring at a time of low water in Kennebec River is liable to cause backwater at the station on the latter river.

Data prior to 1907 have been revised and compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Kennebec River at The Forks, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 17	F. E. Pressey	118	653	1.76	[a]970
May 17	.....do	133	913	3.68	3,410
June 28	W. E. Parsons	120	559	0.96	556
Aug. 17	.....do	127	737	2.60	1,980

[a] Meter affected by anchor ice.

Daily gage height, in feet, of Kennebec River at The Forks, Maine, for 1910.

[Wm. W. Young, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	8.4	......	3.1	......	5.7	......	......	2.1	2.3	2.2	1.9
2	3.3	......	......	3.4	......	5.45	......	......	2.1	2.3	2.15	1.9
3	3.3	......	......	3.8	......	5.55	......	......	2.1	2.3	2.0	1.9
4	3.55	7.9	......	3.0	......	5.65	......	......	2.05	2.3	2.0	1.9
5	3.7	7.4	......	2.6	......	......	......	......	2.0	2.3	2.0	1.9
6	3.55	......	2.05	2.9	......	......	......	4.85	2.0	2.3	2.0	1.9
7	3.3	7.4	2.15	3.5	......	......	......	4.5	1.95	2.3	2.0	1.9
8	3.25	......	2.1	4.35	......	......	......	4.25	1.9	2.3	2.0	1.8
9	3.7	8.0	2.0	4.05	......	......	......	3.85	1.85	2.3	1.95	1.8
10	3.7	......	1.9	3.1	......	......	......	3.35	1.8	2.3	1.9	1.8
11	3.7	8.7	1.9	2.65	......	......	......	2.95	1.85	2.3	1.9	1.9
12	3.8	8.8	1.9	2.45	......	......	......	2.9	1.95	2.15	1.9	1.9
13	4.0	......	1.9	2.3	......	......	......	2.85	2.1	2.1	1.9	1.9
14	4.0	......	1.9	2.15	......	......	......	2.9	2.1	2.1	1.8	2.0
15	4.0	......	1.9	2.0	......	......	......	2.9	2.1	2.1	1.8	2.0
16	4.0	......	1.85	2.2	......	......	......	2.75	2.1	2.1	1.75	2.2
17	3.4	......	1.7	2.6	......	......	......	2.6	2.1	2.2	1.7	2.3
18	3.3	......	1.65	2.8	......	......	......	2.55	2.1	2.2	1.7	2.35
19	3.2	......	1.7	2.8	......	......	......	2.6	2.1	2.2	1.7	2.35
20	3.2	......	1.7	2.95	......	......	......	2.5	2.1	2.2	1.5	2.25
21	3.15	......	1.7	5.0	......	......	......	2.5	2.1	2.2	1.5	2.3
22	2.95	......	1.8	5.25	......	......	......	2.45	2.1	2.2	1.6	2.3
23	5.6	......	2.15	5.1	......	5.65	......	2.4	2.1	2.2	1.75	2.3
24	8.0	......	2.55	5.5	......	5.45	......	2.4	2.1	2.3	1.8	2.35
25	6.9	......	2.7	6.0	......	5.25	......	2.3	2.1	2.3	1.8	2.5
26	5.3	......	3.05	5.75	......	......	......	2.3	2.2	2.4	1.8	2.5
27	5.0	......	3.0	5.95	......	......	......	2.3	2.2	2.5	1.8	2.5
28	6.0	......	2.65	6.5	......	......	......	2.3	2.2	2.6	1.8	2.4
29	6.0	......	2.5	6.05	5.15	......	......	2.2	2.3	2.35	1.8	2.3
30	6.3	......	2.65	5.75	5.5	......	......	2.2	2.3	2.2	1.8	2.2
31	8.4	......	2.75	......	5.55	......	......	2.2	......	2.2	......	2.2

NOTE.—The daily gage heights were probably affected by ice from Jan. 1 to Mar. 5 and from Dec. 16 to 31. There was an ice jam at this station from Jan. 23 to Mar. 5. Gage heights are to water surface except for the period Jan. 23 to Feb. 12, which is doubtful.

The daily gage heights for May 1-28, June 5 to 22, and June 26 to Aug. 5 are omitted, since they are not true indexes of the daily discharge owing to great daily fluctuation of stage caused by logging operations.

Daily discharge, in second-feet, of Kennebec River at The Forks, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	2,600	7,530	7,320	2,990	2,840	1,430	1,630	1,530	1,240
2	......	......	......	3,020	8,040	6,800	2,960	3,010	1,430	1,630	1,480	1,240
3	......	......	......	3,640	7,470	7,000	2,880	3,120	1,430	1,630	1,330	1,240
4	......	......	......	2,460	6,920	7,220	3,080	2,750	1,380	1,630	1,330	1,240
5	......	......	......	1,960	6,920	4,690	2,960	2,680	1,330	1,630	1,330	1,240
6	......	......	1,380	2,330	7,250	4,220	4,310	5,560	1,330	1,630	1,330	1,240
7	......	......	1,480	3,170	6,650	5,680	4,320	4,880	1,280	1,630	1,330	1,240
8	......	......	1,430	4,600	6,650	5,520	4,310	4,420	1,240	1,630	1,330	1,160
9	......	......	1,330	4,060	7,250	4,030	3,160	3,730	1,200	1,630	1,280	1,160
10	......	......	1,240	2,600	7,360	3,960	4,360	2,950	1,160	1,630	1,240	1,160
11	......	......	1,240	2,020	9,810	4,110	4,390	2,400	1,200	1,630	1,240	1,240
12	......	......	1,240	1,800	9,260	4,270	3,150	2,330	1,280	1,480	1,240	1,240
13	......	......	1,240	1,630	6,810	3,770	3,120	2,270	1,430	1,430	1,240	1,240
14	......	......	1,240	1,480	4,580	3,590	3,040	2,330	1,430	1,430	1,160	1,330
15	......	......	1,240	1,330	4,760	3,820	3,040	2,330	1,430	1,430	1,160	1,330
16	......	......	1,200	1,530	5,640	3,830	3,150	2,140	1,430	1,430	1,120	......
17	......	......	1,080	1,960	5,210	3,970	3,080	1,960	1,430	1,530	1,080	......
18	......	......	1,040	2,200	6,600	3,760	3,160	1,910	1,430	1,530	1,080	......
19	......	......	1,080	2,200	4,070	3,750	2,980	1,960	1,430	1,530	1,080	......
20	......	......	1,080	2,400	4,000	3,680	2,980	1,850	1,430	1,530	920	......
21	......	......	1,080	5,870	2,560	3,590	3,050	1,850	1,430	1,530	920	......
22	......	......	1,160	6,380	2,500	6,660	3,080	1,800	1,430	1,530	995	......
23	......	......	1,480	6,080	2,410	7,220	2,980	1,740	1,430	1,530	1,120	......
24	......	......	1,910	6,900	2,290	6,800	2,980	1,740	1,430	1,630	1,160	......
25	......	......	2,080	7,970	3,970	6,380	2,980	1,630	1,430	1,630	1,160	......
26	......	......	2,530	7,430	6,070	3,860	2,840	1,630	1,530	1,740	1,160	......
27	......	......	2,460	7,860	6,710	3,900	2,840	1,630	1,530	1,850	1,160	......
28	......	......	2,020	9,070	5,890	3,120	2,840	1,630	1,530	1,960	1,160	......
29	......	......	1,850	8,080	6,180	3,080	2,840	1,530	1,630	1,680	1,160	......
30	......	......	2,020	7,430	6,900	3,050	2,890	1,530	1,630	1,530	1,160	......
31	......	......	2,140	......	7,000	......	2,890	1,530	......	1,530	......	......

NOTE.—Daily discharges determined from a well-defined discharge rating curve. Values for about Apr. 21 to about Aug. 5 may be much in error, however, due to errors in computed discharge caused by controlled flow for flushing logs down the river and backwater from log jams.

From May 1-28, June 5-22, and June 26 to Aug. 5 the daily discharge was computed by applying the discharge rating table to the several gage readings taken during any given day and weighing these values in accordance with the proportional part of the day to which each gage height is applicable.

Monthly discharge of Kennebec River at The Forks, Maine, for 1910.

[Drainage area, 1,570 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	....	....	2,000	1.27	1.46	D.
February	....	....	1,750	1.11	1.16	D.
March	2,530	1,040	1,510	.962	1.11	C.
April	9,070	1,330	4,070	2.59	2.89	C.
May	9,810	2,290	5,980	3.81	4.39	B.
June	7,320	3,050	4,760	3.03	3.38	B.
July	4,390	2,840	3,210	2.04	2.35	B.
August	5,560	1,530	2,440	1.55	1.79	B.
September	1,630	1,160	1,400	.892	1.00	A.
October	1,960	1,430	1,590	1.01	1.16	A.
November	1,530	920	1,200	.764	.85	A.
December	....	....	1,250	.796	.92	C.
The year	9,810	....	2,610	1.66	22.46	

NOTE.—The discharge during the winter periods is estimated from a study of climatological records, storage records, and records of discharge at other stations in the Kennebec drainage.

Mean discharge Mar. 1-5 estimated 1,500 second-feet; Dec. 16-31, estimated 1,270 second-feet.

This table supersedes table published in the first annual report of the Maine State Water Storage Commission.

KENNEBEC RIVER AT BINGHAM, MAINE.

This station, which is located at the new steel highway bridge across Kennebec River at Bingham, just below the mouth of Austin Stream, was established June 21, 1907. It was discontinued June 30, 1910, because of the reestablishment of the station on Dead River at The Forks. The two stations at The Forks, combined, give very nearly the discharge at Bingham. The nearest dam is about 11 miles downstream, at Solon, but the station is above the influence of backwater, although in the near future it is expected that it will be flooded out by the increase in height of the Solon dam.

The datum of the chain gage attached to the highway bridge has remained the same during the maintenance of the station. Discharge measurements are made from the bridge.

During the winter months the relation of gage height to discharge is much affected by ice, and during the spring and summer months there is also backwater from log jams.

Conditions for obtaining accurate discharge data are good and a well-defined discharge rating curve has been developed for free flow conditions.

This station was established to replace the stations at North Anson on the Kennebec, and The Forks on Dead River. In connection with the other stations in this drainage basin the records of discharge will afford a basis for an estimate of water for power and storage flowing in the Kennebec at any point.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Kennebec River at Bingham, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.		Discharge.
				To top of ice.	To water surface.	
		Feet	*Sq. ft.*	*Feet.*	*Feet.*	*Sec.-ft.*
Jan. 28[a]	F. E. Pressey	439	2,650	7.22	6.89	3,920
Mar. 15[b]	.....do	421	1,980	6.43	5.84	1,700
May 18	.....do	440	2,640	....	4.95	8,400

a Thickness of ice, 1.97 feet.
b Average thickness of ice, 2.32 feet; average distance from water surface to top of ice, .59 foot.

Daily gage height, in feet, and discharge, in second-feet, of Kennebec River at Bingham, Maine, for 1910.

[C. R. Ellis, observer.]

Day.	Jan.		Feb.		Mar.		Apr.		May.		June.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	7.9						8.3	14,000	5.6	11,000	6.0	12,900
2							6.2	13,900	5.9	12,400	5.75	11,700
3							5.2	9,210	5.35	9,860	5.8	11,900
4	7.5		6.1				5.0	8,380	5.4	10,100	5.75	11,700
5					7.0		4.7	7,230	5.6	11,000	4.95	8,180
6							5.6	11,000	6.05	13,100	5.45	10,300
7							7.0	18,100	5.5	10,500	5.35	9,860
8							5.8	11,900	5.75	11,700	4.6	6,860
9	7.1						6.5	15,400	5.65	11,200	4.3	5,810
10							6.1	13,400	5.7	11,400	4.5	6,500
11			6.1				5.3	9,640	6.2	13,900	4.75	7,420
12	7.2						5.0	8,380	5.85	12,200	4.5	6,500
13							4.5	6,500	5.7	11,400	4.6	6,860
14							4.6	6,860	5.3	9,640	4.3	5,810
15					5.6		4.1	5,160	4.95	8,180	4.45	6,320
16	7.5						3.9	4,550	5.1	8,790	4.35	5,980
17							3.9	4,550	5.45	10,300	4.1	5,160
18			6.5				4.1	5,160	5.45	10,300	3.95	4,700
19	7.4						4.2	5,480	5.0	8,380	4.15	5,320
20							4.7	7,230	4.85	7,800	4.3	5,810
21					5.7		5.25	9,420	4.45	6,320	4.55	6,680
22	8.4						5.1	8,790	4.8	7,610	4.45	6,320
23	8.2						5.55	10,800	4.25	5,640	5.15	9,000
24	9.3						6.2	13,900	4.3	5,810	5.2	9,210
25	8.95		6.2				6.0	12,900	4.8	7,610	5.2	9,210
26	8.1				6.8		5.95	12,600	5.05	8,580	4.4	6,150
27	7.6						5.9	12,400	5.8	11,900	4.4	6,150
28					7.3		6.3	14,400	5.2	9,210	4.15	5,320
29	7.0						5.85	12,200	5.6	11,000	3.85	4,400
30					7.2		5.9	12,400	5.4	10,100	3.95	4,700
31					7.7				5.85	12,200		

NOTE.—Ice existed from Jan. 1 to Apr. 1, during which period readings were made to water surface. The ice ranged in thickness from 1.2 feet to 2.4 feet. Considerable fluctuation and error in gage heights was caused by operations at Indian Lake for logging during May and June.

Daily discharge determined from a well-defined discharge rating curve. The figures may, however, be considerably in error as a result of fluctuation of water surface caused by logging operations at Moosehead and Indian lakes.

Discharge Apr. 1 affected by ice.

Monthly discharge of Kennebec River at Bingham, Maine, for 1910.

[Drainage area, 2,660 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			3,250	1.22	1.41	D.
February			2,900	1.09	1.14	D.
March			3,400	1.28	1.48	D.
April	18,100	4,550	10,200	3.84	4.28	C.
May	13,900	5,640	9,970	3.75	4.32	B.
June	12,900	4,400	7,420	2.79	3.11	B.

NOTE.—The discharge for January to March was taken as the sum of the discharge of Kennebec River at The Forks, of Dead River at The Forks, and of an estimated inflow below these two stations and above Bingham.

This table supersedes discharge table published in the first annual report of the Maine State Water Storage Commission.

KENNEBEC RIVER AT WATERVILLE, MAINE.

Observations of the flow of Kennebec River at Waterville have been made by the Hollingsworth & Whitney Co. since November, 1891, and have been continuous since January 12, 1893. This company manufactures manila paper and ground-wood and sulphite pulp. The records for 1910 have been furnished for computation by George H. Marr, engineer for the company.

The station is located at the dam of the mill of Hollingsworth & Whitney Co. at Waterville, about 2 miles above the mouth of Sebasticook River. Messalonskee Stream enters about 3½ miles below the station.

The dam is of timber cribwork, the main portion having a vertical downstream face with a horizontal crest about 5.75 feet wide and an upstream slope of about 40° from the horizontal. The average elevation of the crest of the dam, as determined by levels during July, 1906, was 119.37 feet above the Hollingsworth & Whitney datum, or 71.53 feet above mean sea level, according to the Kennebec datum as corrected by levels of 1906. The total length of the dam is 800 feet, which includes a width of logway of 34 feet. Flashboards are kept on the dam a greater part of the time, their average elevation in July, 1906, being 123.73 feet above the Hollingsworth & Whitney datum, or 75.89 feet above mean sea level. The crest of the dam is in fairly good condition. The leakage has never been measured, but is assumed arbitrarily as 100 second-feet. The water which flows in the canals is used through 46 wheels, most of which have been rated at Holyoke under practically the same head, the average head at Waterville being about 23 feet. Some water is lost from the canal through small waste gates and over wasteweirs. A small amount, estimated at 100 second-feet, is used for washing and mill purposes.

Methods and diagrams for estimating the flow through the wheels and over the dam were developed by the late Sumner Hollingsworth, engineer for the company. Observations were made at 12 o'clock noon of each day, that hour having been chosen after investigation as a time when the flow is least affected by storage of dams upstream and as giving most nearly the average for the day. When the flow of the river is less than about 3,500 second-feet, all of the water is used through the wheels.

Prior to 1906 some errors occurred in computing discharge data at this point, owing to the use of inaccurate information regarding flashboards, and the records are considered as only fair. Since 1906 more care has been taken, and the present results are fairly good.

The maximum crest discharge since records have been kept occurred from 7 until 9 a. m. December 16, 1901, and was 156,800 second-feet.

The average discharge during the 24 hours of that day was 127,000 second-feet. This was probably the greatest flood occurring in the last hundred years on the Kennebec, and even with this great discharge much of the flood flow above Moosehead Lake (some 1,240 square miles of drainage area) was being held in the lake. (See Water-Supply Paper 198 for discussion of this flood.)

The discharge for the minimum week occurred December 14 to 20, 1903, and averaged 638 second-feet.

Data prior to 1907 have been compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Kennebec River at Waterville, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,730	8,620	6,000	29,400	a23,000	18,200	6,940	3,590	2,450	3,060	3,180	2,170
2	a1,300	6,510	6,710	34,500	20,300	17,600	6,140	4,220	2,980	a3,650	2,660	2,520
3	3,150	5,580	7,700	a34,700	19,600	17,300	a2,940	5,700	2,640	2,720	2,670	2,520
4	3,030	4,910	7,640	27,100	18,100	15,500	9,240	5,610	a3,290	2,740	2,360	a1,010
5	2,830	5,520	8,090	25,700	21,000	a14,300	5,550	9,210	3,130	2,770	2,690	2,480
6	2,720	a4,790	a6,900	28,800	19,700	11,000	7,730	0,900	2,720	2,740	a2,780	2,540
7	2,920	4,870	8,090	36,000	18,500	11,300	3,770	a7,360	3,380	2,570	3,530	1,900
8	2,840	4,820	9,290	29,700	a15,700	13,200	7,150	6,890	3,060	2,670	3,700	1,840
9	a2,170	4,800	8,820	33,500	15,800	11,700	8,690	5,930	2,670	a1,630	3,730	194
10	3,020	4,540	7,400	a28,200	16,500	10,900	a6,200	4,130	2,990	2,800	2,840	1,420
11	3,010	4,820	6,500	22,000	17,000	10,400	7,800	3,700	a2,010	2,750	2,770	a1,380
12	3,010	4,810	4,910	18,900	17,100	a10,400	5,600	3,660	2,560	2,420	3,160	1,650
13	2,900	a3,420	a5,100	16,300	16,500	12,300	6,600	3,470	2,370	2,490	a592	1,940
14	2,770	4,750	6,050	9,690	15,300	12,900	3,500	a6,260	2,690	2,450	3,920	1,670
15	2,740	4,450	6,100	11,900	a12,800	11,700	5,420	3,190	2,360	2,440	2,790	2,330
16	a1,510	4,760	6,030	11,100	12,600	11,000	5,420	3,880	2,290	a237	2,780	1,350
17	2,870	4,480	5,720	a11,000	10,700	9,470	a3,640	3,700	2,630	2,750	3,030	2,380
18	2,800	4,460	5,660	6,550	10,300	12,400	5,570	3,480	a2,190	3,450	2,300	a1,310
19	3,100	4,360	4,590	12,000	11,800	a12,300	3,640	3,570	3,180	2,510	2,100	1,620
20	3,000	a3,280	a4,490	11,700	11,400	11,800	3,590	3,620	2,600	2,510	a242	2,310
21	3,120	4,540	5,720	16,200	11,300	10,400	3,480	a1,280	2,650	2,440	1,710	1,740
22	4,230	4,600	6,500	18,400	a8,190	10,700	3,560	3,780	2,670	2,390	1,730	2,280
23	a23,300	4,660	6,530	24,100	10,600	10,700	3,360	3,760	2,370	a927	1,620	1,880
24	18,700	4,620	6,880	a23,000	9,820	12,200	a1,920	2,940	2,340	2,730	2,410	1,530
25	14,500	4,060	12,300	24,100	6,340	12,300	4,510	2,290	a312	2,820	2,130	a1,440
26	12,500	3,660	17,200	19,900	7,800	a8,670	4,820	3,370	100	2,970	1,890	1,320
27	9,820	a3,650	a30,600	26,300	13,400	7,900	6,480	2,720	2,350	3,060	a1,000	2,820
28	8,310	4,970	23,600	28,700	16,400	8,690	6,700	a172	2,370	2,850	1,880	2,480
29	8,270	....	21,000	25,300	a14,900	6,840	6,630	2,620	3,270	2,990	3,340	2,430
30	a7,230	....	29,300	23,100	12,500	6,860	5,640	3,050	2,720	a1,400	4,010	2,730
31	7,000	....	30,100	....	12,800	....	a3,800	2,600	....	3,110	....	2,770

a Sunday.

Monthly discharge of Kennebec River at Waterville, Maine, for 1910.

[Drainage area, 4,270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	23,300	1,300	5,530	1.30	1.50
February	8,620	3,280	4,760	1.11	1.16
March	30,600	4,490	10,400	2.44	2.81
April	36,000	6,550	22,300	5.22	5.82
May	23,000	6,340	14,400	3.37	3.88
June	18,200	6,840	11,700	2.74	3.06
July	9,240	1,920	5,360	1.26	1.45
August	10,900	172	4,210	.986	1.14
September	3,380	100	2,510	.588	.66
October	3,650	237	2,550	.597	.69
November	4,010	242	2,520	.590	.66
December	2,820	194	1,930	.452	.52
The year	36,000	100	7,350	1.72	23.35

KENNEBEC RIVER AT GARDINER, MAINE.

A very interesting record has been kept for 126 years of the dates of opening and closing of navigation or the disappearance and formation of ice on the lower Kennebec River. The first records were published in the old town histories of Gardiner and observations have been maintained to the present time. The following table gives this record since 1785:

Dates of opening and closing of Kennebec River at Gardiner, Maine.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
	1785, Apr. 24	....	1810, Dec. 9	1811, Mar. 24	105
	1786, Mar. 21	....	1811, Dec. 14	1812, Apr. 18	126
1786, Nov. 18	1787, Apr. 7	140	1812, Dec. 10	1813, Apr. 11	122
	1789, Apr. 4	....	1813, Dec. 13 [e]	1813, Dec. 15	108
1791, Jan. 5	1791, Apr. 18	103	1813, Dec. 21	1814, Apr. 6	
1791, Dec. 10	1792, Apr. 3	115	1814, Dec. 4	1815, Apr. 18	135
1792, Nov. 23 [a]	1793, Apr. 1	126	1815, Dec. 2	1816, Apr. 20	140
1793, Dec. 10	....	....	1816, Nov. 29	1817, Apr. 17	139
1795, Jan. 4 [b]	1795, Apr. 6	92	1817, Nov. 25 [f]	1817, Nov. 30	131
	1796, Apr. 1	....	1817, Dec. 7	1818, Apr. 12	
1796, Nov. 28	1797, Apr. 4	128	1818, Dec. 4	1818, Dec. 6	126
1797, Nov. 22	1798, Apr. 12	142	1818, Dec. 10	1819, Apr. 14	
1798, Nov. 23	1799, Apr. 13	142	1819, Dec. 5	1820, Apr. 15	132
1799, Nov. 24	1800, Apr. 10	138	1820, Nov. 16 [g]	1820, Nov. 17	134
1800, Nov. 28 [c]	1800, Dec. 13	113	1820, Nov. 29	1821, Apr. 11	
1801, Jan. 2	1801, Apr. 10		1821, Dec. 1	1822, Mar. 19	109
1801, Dec. 10	1802, Mar. 28	108	1822, Dec. 6	1823, Apr. 11	126
1802, Dec. 16	1803, Mar. 22	96	1823, Nov. 16	1824, Mar. 28	134
1803, Nov. 16 [d]	1803, Dec. 13	138	1824, Dec. 1	1824, Dec. 3	119
1803, Dec. 22	1804, Apr. 12		1824, Dec. 9	1825, Apr. 5	
1804, Nov. 19	1805, Apr. 2	134	1825, Nov. 23	1825, Nov. 28	116
1806, Jan. 2	1806, Mar. 15	72	1825, Dec. 12	1826, Apr. 2	
	1807, Apr. 7	....	1826, Dec. 4	1826, Dec. 10	96
1807, Dec. 18	1808, Mar. 29	102	1826, Dec. 29	1827, Mar. 29	
1808, Dec. 6	1809, Apr. 17	132	1827, Nov. 24	1827, Nov. 30	116
1809, Nov. 23	1810, Apr. 9	137	1827, Dec. 6	1828, Mar. 25	

[a] Opened after closing in 1792.
[b] Jan. 4, 1795, opened to within 2 miles of Nahumkeag Island.
[c] Opened Dec. 13, 1800. Plowing at Christmas.
[d] Vessels came up to Gardiner Dec. 2, 1803; whole river opened Dec. 13, 1803, and closed Dec. 22, 1803.
[e] Vessels came up to Gardiner Dec. 15, 1813.
[f] River broke up from Gardiner Nov. 30, 1817; vessels came up to Gardiner December, 1817; whole river broke up Dec. 7, 1817, and closed the same day.
[g] River opened Nov. 17, 1820, from Gardiner, and the whole river opened Nov. 20, 1820.

Dates of opening and closing of Kennebec River at Gardiner, Maine—Continued.

Closed.	Opened.	Days closed.
1828, Dec. 3	1829, Apr. 12	131
1829, Dec. 3	1830, Apr. 1	120
1830, Dec. 13[a]	1830, Dec. 15	
1830, Dec. 19	1830, Dec. 27	88
1831, Jan. 11	1831, Mar. 30	
1831, Dec. 2	1832, Apr. 14	134
1832, Dec. 2	1833, Apr. 5	124
1833, Dec. 14	1834, Apr. 3	110
1834, Dec. 8	....	138
1835, Nov. 23	1836, Apr. 9	
1836, Nov. 23	1837, Apr. 14	142
1837, Nov. 27	1838, Apr. 3	127
1838, Nov. 24	1839, Apr. 6	133
1839, Dec. 18	1840, Mar. 31	104
1840, Nov. 28	1841, Apr. 5	129
1841, Dec. 1	1841, Dec. 3	
1841, Dec. 7	1841, Dec. 11	105
1841, Dec. 11	1842, Mar. 20	
1842, Nov. 28	1843, Apr. 19	142
1843, Nov. 30	1844, Apr. 9	131
1844, Nov. 27	1845, Mar. 31	124
1845, Dec. 7	1846, Mar. 28	111
1846, Dec. 2	1847, Apr. 20	139
1847, Dec. 21	1848, Apr. 1	102
1848, Dec. 22	1849, Mar. 30	98
1849, Dec. 8	1850, Apr. 3	116
1850, Dec. 8	1851, Apr. 6	119
1851, Dec. 1	1852, Apr. 12	133
1852, Dec. 16	1853, Mar. 29	103
1853, Nov. 27	1853, Nov. 30	141
1853, Dec. 4	1854, Apr. 21	
1854, Dec. 3	1855, Apr. 9	127
1855, Nov. 23[b]	1855, Dec. 10	137
1855, Dec. 11	1856, Apr. 9	
1856, Dec. 1	1857, Apr. 5	125
1857, Dec. 5	1858, Apr. 3	119
1858, Nov. 30	1859, Mar. 31	121
1860, Dec. 6	1861, Apr. 7	122
1861, Dec. 12	1862, Apr. 18	127
1862, Dec. 3	1863, Apr. 13	131
1863, Dec. 3	1863, Dec. 5	
1863, Dec. 6	1863, Dec. 15	114
1863, Dec. 17	1864, Mar. 29	
1864, Dec. 12	1865, Mar. 22	100
1865, Dec. 8	1866, Mar. 31	113
1866, Dec. 13	1867, Apr. 10	118
1867, Dec. 1	1868, Apr. 15	137
1868, Dec. 2	1869, Apr. 11	130
1869, Dec. 4[c]	1870, Jan. 4	
1870, Jan. 8	1870, Feb. 20	117
1870, Feb. 21	1870, Apr. 5	
1870, Dec. 16	1871, Mar. 12	86
1871, Nov. 29	1872, Apr. 16	140
1872, Dec. 1	1872, Dec. 2	130
1872, Dec. 7	1873, Apr. 15	
1873, Nov. 19	1874, Apr. 3	134
1874, Dec. 1	1874, Dec. 3	133
1874, Dec. 5	1875, Apr. 14	
1875, Nov. 22	1876, Apr. 7	137
1876, Dec. 1	1876, Dec. 2	111
1876, Dec. 9	1877, Mar. 28	
1877, Dec. 10	1878, Mar. 16	96
1878, Dec. 18	1879, Apr. 10	113
1879, Dec. 18	1880, Mar. 24	104
1880, Mar. 25	1880, Mar. 31	
1880, Nov. 23	1881, Mar. 22	119
1881, Nov. 28	1881, Dec. 1	
1881, Dec. 11	1881, Dec. 14	113
1881, Dec. 16	1881, Dec. 30	
1882, Jan. 2	1882, Apr. 5	
1882, Dec. 1	1883, Apr. 14	134
1883, Dec. 2	1884, Apr. 7	127
1884, Dec. 13	1885, Apr. 16	124
1885, Dec. 12[d]	1886, Apr. 16	125
1886, Dec. 2	1887, Apr. 21	140
1887, Dec. 1	1887, Dec. 5	120
1887, Dec. 22	1888, Apr. 15	
1888, Nov. 22	1888, Nov. 28	
1888, Dec. 13	1889, Jan. 10	93
1889, Jan. 20	1889, Mar. 20	
1889, Dec. 4	1889, Dec. 9	
1889, Dec. 14	1889, Dec. 22	111
1889, Dec. 27	1890, Apr. 4	
1890, Dec. 2	1891, Apr. 3	122
1891, Dec. 17	1891, Dec. 25	89
1892, Jan. 9	1892, Mar. 30	
1892, Dec. 18	1893, Apr. 12	115
1893, Dec. 4	1894, Mar. 23	109
1894, Nov. 30	1895, Apr. 8	129
1895, Dec. 6[e]	1895, Dec. 27	85
1896, Jan. 5	1896, Mar. 9	
1896, Dec. 7	1897, Apr. 3	117
1897, Dec. 2	1897, Dec. 11	97
1897, Dec. 20	1898, Mar. 18	
1898, Dec. 12	1899, Apr. 11	120
1899, Dec. 27	1900, Apr. 2	96
1900, Dec. 6	1901, Apr. 4	119
1901, Nov. 28[f]	1901, Dec. 15	100
1901, Dec. 20	1902, Mar. 12	
1902, Dec. 6	1903, Mar. 14	98
1903, Nov. 28	1904, Apr. 6	131
1904, Dec. 5	1905, Apr. 7	123
1905, Dec. 10	1906, Apr. 5	116
1906, Dec. 3	1907, Apr. 15	133
1907, Dec. 3	1908, Mar. 28	116
1908, Dec. 11	1909, Apr. 2	112
1909, Dec. 22	1910, Mar. 20	89
1910, Dec. 4	1911, Apr. 15	133

[a] Two vessels arrived from Boston Jan. 1, 1831.
[b] Opened Dec. 10, 1855. Vessels came up to Gardiner.
[c] Opened Feb. 20, 1870, above and for 3 miles below Gardiner.
[d] The ice broke up Jan. 6, 1886, and jammed at Swan Island, the jam extending nearly to Hallowell and completely ruining the ice crop above Swan Island.
[e] The ice broke Mar. 2, 1896, jamming at Swan Island and making the greatest flood at Gardiner ever known, carrying away the Gardiner and Randolph bridge.
[f] 1902. Biggest freshet, except the above, ever known on the Kennebec. Drift ice jammed from Richmond to Augusta.

NOTE.—Average length of time closed 120 days per year. Greatest length of time closed 142 days, Nov. 22, 1797, to Apr. 12, 1798, and Nov. 23, 1798, to Apr. 13, 1799. Shortest length of time closed 72 days, Jan. 2, 1806, to Mar. 15, 1806.

Earliest date closed Nov. 16, 1803, 1820, 1823.
Latest date first closed Jan. 5, 1791.
Earliest date opened Mar. 9, 1896.
Latest date opened Apr. 24, 1785.

DEAD RIVER NEAR THE FORKS, MAINE.

This station, which is located one-eighth mile above the farmhouse of Jeremiah Durgin and 1½ miles west of The Forks, was established September 29, 1901, discontinued August 15, 1907, and reestablished March 16, 1910.

The gage is an inclined staff bolted to a large bowlder on the left bank.

Its datum has remained unchanged since the establishment of the station.

Discharge measurements are made from a car suspended from a cable.

The bed is of gravel and small bowlders. The banks are medium high and overflow only at extreme high water.

During the winter months the discharge is affected by ice. It is also affected at times by log driving.

Conditions for obtaining accurate discharge data during unobstructed periods are good, and a good discharge rating curve has been developed. The 1910 discharge measurements confirmed the 1907 discharge rating curve, and the latter is used in this year's computations.

Data prior to 1907 have been compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Discharge measurements of Dead River near The Forks, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 17	F. E. Pressey	234	681	1.77	1,560
June 28	W. E. Parsons	227	492	1.25	854
Aug. 17	.....do	220	354	.79	320
18	.....do	220	359	.79	346
18	.....do	220	361	.79	354

Daily gage height, in feet, of Dead River near The Forks, Maine, for 1910.

[Jeremiah Durgin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				4.25	4.4	3.2	1.2	0.8	1.0	0.7	0.9	0.9
2				4.7	3.8	3.0	1.1	.9	.9	.7	.8	1.1
3				4.65	3.1	2.95	1.25	.9	1.0	.6	.9	1.1
4				3.55	2.55	2.6	1.3	1.0	1.0	.6	.9	1.2
5				2.9	3.45	2.45	1.1	1.0	.9	.5	.8	1.1
6				5.35	1.95	2.3	1.15	1.0	1.0	.6	.9	1.2
7				4.8	2.65	2.05	1.1	1.05	1.0	.5	.9	1.2
8				5.7	3.5	2.0	1.0	1.2	.9	.6	1.0	1.3
9				4.6	2.3	1.9	1.1	1.1	1.0	.5	.9	1.4
10				4.2	2.25	1.75	1.0	1.05	.9	.6	1.0	1.4
11				3.8	3.65	1.8	.9	1.1	.8	.6	.9	1.3
12				3.5	2.1	1.8	1.0	.95	.9	.5	.95	1.3
13				2.5	2.4	1.8	.9	.95	.7	.6	.8	1.3
14				2.5	2.05	2.2	1.0	.8	.8	.5	.85	1.2
15				2.6	2.95	2.0	.8	.9	.8	.6	.8	1.3

Daily gage height, in feet, of Dead River near The Forks, Maine, for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	......	......	1.2	2.6	1.85	1.8	0.9	0.85	0.7	0.5	0.7	1.1
17	......	......	1.1	2.25	1.8	1.85	.9	.7	.8	.5	.8	1.1
18	......	......	1.1	3.3	1.85	1.7	.8	.8	.7	.5	.7	1.1
19	......	......	1.0	4.0	1.95	1.7	.9	.7	.8	.5	.8	1.0
20	......	......	1.1	2.95	1.9	1.6	.8	.8	.8	.5	.8	1.0
21	......	......	1.1	2.7	1.8	1.6	.7	.8	.65	.5	.8	.9
22	......	......	1.2	3.4	3.7	1.5	.8	.7	.7	.5	.9	1.0
23	......	......	1.2	4.6	1.9	1.5	.7	.8	.65	.5	.8	.9
24	......	......	1.45	4.1	1.8	1.5	.8	.7	.5	.5	.9	1.0
25	......	......	2.25	4.6	1.9	1.35	.7	.8	.7	.5	.9	1.0
26	......	......	2.7	3.4	3.9	1.45	.8	.8	.7	.5	.8	1.25
27	......	......	2.8	4.0	4.3	1.45	.8	.6	.6	.6	.9	1.35
28	......	......	2.7	3.7	4.2	1.2	.7	.7	.7	.6	.9	1.45
29	......	......	2.7	4.15	4.0	1.3	.8	.6	.6	.8	1.0	1.6
30	......	......	3.0	4.45	3.15	1.1	.7	.7	.7	.8	1.0	1.6
31	......	......	3.3	......	4.55	......	.8	.9	......	.9	......	1.55

NOTE.—Gage heights probably unaffected by ice Mar. 16 to 31. On Apr. 21, 26, 30, and May 6, 9, 17, and 26 water was released from the dam above for short periods, and hence the recorded gage heights are liable to considerable error. Relation between gage height and discharge probably affected by ice throughout the month of December. The gage readings for December are probably to water surface.

Daily discharge, in second-feet, of Dead River near The Forks, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	7,230	7,730	4,240	825	365	580	270	470	......
2	......	......	......	8,780	5,830	3,790	700	470	470	270	365	......
3	......	......	......	8,600	4,010	3,680	890	470	580	185	470	......
4	......	......	......	5,120	2,880	2,970	955	580	580	1[illegible]	470	......
5	......	......	......	3,570	4,860	2,690	700	580	470	110	365	......
6	......	......	......	11,300	5,190	2,430	762	580	580	185	470	......
7	......	......	......	9,140	3,[illegible]60	2,020	700	640	580	110	4[illegible]	......
8	......	......	......	12,[illegible]	4,990	1,940	580	825	470	185	5[illegible]	......
9	......	......	......	8,420	6,270	1,[illegible]00	700	700	580	110	470	......
10	......	......	......	7,060	2,540	1,580	580	640	470	185	580	......
11	......	......	......	5,830	5,400	1,650	470	700	365	185	470	......
12	......	......	......	4,990	2,100	1,650	580	525	470	110	525	......
13	......	......	......	2,780	2,600	1,650	470	525	270	185	365	......
14	......	......	......	2,780	2,020	2,260	580	365	365	110	418	......
15	......	......	......	2,970	3,680	1,940	365	470	365	185	365	......
16	......	......	825	2,970	1,720	1,650	470	418	270	110	270	......
17	......	......	700	2,340	4,260	1,720	470	270	365	110	365	......
18	......	......	700	4,480	1,720	1,500	365	365	270	110	270	......
19	......	......	580	6,430	1,870	1,500	470	270	365	110	365	......
20	......	......	700	3,580	1,800	1,360	365	365	365	110	365	......
21	......	......	700	4,660	1,650	1,360	270	365	228	110	365	......
22	......	......	825	4,730	5,540	1,220	365	270	270	110	470	......
23	......	......	825	8,420	1,800	1,220	270	365	228	110	365	......
24	......	......	1,160	6,740	1,650	1,220	365	270	110	110	470	......
25	......	......	2,340	8,420	1,800	1,020	270	365	270	110	470	......
26	......	......	3,160	6,490	7,830	1,160	365	365	270	110	365	......
27	......	......	3,360	6,430	7,400	1,160	365	185	185	185	470	......
28	......	......	3,160	5,540	7,060	825	270	270	270	185	470	......
29	......	......	3,160	6,900	6,430	955	365	185	185	365	580	......
30	......	......	3,790	9,270	4,120	700	270	270	270	365	580	......
31	......	......	4,480	......	8,250	......	365	470	......	470	......	......

NOTE.—Daily discharge determined from the 1907 discharge rating curve, which is well defined. For Apr. 21, 26, 30, and May 6, 9, 17, and 26 the daily discharge was computed by applying the rating table to the several gage readings taken during the day and weighting these values in accordance with the proportional part of the day to which each gage height is applicable.

Monthly discharge of Dead River near The Forks, Maine, for 1910.

[Drainage area, 878 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			1,000	1.14	1.31	D.
February			900	1.03	1.07	D.
March	4,480	580	1,470	1.67	1.92	D.
April	12,800	2,340	6,300	7.18	8.01	C.
May	8,250	1,650	4,120	4.69	5.41	C.
June	4,240	700	1,830	2.08	2.32	B.
July	955	270	501	.571	.66	A.
August	825	185	436	.497	.57	A.
September	580	110	371	.423	.47	A.
October	470	110	173	.197	.23	B.
November	580	270	436	.497	.55	A.
December			200	.228	.26	D.
The year	12,800		1,470	1.67	22.78	

NOTE.—The discharge during the winter periods is determined from a study of climatological, storage, and discharge records at other stations in the Kennebec drainage.
Mean discharge, Mar. 1-15, estimated, 1,000 second-feet.

SANDY RIVER NEAR FARMINGTON, MAINE.

Sandy River rises in western part of Franklin County, in the hilly region east of Rangeley Lake, flows southeastward about 32 miles, then northeastward 17 miles, and enters the Kennebec about 3 miles below Madison. Its drainage area comprises 670 square miles. No large streams or ponds are tributary to this river. The total fall is about 1,600 feet, mostly in upper part of basin.

The gaging station, which is located at the Fairbanks highway bridge, 3 miles above Farmington, was established July 11, 1910.

A standard chain gage is used.

Discharge measurements are made from the lower side of the bridge.

The left bank is high and rocky; the right is subject to overflow in extreme freshet stages. During low water the current is sluggish at the bridge. The channel is about 194 feet wide and is broken by one pier.

The discharge at this station is affected by ice during the winter months.

Discharge measurements of Sandy River near Farmington, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 22	F. E. Pressey	164	250	3.32	267
July 11	.....do	45	51	2.42	73
15	W. E. Parsons	45	52	2.45	73
29	.....do	50	65	2.64	120
Aug. 5	.....do	174	368	3.89	546
25	.....do	40	48	2.35	58
25	.....do	60	43	2.35	63

Daily gage height, in feet, and discharge, in second-feet, of Sandy River near Farmington, Maine, for 1910.

[L. A. Daggett, observer.]

Day.	July.		Aug.		Sept.		Oct.		Nov.		Dec.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.4	67	2.2	40	2.3	53	2.5	82	2.6	100
2			2.35	60	2.25	46	2.4	67	2.4	67	2.55	91
3			2.35	60	2.25	46	2.4	67	2.4	67	2.5	82
4			2.7	119	2.3	53	2.4	67	2.4	67	2.5	82
5			3.8	488	2.4	67	2.4	67	2.7	119	2.5	82
6			3.0	180	2.4	67	2.35	60	3.4	298	2.45	74
7			2.8	138	2.6	100	2.35	60	3.0	180	2.4	67
8			2.8	138	2.55	91	2.3	53	2.8	138	2.3	53
9			2.6	100	2.5	82	2.3	53	2.7	119	2.3	53
10			2.5	82	2.4	67	2.3	53	2.6	100	2.3	53
11	2.4	67	2.5	82	2.4	67	2.3	53	2.5	82	2.3	53
12	2.5	82	2.5	82	2.3	53	2.3	53	2.6	100	2.3	53
13	2.45	74	2.5	82	2.25	46	2.3	53	2.6	100	2.3	53
14	2.55	91	2.4	67	2.5	82	2.25	46	2.5	82		
15	2.5	82	2.6	100	2.7	119	2.25	46	2.5	82		
16	2.4	67	3.3	262	2.6	100	2.3	53	2.4	67		
17	2.4	67	3.1	202	2.4	67	2.2	40	2.3	53	2.5	
18	2.35	60	2.6	100	2.3	53	2.2	40	2.5	82		
19	2.35	60	2.7	119	2.35	60	2.2	40	2.3	53		
20	2.35	60	2.7	119	2.3	53	2.25	46	2.3	53		
21	2.35	60	2.55	91	2.3	53	2.25	46	2.25	46		
22	2.4	67	2.5	82	2.3	53	2.25	46	2.3	53		
23	2.45	74	2.4	67	2.3	53	2.25	46	2.3	53		
24	2.45	74	2.4	67	2.25	46	2.3	53	2.4	67	2.8	
25	2.4	67	2.35	60	2.25	46	2.3	53	2.4	67		
26	2.3	53	2.3	53	2.3	53	2.5	82	2.4	67		
27	2.3	53	2.3	53	2.35	60	2.6	100	2.35	60		
28	2.4	67	2.3	53	2.4	67	2.65	110	2.4	67		
29	2.6	100	2.3	53	2.5	82	2.7	119	2.5	82		
30	2.4	67	2.25	46	2.5	82	2.7	119	2.5	82		
31	2.4	67	2.25	46			2.6	100				

NOTE.—The relation between gage height and discharge was affected by ice Dec. 14 to 31. There may also have been some effect from ice Dec. 4 to 13. Gage heights Dec. 17 and 24 to water surface. Ice 1 foot thick at gage Dec. 17. About 1 foot of water over ice Dec. 24.

Daily discharge determined from a well-defined discharge rating curve. Discharges Dec. 4 to 13 may be somewhat in error because of the presence of ice.

Monthly discharge of Sandy River near Farmington, Maine, for 1910.

[Drainage area, 270 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
July 11-31	100	53	69.5	0.257	0.20	A.
August	488	46	107	.396	.46	A.
September	119	40	65.1	.241	.27	A.
October	119	40	62.7	.232	.27	A.
November	298	46	87.8	.325	.36	A.
December	100		62.8	.233	.27	D.

NOTE.—The discharge from Dec. 14 to 31 was estimated from climatologic records and records of discharge in adjacent drainage basins. There may also have been some effect from ice from Dec. 4 to 13. Mean discharge Dec. 14 to 31, estimated, 58 second-feet.

SEBASTICOOK RIVER AT PITTSFIELD, MAINE.

Sebasticook River rises in ponds in southeastern Somerset and western Penobscot counties and flows in a general southwesterly direction 45 miles to Kennebec River at Winslow, opposite Waterville. It is the largest tributary of the Kennebec, and it is also one of the most fully developed for power. Out of a total fall of 170 feet between Moose Pond and the Kennebec only about 50 feet remain undeveloped. Storage facilities are good but have been only in part utilized. The basin is largely in farm lands.

The gaging station, which was established July 3, 1908, is located at the steel highway bridge just above the Maine Central Railroad Bridge across the river in the town of Pittsfield, Maine.

About 800 feet upstream from the highway bridge is a dam which furnishes power to the Robert Dobson Co. and the Smith Woolen Co.; the dam of the Waverly woolen mill is about one-half mile farther upstream. About 5 miles below the station and 2 miles from Burnham is the Sebasticook Power Co.'s dam. There is a clear fall below the gage, and the dam below has no effect on the discharge.

The chain gage datum has remained the same since the establishment of the station.

Discharge measurements are made from the highway bridge.

Conditions are good for obtaining accurate discharge data, and a fairly well-defined discharge rating curve has been developed for medium stages, although more measurements are desirable to determine the flow at low and high stages. Owing to the proximity of the dam above and the rapid fall of the stream, the discharge at the gaging station is probably not materially affected by ice.

Information in regard to this station is contained in the annual reports of the Maine State Water-Storage Commission.

Discharge measurements of Sebasticook River at Pittsfield, Maine, in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 27	F. E. Pressey	108	290	4.31	1,050
Mar. 14	....do	108	231	3.87	647
June 7	....do	105	181	3.38	394
July 25	W. E. Parsons	102	170	3.20	304

Daily gage height, in feet, of Sebasticook River at Pittsfield, Maine, for 1910.

[Easter B. Morrill, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.25	4.0	3.65	5.4	4.2	3.35	3.4	3.25	2.95	2.9	2.65	2.9
2	2.9	4.0	3.65	5.5	4.3	3.3	3.05	3.25	3.05	2.85	2.7	2.95
3	3.2	4.0	3.7	5.6	4.3	3.4	2.75	3.1	2.95	2.95	2.7	2.85
4	3.3	3.95	3.7	5.55	4.3	3.35	2.85	3.25	2.75	2.95	2.65	2.2
5	3 4	3.85	3.55	5.4	4.2	2.75	2.95	3.15	2.9	2.9	2.6	2.85
6	3.35	3.6	3.4	5.35	4.1	3.15	3.25	3.25	2.95	3.0	2.5	2.95
7	3.4	3.75	3.85	5.2	3.95	3.15	3.2	3.15	2.9	2.9	2.65	2.95
8	3.3	3.75	4.05	5.05	3.9	3.15	3.15	3.15	3.05	2.9	2.65	2.55
9	2.9	3.8	4.1	4.85	4.0	3.2	3.05	3.25	2.95	2.5	2.65	2.4
10	3.15	3.65	4.05	4.8	3.9	3.15	2.95	3.25	2.9	2.7	2.65	2.35
11	3.35	3.6	3.95	4.75	3.85	3.1	3.2	3.2	2.75	2.85	2.7	2.3
12	3.4	3.5	3.9	4.55	3.85	2.85	3.25	3.25	2.95	2.75	2.6	2.5
13	3.3	3.35	3.6	4.45	3.8	3.5	3.2	3.1	3.0	2.7	2.3	2.45
14	3.3	3.65	3.9	4.35	3.8	3.05	3.05	2.6	3.0	2.5	2.45	2.45
15	3.15	3.65	4.0	4.3	3.5	2.75	3.05	3.15	2.95	2.7	2.6	2.4
16	2.95	3.7	3.9	3.5	3.65	3.15	2.8	3.2	3.05	2.45	2.5	2.5
17	3.3	3.6	3.9	2.7	3.5	3.05	2.7	3.1	2.95	2.5	2.75	2.45
18	3.3	3.6	3.9	2.85	3.45	3.35	3.05	3.15	2.85	2.8	2.8	2.4
19	3.3	3.5	3.8	3.25	3.4	3.0	3.25	3.15	2.6	2.7	2.6	2.5
20	3.25	3.4	3.45	3.3	3.4	3.45	3.15	3.0	2.85	2.8	2.25	2.5
21	3.4	3.6	3.95	3.4	3.35	3.45	3.1	2.75	3.05	2.75	2.8	2.55
22	3.6	3.55	3.9	3.35	3.3	3.45	3.25	3.15	3.05	2.6	2.9	2.6
23	4.0	3.6	3.95	3.3	3.85	3.7	3.2	3.15	3.05	2.5	2.8	2.65
24	3.95	3.55	4.0	3.4	3.85	4.1	2.85	3.15	3.0	2.7	2.85	2.5
25	3.9	3.55	3.9	3.4	3.85	3.45	3.2	3.05	2.5	2.5	2.95	2.4
26	3.8	3.45	4.05	3.55	3.4	2.9	3.2	3.15	3.0	2.65	2.9	2.55
27	3.9	3.4	4.2	3.9	3.35	3.35	3.25	2.95	3.05	2.7	2.5	2.6
28	4.25	3.6	4.35	3.85	3.4	3.35	3.25	2.75	3.0	2.6	2.75	2.75
29	4.25	......	4.75	4.05	3.15	3.45	3.2	3.0	3.0	2.55	2.85	2.95
30	4.25	......	5.3	4.05	3.4	3.4	3.05	3.05	2.9	2.5	2.95	2.7
31	4.15	......	5.3	......	3.35	......	2.8	3.05	......	2.55	......	2.25

Daily discharge, in second-feet, of Sebasticook River at Pittsfield, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	331	745	512	2,330	a 938	374	395	331	212	193	111	193
2	a 193	745	512	2,460	1,040	352	250	331	250	a 176	125	212
3	310	745	540	a 2,590	1,040	395	a 142	270	212	212	125	176
4	352	706	540	2,520	1,040	374	176	331	a 142	212	111	a 14
5	395	634	462	2,330	938	a 142	212	290	193	193	97	176
6	374	a 485	a 395	2,260	838	290	331	331	212	230	a 71	212
7	395	570	634	2,080	706	290	310	a 290	193	193	111	212
8	352	570	792	1,900	a 668	290	290	290	250	193	111	84
9	a 193	600	838	1,650	745	310	250	331	212	a 71	111	50
10	290	512	792	a 1,590	668	290	a 212	331	193	125	111	40
11	374	485	706	1,530	634	270	310	310	a 142	176	125	a 30
12	395	438	668	1,300	634	a 176	331	331	212	142	97	71
13	352	a 374	a 485	1,200	600	438	310	270	230	125	a 30	60
14	352	512	668	1,090	600	250	250	a 97	230	71	60	60
15	290	512	745	1,040	a 438	142	250	290	212	125	97	50
16	a 212	540	668	438	512	290	158	310	250	a 60	71	71
17	352	485	668	a 125	438	250	a 125	270	212	71	142	60
18	352	485	668	176	416	374	250	290	a 176	158	158	a 50
19	352	438	600	331	395	a 230	331	290	97	125	97	71
20	331	a 395	a 416	352	395	416	290	230	176	158	a 22	71
21	395	485	706	395	374	416	270	a 142	250	142	158	84
22	485	462	668	374	a 352	416	331	290	250	97	193	97
23	a 745	485	706	352	634	540	310	290	250	a 71	158	111
24	706	462	745	a 395	634	838	a 176	290	230	125	176	71
25	668	462	668	395	634	416	310	250	a 71	71	212	a 50
26	600	416	792	462	395	a 193	310	290	230	111	193	84
27	668	a 395	a 938	668	374	374	331	212	250	125	a 71	97
28	989	485	1,090	634	395	374	331	a 142	230	97	142	142
29	989	....	1,530	792	a 290	416	310	230	230	84	176	212
30	a 989	....	2,200	792	395	395	250	250	193	a 71	212	125
31	888	....	2,200	....	374	....	a 158	250	....	84	....	22

a Sunday.

NOTE.—Daily discharge determined from a fairly well-defined rating curve between 70 and 1,100 second-feet. Below 70 second-feet the discharge figures are approximate, the rating curve having been extended by study of area and velocity curves. Above 1,100 second-feet the rating curve is based on one measurement at 3,860 second-feet and can be considered fairly well defined.

Monthly discharge of Sebasticook River at Pittsfield, Maine, for 1910.

[Drainage area, 320 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	989	193	473	1.48	1.71	B.
February	745	374	522	1.63	1.70	B.
March	2,200	395	792	2.48	2.86	A.
April	2,590	125	1,150	3.59	4.00	A.
May	1,040	290	598	1.87	2.16	B.
June	838	142	344	1.08	1.20	B.
July	395	125	266	.831	.96	B.
August	331	97	273	.853	.98	B.
September	250	71	206	.644	.72	B.
October	230	60	132	.412	.48	B.
November	212	22	122	.381	.42	B.
December	212	14	98.6	.308	.36	B.
The year	2,590	14	415	1.30	17.54	

NOTE.—The minima for many months are abnormally low, due to storage of water above the station on Sundays and other days.

The discharge during the winter months was probably unaffected by ice.

COBBOSSEECONTEE LAKE, MAINE.

Cobbosseecontee Lake is located in the towns of Winthrop, Manchester, West Gardiner, Litchfield, and Monmouth, is the largest body of water in the drainage basin of Cobbosseecontee Stream, and is the largest storage reservoir by which the flow of the stream is so well regulated in the interests of the water powers below. The area of the lake is 8.4 square miles at an elevation of 168 feet above mean sea level.

The following table shows the dates of closing in the fall and opening or disappearance of ice in the spring from this lake since 1839, from records furnished by J. E. Brainard, East Winthrop, Me.:

Dates of closing and opening of Cobbosseecontee Lake.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
1839, Dec. 19	1840, Apr. 15	119	1875, Dec. 2	1876, May 1	152
1840, Dec. 2	1841, Apr. 28	148	1876, Dec. 12	1877, Apr. 18	128
1841, Dec. 20	1842, Apr. 16	118	1877, Dec. 26	1878, Apr. 14	110
1842, Nov. 28	1843, May 5	159	1878, Dec. 28	1879, May 5	129
1843, Nov. 2	1844, Apr. 22	173	1879, Dec. 16	1880, Apr. 22	129
1844, Nov. 29	1845, May 2	155	1880, Nov. 27	1881, Apr. 21	146
1845, Dec. 8	1846, Apr. 17	131	(1881) Jan. 2, 1882	1882, Apr. 28	117
1846, Dec. 10	1847, May 8	150	1882, Dec. 5	1883, May 1	148
1847, no record	1848, no record		1883, Dec. 16	1884, Apr. 26	133
1848, no record	1849, no record		1884, Dec. 18	1885, Apr. 29	133
1849, no record	1850, May 1		1885, Dec. 14	1886, Apr. 20	128
1850, Dec. 13	1851, Apr. 21	130	1886, Dec. 5	1887, May 7	154
1851, Dec. 5	1852, May 3	151	1887, Dec. 24	1888, May 9	138
1852, Dec. 16	1853, Apr. 20	126	1888, Dec. 20	1889, Apr. 15	117
1853, Dec. 5	1854, May 8	155	(1889) Jan. 9, 1890	1890, Apr. 26	108
1854, Dec. 7	1855, Apr. 25	140	1890, Dec. 3	1891, Apr. 28	147
1855, Dec. 5	1856, Apr. 26	144	(1891) Jan. 1, 1892	1892, Apr. 18	109
1856, Dec. 2	1857, Apr. 17	137	1892, Dec. 22	1893, May 4	134
1857, Dec. 16	1858, Apr. 18	124	1893, Dec. 9	1894, Apr. 24	137
1858, Nov. 30	1859, Apr. 30	152	1894, Nov. 30	1895, Apr. 21	143
1859, Dec. 8	1860, Apr. 23	138	1895, Dec. 9	1896, Apr. 22	136
1860, Dec. 7	1861, Apr. 25	140	1896, Dec. 18	1897, Apr. 24	128
1861, Dec. 23	1862, May 6	135	1897, Dec. 4	1898, Apr. 16	134
1862, Dec. 9	1863, May 2	145	1898, Dec. 14	1899, Apr. 29	137
1863, Dec. 21	1864, Apr. 23	125	1899, Dec. 27	1900, Apr. 24	119
1864, Dec. 13	1865, Apr. 13	122	1900, Dec. 11	1901, Apr. 20	131
1865, Dec. 16	1866, Apr. 18	124	1901, Dec. 19	1902, Apr. 2	105
1866, Dec. 16	1867, Apr. 27	133	1902, Dec. 8	1903, Apr. 5	119
1867, Dec. 2	1868, May 1	152	1903, Dec. 15	1904, Apr. 28	136
1868, Dec. 4	1869, Apr. 29	147	1904, Dec. 3	1905, Apr. 21	140
1869, Dec. 9	1870, Apr. 24	137	1905, Dec. 8	1906, Apr. 24	138
1870, Dec. 15	1871, Apr. 9	116	1906, Dec. 5	1907, May 1	148
1871 Dec. 7	1872, May 3	149	1907, Dec. 19	1908, Apr. 21	125
1872, Dec. 9	1873, May 2	145	1908, Dec. 8	1909, Apr. 20	134
1873, Nov. 27	1874, May 4	159	1909, Dec. 25	1910, Apr. 4	101
1874, Dec. 10	1875, May 2	144	1910, Dec. 9	1911, Apr. 28	141

NOTE.—Average length of time closed, 135 days per year. Greatest length of time closed, 173 days, Nov. 2, 1843, to Apr. 22, 1844. Shortest length of time closed, 101 days, Dec. 25, 1909, to Apr. 4, 1910. Earliest date closed, Nov. 2, 1843. Latest date closed, Jan. 9, 1890. Earliest date opened, Apr. 2, 1902. Latest date opened, May 9, 1888.

COBBOSSEECONTEE STREAM AT GARDINER, MAINE.

Cobbosseecontee Stream drains a group of lakes lying 5 to 15 miles west of Augusta. From the largest of these, Cobbosseecontee Pond, which has an area of 8.4 square miles, the river flows southward, eastward, and then northeastward, entering Kennebec River at Gardiner. Its total drainage area, 240 square miles, is largely in farm lands. The aggregate area of the ponds at the head of the stream is about 19 square miles. From Lake Maranacook—one of the upper lakes—to the Kennebec the fall is 206 feet, about 128 feet in the last three-fourths of a mile of the river course.

The Cobbosseecontee is a most remarkable example of the regularity of flow that can be obtained with proper storage, and except for a short time each spring there is usually no water wasted.

Records of flow of Cobbosseecontee Stream have been kept at the dam of the Gardiner Water Power Co. since 1890. This dam is the uppermost of a series of seven dams near the mouth of the river at Gardiner, and is of stone masonry, with a timber apron at the toe. The downstream face has an approximate slope of 1 horizontal to 4 vertical. The crest is horizontal and is about 6 feet wide. The upstream slope is about 1 vertical to 8 horizontal. The total length of the dam is about 100 feet, and flashboards 4.5 feet high are maintained continuously. The total head obtained is about 10 feet. The head-bay entrance is on the right bank, and from this runs a wooden penstock in which is placed a 39-inch Hercules wheel. In the head bay there is also a gatehouse with two gates which are kept partially open most of the time to regulate the proper flow down the river.

The records of flow are made up by considering (1) the flow over the dam, which is usually nothing, except for a short time in the spring; (2) the flow through the sluice gates, which is regulated by means of tables drawn up for the company by Hiram F. Mills, C. E., showing the discharge through the two gates for different pond levels, the practical application of this method being to obtain a given flow at any time by setting these gates at the required gate opening, the flow through the wheel being taken into account; (3) the amount of water flowing through the 39-inch wheel, which is ascertained from this gate opening and pond level by means of a table, also provided for this purpose by Mr. Mills. The water that is pumped for the Gardiner supply is neglected in computations, being but a small percentage of the flow. It is also assumed that the tail-water level remains constant. The leakage by the dam was measured during 1905 and found to be 10 second-feet, and correction made accordingly until August, 1907, when the dam was repaired. On Sundays and legal holidays gates are closed and no water is allowed to run unless the lake is full.

These records have been furnished by S. D. Warren & Co., through their engineer, Joseph A. Warren, and are considered excellent.

The maximum daily discharge since the establishment occurred March 12, 1903, and was 3,275 second-feet. The discharge for the minimum week (not including holidays or times when for some reason the plant was shut down) occurred October 23 to 29, 1899, and averaged 57 second-feet.

Data prior to 1907 have been compiled in Water-Supply Paper 198.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Cobbosseecontee Stream at Gardiner, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	230	240	280	336	a 860	280	280	260	260	260	220	150
2	a 0	240	280	345	875	280	280	260	260	a 0	220	150
3	230	240	280	a 354	875	280	a 0	260	260	260	220	150
4	230	240	280	345	850	280	20	260	a 0	260	220	a 0
5	230	240	280	325	850	a 0	160	260	260	260	220	150
6	230	a 0	a 0	310	875	280	280	260	260	260	a 0	150
7	230	240	290	306	875	280	170	a 0	260	260	220	150
8	230	240	350	306	a 370	280	260	260	260	260	220	150
9	a 0	240	400	315	290	280	260	260	260	a 0	220	150
10	215	240	390	a 0	280	280	a 0	260	260	220	220	150
11	200	240	370	280	280	280	260	260	a 0	220	220	a 0
12	200	240	335	280	280	a 0	260	260	260	220	220	140
13	200	a 0	a 15	280	280	280	260	260	260	220	a 0	130
14	200	240	314	280	280	280	260	a 0	260	220	200	120
15	200	240	314	280	a 0	280	260	260	260	220	200	120
16	a 0	240	314	280	280	280	260	260	260	a 0	200	120
17	200	240	314	a 0	280	280	a 0	260	260	220	200	120
18	200	240	305	270	280	280	260	260	a 0	220	200	a 0
19	200	240	300	260	280	a 0	260	260	260	220	200	120
20	200	a 0	a 0	260	280	280	260	260	260	220	a 0	120
21	200	240	280	260	280	280	260	a 0	260	220	170	120
22	215	240	280	260	a 0	280	260	260	260	220	170	120
23	a 0	240	280	270	280	280	260	260	260	a 0	170	110
24	260	240	280	a 0	280	280	a 0	260	260	220	85	100
25	245	240	280	280	280	280	260	260	a 0	220	170	a 0
26	230	240	290	280	280	a 0	260	260	260	220	170	30
27	230	a 0	a 160	285	280	280	260	260	260	220	a 0	120
28	230	270	320	445	280	280	260	a 0	260	220	150	120
29	230	......	320	580	a 0	280	260	260	260	220	150	120
30	a 0	......	325	708	20	280	260	260	260	a 0	150	125
31	240	......	336	......	280	......	a 0	260	......	220	......	130

a Sunday.

Monthly discharge of Cobbosseecontee Stream at Gardiner, Maine, for 1910.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	260	0	184	0.767	0.88
February	270	0	207	.862	.90
March	400	0	276	1.15	1.33
April	708	0	293	1.22	1.36
May	875	0	380	1.58	1.82
June	280	0	243	1.01	1.13
July	280	0	206	.858	.99
August	260	0	226	.942	1.09
September	260	0	225	.938	1.05
October	260	0	194	.808	.93
November	220	0	167	.696	.78
December	150	0	111	.462	.53
The year	875	0	226	.942	12.79

ANDROSCOGGIN RIVER.

GENERAL FEATURES OF AREA DRAINED.

Androscoggin River is formed by the junction of Magalloway River and the outlet of the Umbagog-Rangeley Lakes near the Maine-New Hampshire boundary. For about 35 miles it flows southward in New Hampshire, then turns abrubtly and flows eastward in Maine, finally turning toward the south and joining the Kennebec in Merry-meeting Bay, near Brunswick. The river is about 200 miles long and the greatest width of its basin about 70 miles. The total drainage area is 3,470 square miles, about 80 per cent of which is in Maine. Its only important tributary is Little Androscoggin River, which enters at Auburn.

The lower part of the basin is hilly and partly wooded, and much of it is farm land; the upper part is very broken and mountainous and is largely in forest. The general elevation of the basin is greater than that of any other on the Atlantic coast. Umbagog Lake is about 1,240 feet above sea level, and Rangeley Lake about 1,500 feet. The sources of Magalloway River reach elevations of from 2,600 to 2,900 feet.

Granite, gneiss, and mica schists are found along the main course of the river, with clay slate in the upper part of the basin. The bed of the river, like that of the Kennebec and Penobscot, is rocky where falls occur, and its high banks little subject to overflow—conditions that are advantageous in the development of water power.

The mean annual precipitation is probably about 40 inches, ranging from 43 inches near the coast to less than 35 inches in the extreme northern part of the basin. Winters in the northern portions of the basin are extremely rigorous and low water frequently occurs during the winter months on this account.

The Androscoggin is naturally provided with storage facilities as fine as those of any other river in the East. Including the Umbagog-Rangeley series and Kennebago Lake, which afford a combined water surface of about 69 square miles, there is a storage of about 19,600,000,000 cubic feet. The drainage area at the outlet of Umbagog Lake and above the mouth of Magalloway River is 635 square miles; of Magalloway River at its mouth, 460 square miles. Under the efficient management of the Union Water Power Co. the storage afforded by these lakes has had a marked effect upon the regimen of flow during low water for the past few years. A number of the companies on the river have formed the Androscoggin Reservoir Co. and constructed a dam on Magalloway River which affords approximately 8,000,000,000 cubic feet of additional storage and very materially increases the low-water flow of the Androscoggin.

Androscoggin River is probably as well developed as any other river in the country. Of the 1,240 feet fall between Umbagog Lake and tide water about 659 feet have been developed and furnishes power to many mills, including the cotton mills of Brunswick and Lewiston, and the great pulp and paper mills of Livermore Falls, Rumford Falls, and Berlin; but there still remain some excellent unutilized sites of especial value on account of the uniform flow of the stream.

Androscoggin River is an important stream for log driving, and care is exercised in the amount of water used for this purpose. The regulation of the flow is under one management, and is controlled in the interests of both log driving and the water-power developments.

Little Androscoggin River, about 30 miles long and draining an area of about 380 square miles, is well endowed with storage facilities and is an important water-power stream for its size. The river is practically all utilized from Mechanic Falls to the mouth at Auburn.

The longest record of flow on the Androscoggin is that at Rumford Falls, extending back to 1892. The driest year since the beginning of the records was 1905, and the wettest 1893, the total flow during these two years being about in the ratio of 1 to 1.89.

RIVER SURVEYS IN ANDROSCOGGIN RIVER BASIN.

The results of surveys in the Androscoggin River basin by the United States Geological Survey in cooperation with the State of Maine are represented by the maps in the following list:

	Sheets.
Androscoggin River, Brunswick to Livermore Falls, profile only....	2
Androscoggin River, Livermore Falls to Umbagog Lake, plan and profile..	8
Umbagog Lake, Upper Richardson Lake, Lower Richardson Lake..	1
Mooselookmeguntic Lake..	1
Mooselookmeguntic Lake outlet, Richardson Lakes outlet..........	1

The river maps show not only the plan of the river, with 5-foot contours along the banks, but also the profiles of the rivers, and are of value in studying developed and undeveloped water-power sites, as, in connection with the stream gaging record, they afford data for a close estimate of the total horsepower that can be developed at the rips and falls. The lake maps are of value in computing the capacity of the various lakes in cubic feet if their use as storage reservoirs is contemplated.

These maps may be obtained without cost by applying to C. C. Babb, district engineer, United States Geological Survey, State House, Augusta, Maine.

RANGELEY LAKE, MAINE.

Rangeley Lake, the uppermost of a series of natural storage reservoirs at the headwaters of the Androscoggin River, drains into Mooselookmeguntic Lake through Rangeley Stream. It is located in the town of Rangeley, Rangeley Plantation, and Sandy River Plantation in Franklin County. The elevation of the lake is 1,515 feet above mean sea level. A dam at the outlet controls a storage of about 1,055,000,000 cubic feet. The storage on this lake, together with that on Mooselookmeguntic, Upper and Lower Richardson, and Umbagog lakes, aggregating 18,500,000,000 cubic feet, is regulated in the interests of the numerous and extensive water-power plants below.

The following table shows the dates of closing and opening or disappearance of ice from this lake since 1880, from records furnished by George M. Esty, Rangeley, Maine, to the Commissioners of Inland Fisheries and Game:

Dates of closing and opening of Rangeley Lake.

Closed.	Opened.	Days closed.	Closed.	Opened.	Days closed.
1879, no record	1880, May 8		1895, Dec. 9	1896, May 9	153
1880, no record	1881, May 15		1896, no record	1897, May 12	
1881, no record	1882, May 21		1897, Dec. 19	1898, May 6	139
1882, Dec. 10	1883, May 14	156	1898, Dec. 12	1899, May 7	147
1883, no record	1884, May 11		1899, Dec. 27	1900, May 15	140
1884, Dec. 19	1885, May 16	149	1900, Dec. 11	1901, May 4	145
1885, no record	1886, May 5		1901, Dec. 17	1902, Apr. 28	133
1886, Dec. 5	1887, May 20	167	1902, Dec. 10	1903, Apr. 29	141
1887, Dec. 24	1888, May 23	152	1903, Dec. 12	1904, May 13	154
1888, Dec. 13	1889, Apr. 29	138	1904, Dec. 7	1905, May 2	147
1889, no record	1890, May 9		1905, Dec. 11	1906, May 13	154
1890, Dec. 2	1891, May 14	164	1906, Dec. 9	1907, May 19	162
1891, Dec. 17	1892, May 9	145	1907, Dec. 16	1908, May 10	147
1892, no record	1893, May 21		1908, Dec. 8	1909, May 14	158
1893, Dec. 4	1894, May 2	150	1909, Dec. 25	1910, Apr. 19	116
1894, Dec. 10	1895, May 7	149	1910, Dec. 11	1911, May 11	152

NOTE.—Earliest closing date, Dec. 2, 1890. Earliest opening date, Apr. 19, 1910. Latest closing date, Dec. 27, 1899. Latest opening date, May 23, 1888. Shortest period closed, 116 days in 1909–10. Longest period closed, 167 days in 1886–7.

ANDROSCOGGIN RIVER AT ERROL DAM, N. H.

The Errol dam controls the storage of Umbagog, the lower of the Rangeley series of lakes. The dam is located about 5 miles below the outlet of the lake, about 3.5 miles below the mouth of Magalloway River, thus making this latter stream one of the feeders of Umbagog Lake, and 1 mile above the town of Errol.

Records of the discharge through the Errol dam have been maintained since January 1, 1905, by the Union Water Power Co. The following records have been furnished by Walter H. Sawyer:

The dam is a frame structure about 175 feet between abutments.

The rod gage is movable. Readings are taken each day from the sill of deep gate No. 6. The entire flow passes through various gates of different sizes, 14 in all. There is no provision for overflow besides the gates. Beginning at the left end, the gates are described as follows:

One gate 10 feet deep by 15 feet wide; seldom used.

Three gates 10½ feet deep by 15 feet wide; open nearly all the time. These three gates were originally the same depth as the one just mentioned, but a 6-inch plank was removed from that gate a short time ago, as it interfered with the driving of logs.

Nine gates 15 feet deep by 7 feet wide in the clear (so-called deep gates); open a portion of the time only.

One gate 15 feet deep by 5 feet wide; grist-mill gate; used occasionally.

The cap of all the 14 gates is one continuous beam and on the same level, thus making the bottom of the various gates at different levels.

The elevation of the sill of deep gate No. 6 and of the zero of the Errol dam gage is 1,231.3 feet above sea level. A "deadhead" a short distance above the dam at present controls the low-water flow, and its height, 2.66 feet, must be subtracted from the head as read from Errol dam gage to obtain the depth of water in Umbagog available for storage.

The winter flow is only slightly affected by ice at this station.

The gates of the Errol dam have not been rated as thoroughly as might be desired, but the records as published below approximate the true discharge.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Androscoggin River at Errol dam, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,207	1,122	787	1,393	3,600	3,860	1,307	1,062	1,136	1,108	995	1,183
2	1,184	1,075	738	2,289	3,151	4,336	1,385	1,100	1,122	1,049	1,082	1,160
3	1,150	1,149	755	2,928	2,762	3,784	1,497	1,100	1,180	1,019	879	1,082
4	1,150	1,165	945	3,022	2,339	3,368	1,609	1,116	1,252	1,019	753	1,082
5	1,150	1,085	1,098	3,086	2,887	3,338	1,462	1,155	1,403	978	774	1,168
6	1,150	1,140	964	3,598	3,046	3,268	1,368	1,143	1,592	982	768	1,190
7	1,150	1,190	872	5,873	3,046	3,222	1,264	1,140	1,365	982	515	1,190
8	1,150	1,274	878	6,562	3,010	3,285	1,141	1,188	1,365	967	325	1,190
9	1,150	1,268	1,012	6,844	2,994	3,362	1,154	1,200	1,133	959	931	1,211
10	1,150	1,263	1,219	6,283	2,994	3,261	1,300	1,214	1,098	945	1,145	1,211
11	1,150	1,257	1,212	5,362	2,356	3,261	1,411	1,119	1,098	945	1,070	1,211
12	1,150	1,251	1,212	3,234	1,980	3,243	1,392	1,040	1,219	945	1,062	1,214
13	1,136	1,247	1,198	3,637	2,234	3,200	1,189	1,123	1,168	945	1,048	1,231
14	1,150	1,242	1,198	2,758	2,766	2,853	1,208	1,185	1,146	959	1,038	1,231
15	1,150	1,232	1,202	2,317	2,766	2,596	1,241	1,042	1,129	959	1,023	1,253
16	1,136	1,223	1,199	1,882	2,737	2,556	1,227	972	1,107	959	1,005	1,253
17	1,136	1,138	1,294	2,066	2,528	2,697	1,248	987	1,086	959	990	1,268
18	1,136	1,082	1,324	1,952	1,587	2,185	1,271	1,010	1,123	959	1,112	1,288
19	1,136	1,182	1,316	2,367	1,587	2,264	1,271	1,010	1,044	959	1,199	1,297
20	1,136	1,226	1,304	2,052	1,737	2,461	1,254	979	1,044	978	1,173	1,298
21	1,127	1,218	1,289	2,095	1,769	2,416	1,223	972	1,044	966	1,189	1,270
22	982	1,214	1,289	2,491	2,506	2,358	1,164	1,105	1,169	948	1,215	1,307
23	914	1,207	1,285	2,987	2,700	2,267	1,103	1,180	1,189	959	1,248	1,343
24	989	1,197	1,277	3,049	2,726	2,184	1,039	1,157	1,212	962	1,319	990
25	997	1,187	1,271	3,075	2,752	2,111	933	1,135	1,212	964	1,227	928
26	1,041	1,175	1,236	3,716	3,379	1,981	884	1,104	1,228	1,015	1,190	1,218
27	1,117	1,169	1,175	4,528	3,955	1,900	979	1,153	1,271	999	1,166	1,240
28	1,124	1,055	1,211	2,575	3,989	2,012	1,076	1,267	1,123	1,015	1,141	1,146
29	1,138	....	1,236	3,842	3,924	1,723	1,031	1,309	1,065	1,015	1,143	1,186
30	1,151	....	1,288	3,842	3,587	1,338	1,006	1,232	1,108	1,015	1,195	1,074
31	1,162	....	1,360	....	3,467	....	1,019	1,154	....	937	....	1,074

Monthly discharge of Androscoggin River at Errol dam, N. H., for 1910.

[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.	
January	1,207	914	1,121	1.02	1.18
February	1,274	1,055	1,187	1.08	1.12
March	1,360	738	1,150	1.05	1.21
April	6,844	1,393	3,390	3.10	3.46
May	3,989	1,587	2,802	2.56	2.95
June	4,336	1,338	2,756	2.52	2.81
July	1,609	884	1,215	1.11	1.28
August	1,309	972	1,118	1.02	1.18
September	1,592	1,044	1,181	1.08	1.20
October	1,108	937	980	.895	1.03
November	1,319	325	1,031	.942	1.05
December	1,343	928	1,193	1.09	1.26
The year	6,844	325	1,590	1.46	19.73

ANDROSCOGGIN RIVER AT SHELBURNE, N. H.

This station, which is located at the steel highway bridge about half a mile north of railway station at Shelburne, N. H., 5¾ miles below the mouth of Peabody River, and 6 miles above Wild River, was established May 30, 1903, discontinued April 30, 1907, and reestablished May 20, 1910.

A standard chain gage is attached to the bridge; its datum has remained unchanged during the maintenance of the station.

The bed of the river is sandy, and extreme floods and serious obstructions by ice or logs cause considerable changes. Both banks are subject to overflow in extreme high freshets.

Discharge measurements are made from the highway bridge, to which gage is attached.

The nearest dam upstream is that of the Lead-Mine Bridge power station of the Berlin Mills Co., about 2 miles distant. Downstream the first dam is at Rumford Falls. The discharge is affected by log jams and, during the winter months, by ice. At low stages conditions are poor for measuring and the results are approximate.

Estimates of daily discharge for this station are not published for 1910, as the measurements made during this year indicate a change in the control and the data obtained are not adequate for the construction of a discharge rating curve.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

Discharge measurements of Androscoggin River at Shelburne, N. H., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 20	F. E. Pressey	394	1,030	4.42	2,930
July 13	.....do	392	793	3.85	1,660
14	W. E. Parsons	392	830	3.98	1,710
Aug. 24	.....do	388	851	3.84	1,660

Daily gage height, in feet, of Androscoggin River at Shelburne, N. H., for 1910.

[James Simpson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1						5.82	4.12	4.05	4.00	4.00	4.00	3.65
2						5.82	4.02	4.00	3.95	3.90	4.10	3.60
3						5.80	4.02	4.05	4.02	4.10	4.10	3.70
4						5.82	4.07	4.15	4.00	4.00	4.10	3.65
5						5.67	3.94	4.10	3.95	4.10	4.10	3.70
6						5.57	3.82	4.05	4.20	4.00	3.90	3.75
7						5.37	3.77	3.90	4.15	4.00	4.00	3.75
8						5.27	3.92	3.95	4.10	4.00	4.10	3.80
9						5.02	3.87	3.95	4.05	3.95	3.75	3.85
10						4.97	3.17	3.90	4.10	4.00	4.00	4.15
11						4.92	3.47	4.00	3.95	4.00	4.10	4.65
12						4.97	4.02	3.95	4.05	3.95	4.15	5.30
13						5.02	3.92	4.00	4.00	4.00	4.00	5.20
14						5.02	3.92	3.85	4.10	4.00	4.05	5.20
15						4.92	3.97	4.05	4.00	4.00	4.00	5.95
16						4.90	4.05	4.00	4.00	3.90	4.00	6.15
17						4.82	4.00	4.05	4.00	4.00		
18						4.80	4.10	4.00	3.90	4.00		6.30
19						4.80	4.15	4.05	4.05	3.95	4.00	
20					4.42	4.97	4.10	4.00	4.00	4.00	3.85	
21					4.52	4.77	4.00	3.80	4.10	4.00	4.00	
22					3.87	4.62	4.00	4.05	4.05	4.00	4.10	
23					4.42	4.62	4.05	4.00	4.10	3.85	4.00	
24					4.52	4.54	3.90	4.00	4.05	4.00	3.90	
25					4.62	4.57	4.15	4.05	4.00	4.00	3.85	6.50
26					4.97	4.62	4.05	4.00	4.00	4.00	3.80	
27					5.60	4.57	4.10	4.05	4.05	4.00	3.70	
28					5.72	4.37	5.60	3.90	4.00	4.00	3.75	
29					5.70	4.27	4.20	4.05	4.10	4.00	3.80	
30					5.74	4.12	4.10	3.95	4.00	3.90	3.80	
31					5.80		3.45	4.00		4.00		

NOTE.—Backwater caused by ice below the station from Dec. 10 to 25. Gage heights taken to water surface. The relation between gage height and discharge may also have been slightly affected by ice during the first part of December.

ANDROSCOGGIN RIVER AT RUMFORD FALLS, MAINE.

The discharge of Androscoggin River at Rumford Falls since 1892 has been computed and furnished by Charles A. Mixer, engineer for the Rumford Falls Power Co., by adding the actual measured quantities passing through the wheels to the computed flow over the dam, using the customary Francis weir formula with modified coefficient.

At Rumford Falls is one of the finest water powers on the Atlantic coast. Here the Androscoggin descends 177 feet in a mile in several pitches over granite ledges. A comprehensive plan of development for the use of power from three levels has been laid out and partly executed. From the high-level canal there is a fall of 97 feet to the middle level, which also receives a direct and independent supply of water from the river. The water in the middle-level canal is then used and discharged, after a fall of 50 feet, into the low-level canal, from which, in turn, there is a final drop of 30 feet to the river. Dams have been built at the entrance of the high and middle level canals.

The present wheel installation calls for 30,000 horsepower, of which 25,000 horsepower are utilized at Rumford Falls, largely in the manufacture of pulp and paper. The total proposed development comprises some 54,000 gross horsepower.

The maximum daily discharge occurred April 15, 1895, and was about 55,200 second-feet. The discharge for the minimum week occurred February 15 to 21, 1904, and averaged 686 second-feet.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Androscoggin River at Rumford Falls, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,389	2,298	3,740	10,577	a8,034	4,907	2,094	1,348	1,691	1,600	1,600	1,534
2	a1,531	2,215	3,698	9,788	6,581	5,225	1,956	1,486	1,541	a1,526	1,503	1,445
3	1,545	2,247	3,309	a9,230	6,058	5,033	a1,940	1,308	1,530	1,452	1,518	1,226
4	1,495	2,154	3,051	8,289	6,864	4,811	1,940	2,019	a1,646	1,460	1,738	a1,208
5	1,340	2,235	2,863	8,924	6,540	a4,506	1,924	3,445	1,646	1,500	2,425	1,293
6	1,401	a1,980	a2,696	11,790	5,484	4,103	1,866	2,382	1,762	1,490	a2,222	1,567
7	1,553	1,737	2,780	12,796	4,820	4,780	1,817	a2,092	2,094	1,655	2,018	1,116
8	1,536	1,756	2,800	12,736	a4,671	4,416	1,751	1,802	1,949	1,663	2,006	1,260
9	a1,575	1,832	2,715	11,554	4,664	4,172	1,681	1,821	2,005	a1,485	1,516	1,307
10	1,491	1,896	2,555	a10,596	4,643	3,959	a1,847	1,592	1,888	1,306	1,463	1,212
11	1,515	2,042	2,407	9,233	4,694	3,836	1,822	1,695	a1,664	1,400	1,695	a1,265
12	1,503	1,941	2,458	7,240	4,204	a4,374	1,898	1,732	1,440	1,626	1,783	1,319
13	1,526	a1,882	a2,512	5,951	3,524	4,409	1,732	1,676	1,738	1,492	a1,530	1,468
14	1,541	1,888	2,567	5,053	3,434	3,765	1,549	a1,608	1,748	1,338	1,506	1,316
15	1,478	1,922	2,624	4,355	a3,207	3,579	1,685	1,539	1,970	1,335	1,673	1,475
16	a1,430	1,914	2,360	4,501	3,810	3,430	1,579	2,281	1,887	a1,248	1,565	1,409
17	1,490	1,898	2,444	a3,781	3,865	3,533	a1,572	2,212	1,842	1,162	1,535	1,292
18	1,557	1,879	2,199	3,710	3,462	3,707	1,449	2,054	a1,732	1,355	1,749	a1,540
19	1,551	1,831	2,224	4,564	3,551	a4,050	1,654	1,920	1,622	1,169	1,664	1,412
20	1,608	a1,750	a2,315	6,702	3,144	3,515	1,556	1,775	1,556	1,389	a1,526	1,526
21	1,622	1,818	2,406	7,265	3,120	3,227	1,525	a1,694	1,439	1,661	1,388	1,581
22	8,264	1,978	2,842	7,828	a2,562	3,106	1,534	1,613	1,448	1,442	1,517	1,446
23	a14,223	2,107	2,942	11,244	3,211	2,779	1,619	1,545	1,470	a1,379	1,546	1,332
24	7,025	2,034	3,082	a8,393	3,416	2,776	a1,591	1,493	1,627	1,316	1,438	1,433
25	4,561	1,938	5,494	7,008	3,493	2,754	1,384	1,631	a1,490	1,472	1,445	a1,904
26	3,713	1,862	9,063	8,964	3,768	a2,185	1,514	1,627	1,352	1,407	1,428	1,654
27	3,056	a1,822	a7,587	14,253	4,327	2,428	1,384	1,552	1,446	1,408	a1,528	1,434
28	2,882	2,168	6,353	10,839	4,559	2,500	1,417	a1,471	1,580	1,562	1,689	1,738
29	2,599	....	6,842	7,879	a4,487	2,057	2,042	1,390	1,812	1,579	1,556	1,687
30	a2,470	....	10,312	7,479	4,328	2,242	1,381	1,488	1,677	a1,490	1,608	1,662
31	2,282	....	10,370	....	4,474	....	a1,301	1,587	....	1,500	....	1,460

a Sunday.

Monthly discharge of Androscoggin River at Rumford Falls, Maine, for 1910.

[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.	
January	14,223	1,340	2,669	1.28	1.48
February	2,298	1,737	1,965	.940	.98
March	10,370	2,199	3,923	1.88	2.17
April	14,253	3,710	8,417	4.03	4.50
May	8,034	3,120	4,419	2.11	2.43
June	5,225	2,057	3,672	1.76	1.96
July	2,094	1,301	1,678	.803	.93
August	3,445	1,308	1,770	.847	.98
September	2,094	1,352	1,676	.802	.90
October	1,663	1,162	1,447	.692	.80
November	2,425	1,388	1,646	.788	.88
December	1,904	1,116	1,436	.687	.79
The year	14,253	1,116	2,893	1.38	18.80

LAKE AUBURN, MAINE.

Lake Auburn is in the city of Auburn in Androscoggin County. The outlet stream is about 2 miles long and enters Androscoggin River about 2 miles above the mouth of the Little Androscoggin River. The lake is used for the water supply of the cities of Lewiston and Auburn. The area of the lake is 3.5 square miles at an elevation of 259 feet above mean sea level.

The following table gives the dates of opening or disappearance of ice from this lake:

Dates of opening of Lake Auburn, Maine.

1890, Apr. 26.	1898, Apr. 18.	1906, Apr. 24.
1891, Apr. 27.	1899, Apr. 30.	1907, Apr. 30.
1892, Apr. 21.	1900, Apr. 26.	1908, Apr. 24.
1893, May 5.	1901, Apr. 15.	1909, Apr. 30.
1894, Apr. 24.	1902, Apr. 4.	1910, Apr. 5.
1895, Apr. 23.	1903, Apr. 4.	1911, Apr. 29.
1896, Apr. 25.	1904, May 1.	
1897, Apr. 26.	1905, Apr. 23.	

PRESUMPSCOT RIVER.

GENERAL FEATURES OF AREA DRAINED.

Presumpscot River, the outlet of Sebago Lake, rises about 17 miles northwest of Portland. The principal tributary of the lake is Crooked River, a stream heading 35 miles farther north and within 3 miles of the Androscoggin. The area of the lake is 44.8 square miles. The total lake surface in the drainage basin is 78 square miles. The area of the drainage basin at the outlet of the lake is 436 square miles, and at the mouth of the river 616 square miles.

The northern part of the basin is mountainous and wooded; the southern part is moderately hilly and mostly in farm land. Granite gneiss and mica schists appear in many places, and the soil is gravelly and sandy. The fall from Sebago Lake to tidewater is about 265 feet in a distance of nearly 22 miles, or an average of about 12 feet per mile.

The mean annual precipitation is probably about 42 inches. The river and lake generally freeze over during the winter.

Sebago Lake is a magnificent natural storage reservoir, and its utilization for this purpose has made the regimen of flow of the Presumpscot extremely regular. Nowhere in the United States is there a better example of efficient regulation of storage than on the Presumpscot.

A record of flow from Sebago Lake has been kept since 1887. During this period of over 20 years the driest season was that of 1905 and the wettest 1891, the total flow for these two years being about in the ratio of 1 to 2.22.

SEBAGO LAKE, MAINE.

Sebago Lake lies in Cumberland County, in the towns of Sebago, Naples, Casco, Raymond, and Standish, at an altitude of 262 feet above sea level. Its maximum length (northwest-southeast) is about 12 miles; its greatest width (across the north end) 5 miles, and the area of its water surface 44.8 square miles. Its principal tributaries drain many lakes and ponds lying to the north and west. On the southwest the divide separating its waters from those of Saco River lies scarcely a mile back from the lake shore. The lake contains a number of islands, of which Frye Island is the largest.

The flow of the lake to Presumpscot River is controlled by the dam at North Windham.

Record of the annual date of opening of the lake has been kept for more than a century. A record of the closing dates has not been kept.

The lower bay usually closes from December 18 to January 7, on the average about December 25. The great bay usually closes about the middle of January. The following is the record of opening or disappearance of ice from the lake:

Dates of opening of Sebago Lake.

1807, May 7.	1823, Apr. 23.	1843, May 2.
1812, May 1.	1824, Apr. 17.	1844, Apr. 17.
1816, Apr. 30.	1825, Apr. 16.	1845, Apr. 24.
1819, Apr. 29.	1826, Apr. 18.	1846, Apr. 14.
1820, Apr. 25.	1834, Apr. 14.	1849, Apr. 29.
1821, Apr. 29.	1837, May 1.	1852, May 4.
1822, Apr. 12.	1841, Apr. 29.	1855, Apr. 27.

1857, Apr. 14.
1858, Apr. 16.
1862, Apr. 29.
1863, Apr. 28.
1866, Apr. 18.
1867, Apr. 26.
1871, Apr. 5.
1872, May 9.
1873, May 1.
1874, May 7.
1875, May 6.
1876, May 1.
1877, Apr. 23.
1878, Apr. 12.
1879, May 5.
1880, Apr. 13.
1881, Apr. 24.
1882, Apr. 19.
1883, Apr. 29.
1884, Apr. 26.
1885, Apr. 26.
1886, Apr. 25.
1887, May 1.
1888, May 8.
1889, Apr. 12.
1890, Apr. 24.
1891, Apr. 23.
1892, Apr. 23.
1893, May 4.
1894, Apr. 19.
1895, Apr. 21.
1896, Apr. 21.
1897, Apr. 22.
1898, Apr. 13.
1899, Apr. 27.
1900, Apr. 26.
1901, Apr. 15.
1902, Mar. 29.
1903, Mar. 27.
1904, Apr. 23.
1905, Apr. 24.
1906, Apr. 21.
1907, Apr. 25.
1908, Apr. 25.
1909, Apr. 8.
1910, Apr. 1.
1911, Apr. 20.

PRESUMPSCOT RIVER AT OUTLET OF SEBAGO LAKE, MAINE.

Since January, 1887, the flow from Sebago Lake has been regularly recorded, the quantity being deduced during most of this time from the openings in the gates at the dam, the discharging capacity of which under different conditions of head has been determined and tabulated by Hiram F. Mills, of Lowell. In March, 1904, S. D. Warren & Co. completed a hydroelectric plant at Eel Weir Falls, near Sebago Lake, bringing water directly from the dam at the lake by means of a canal. A head of 40 feet is thus obtained at average lake level.

The development of Eel weir has necessitated a different method of recording the flow from the lake. The water is used through three pairs of 33-inch Hercules wheels. The water used by these wheels is recorded by three Allen meters, one on each pair. These meters were rated by the result of a test at Holyoke of one pair of these wheels.

Since the station was finished the performance of the wheels and of the recording meters has been checked by careful current-meter readings in the canal and brake tests of the wheels, combined with electrical readings of the generator output. The records of the generator output of the station are kept and the constant ratio between these readings and the Allen meter records gives a good check on the latter.

It is usually desired to keep a constant flow through the canal, and when demands for power are not sufficient to utilize the entire flow through the wheels the excess of water is run off through a pair of regulating gates at the power station, a record of the openings of these gates being kept and the flow computed from a coefficient determined by current-meter tests.

The flow at times from the lake may be greater than it is safe to carry through the canal, though this has not yet happened. At such times it will be necessary to draw part of the water through the old regulating gates in the main dam.

A continuous record of the Sebago Lake level has been kept since January, 1872. The lake fills rapidly after March 1, attaining its maximum height between the middle of April and June 1, and then gradually subsides as water is withdrawn for mill purposes until a minimum stage is reached—sometimes in the autumn, but usually in the winter.

The records of lake level and discharge make an unusually complete and valuable series of data. These have been furnished from time to time by S. D. Warren & Co., and the data regarding the new methods of measurement, etc., is from a description furnished by Joseph A. Warren.

The maximum daily discharge occurred March 6, 1896, and was 13,800 second-feet. The discharge for the minimum week (not considering periods when for some reason the plant was not running) occurred March 17 to 23, 1907, and averaged 256 second-feet.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Presumpscot River at outlet of Sebago Lake, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	678	708	649	543	a 364	555	553	552	552	532	530	425
2	a 395	690	463	428	550	552	543	555	550	a 186	528	413
3	685	678	595	a 374	553	555	a 258	555	545	537	535	410
4	705	680	563	547	552	550	338	552	a 403	537	527	a 327
5	700	637	513	543	557	a 307	542	548	543	537	525	408
6	707	a 395	a 278	547	557	553	553	550	547	537	a 357	427
7	688	687	475	550	555	552	557	a 320	547	538	528	420
8	640	670	435	547	a 342	552	553	550	547	523	528	420
9	a 378	673	480	563	555	553	553	552	547	a 117	528	437
10	697	670	580	a 360	553	553	a 369	550	533	487	528	422
11	688	665	600	545	552	550	555	553	a 317	555	528	a 293
12	708	648	587	548	550	a 327	560	548	547	538	527	427
13	700	a 357	a 307	548	550	555	553	545	547	538	a390	427
14	707	680	567	560	548	555	553	a 343	542	535	527	425
15	677	707	535	562	a 205	554	558	548	545	537	527	433
16	a 428	703	538	473	552	552	550	548	537	a 377	527	337
17	682	708	533	a 367	552	575	a 399	548	540	575	527	318
18	690	700	537	547	552	557	552	547	a 306	535	525	a 125
19	675	695	533	548	555	a 413	553	548	543	533	523	343
20	677	a 373	a 342	550	550	545	553	543	543	533	a 295	342
21	673	692	538	550	550	550	557	a 315	543	525	422	343
22	427	688	537	507	a 301	548	555	548	542	528	442	343
23	a 226	705	553	482	552	552	553	548	542	a 236	422	338
24	685	700	603	a 310	552	548	a 263	548	542	615	425	340
25	672	700	562	552	553	548	553	548	a 393	535	428	a 138
26	670	668	538	543	552	a 404	555	547	542	535	428	348
27	688	a 400	a 350	492	552	545	537	542	540	533	a 360	330
28	708	668	535	517	548	545	552	a 370	540	532	422	347
29	655	......	553	552	a 310	550	553	543	542	528	427	337
30	a 330	......	532	498	567	550	545	547	537	a 410	427	340
31	690	......	553	......	523	......	a 335	548	......	530	......	322

a Sunday.

Monthly discharge of Presumpscot River at outlet of Sebago Lake, Maine, for 1910.

[Drainage area, 436 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	708	226	624	1.43	1.65
February	708	357	641	1.47	1.53
March	649	278	515	1.18	1.36
April	563	310	508	1.17	1.30
May	567	205	512	1.17	1.35
June	575	307	527	1.21	1.35
July	560	258	508	1.17	1.35
August	555	315	521	1.19	1.37
September	552	306	518	1.19	1.33
October	615	117	493	1.13	1.30
November	535	295	474	1.09	1.22
December	437	125	358	.821	.95
The year	708	117	516	1.18	16.06

SACO RIVER.

GENERAL FEATURES OF AREA DRAINED.

Saco River rises in the White Mountain region of New Hampshire at an elevation of about 1,900 feet above sea level and has a general southeasterly course to the Atlantic Ocean. It is about 105 miles long; the maximum width of its drainage basin is about 30 miles, and its drainage area, comprising 1,720 square miles, lies about equally in Maine and New Hampshire. Ossipee River, the largest tributary of the Saco, enters the main stream at Cornish, Me.

The headwaters of the Saco are in one of the highest and roughest mountain regions in the eastern portion of the United States, with steep wooded slopes and narrow river valleys, and with heavy falls to the mountain streams. The mountains grow gradually lower as the ocean is approached, becoming undulating hills in the central portions of the basin and comparatively flat land near the sea. The southern half of the drainage basin has been practically cleared of forests, but the remainder is still largely wooded. The prevailing rock is granite, which makes excellent building material for dams and foundations. The surface material covering the larger part of the region is sand and gravel.

The mean annual precipitation is about 43 inches. Winter conditions in the mountainous part of the basin are quite rigorous and snowfall usually deep.

The Saco River drainage basin has about 84 square miles of lake surface, of which Great Ossipee and Moose lakes are the most important. In its upper courses the river falls very rapidly, but the regimen of flow is variable and typical of the mountain stream. In the lower part of the basin, particularly below the entrance of Ossipee

River, the stream is more stable in regimen. There are some excellent undeveloped power sites on Saco River, and at Biddeford and Saco are the important developments of the Saco Water Power Co., furnishing power for cotton mills. The Saco is rapidly being developed, as its power is adjacent to Portland and other cities where a good market is available.

At West Buxton is the hydroelectric plant of the Portland Electric Co., built in 1906–7 and developing 4,000 horsepower. About 1¾ miles above, at Bonnie Eagle Falls, is the new hydroelectric plant of the Cumberland County Power & Light Co., providing for 8,000 horsepower development and placed in operation in 1911.

SACO RIVER NEAR CENTER CONWAY, N. H.

This station, which is located at the wooden highway bridge between Center Conway and Redstone, N. H., about 2 miles from each place, about 3 miles below the mouth of Swift River, and 2 miles above the outlet of Conway Lake, was established August 26, 1903, in cooperation with the New Hampshire Forestry Commission. Since 1904 it has been maintained by the United States Geological Survey.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge or by wading.

During the winter months the discharge is so affected by ice that observations are discontinued.

Recent measurements indicate a radical change in conditions of flow. Insufficient measurements have been taken to define the new discharge rating curve.

Information in regard to this station is contained in the annual report of the Maine State Water Storage Commission.

The following discharge measurement was made by W. E. Parsons, from the railroad bridge about 900 feet below the station:

August 16, 1910: Width, 120 feet; area, 915 square feet; gage height, 5.19 feet; discharge, 1,360 second-feet.

Daily gage height, in feet, of Saco River near Center Conway, N. H., for 1910.

[Fred Masterton, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		4.48		7.85	6.12	4.82	3.82	3.32	3.24	3.33	3.36	3.53
2	4.48	4.92		7.94	6.17	4.74	3.70	3.26	3.24	3.34	3.32	3.48
3		5.24		7.22	5.97	4.47	3.70	3.26	3.23	3.37	3.66	3.30
4		7.62		6.86	6.54	4.31	3.69	3.70	3.41	3.38	4.56	3.39
5		7.06		7.38	6.02	4.21	3.73	6.66	3.45	3.37	5.36	3.54
6		6.02	5.97	8.24	5.68	4.55	3.68	4.67	4.02	3.36	4.84	3.53
7			5.28	8.49	5.48	5.35	3.56	4.14	4.56	3.34	4.40	
8			5.24	7.55	5.28	5.00	3.54	4.08	3.97	3.33	4.12	
9	4.53		5.02	6.70	5.20	4.73	3.51	3.88	3.71	3.34	3.94	
10			4.82	6.26	5.34	4.52	3.45	3.72	3.54	3.33	3.87	
11			4.58	6.00	5.24	4.61	3.50	3.81	3.48	3.32	3.82	
12			4.66	5.74	5.02	5.84	3.56	3.88	3.41	3.28	3.76	
13			4.52	5.48	4.92	5.78	3.44	3.71	3.44	3.27	3.74	
14			4.70	5.30	4.79	5.17	3.43	3.58	4.00	3.29	3.70	
15			4.51	5.28	4.72	4.82	3.42	3.50	3.93	3.30	3.65	
16			4.38	4.72	4.68	4.63	3.38	4.98	3.64	3.32	3.60	
17			4.36	5.09	4.59	4.69	3.36	4.19	3.52	3.32	3.58	
18			4.10	5.08	4.56	5.12	3.33	3.80	3.44	3.28	3.56	
19			4.26	5.70	5.46	5.31	3.31	3.73	3.40	3.27	3.55	
20			4.36	7.08	5.02	4.79	3.34	3.76	3.37	3.28	3.46	
21			4.92	7.42	4.77	4.55	3.32	3.59	3.30	3.26	3.68	
22	14.37		4.85	7.50	4.71	4.34	3.52	3.52	3.30	3.26	3.53	
23	8.65		5.06	8.61	4.62	4.28	3.60	3.46	3.30	3.28	3.52	
24	6.88		5.23	7.13	4.60	4.22	3.45	3.42	3.28	3.32	3.50	
25	6.12		6.64	7.17	4.61	4.14	3.38	3.36	3.28	3.32	3.49	
26	5.66		8.32	6.80	4.90	4.01	3.32	3.37	3.36	3.32	3.41	
27	5.33		6.84	9.54	4.70	3.98	3.30	3.28	3.32	3.30	3.48	
28	5.11		6.59	7.62	4.52	3.96	3.26	3.25	3.40	3.35	3.43	
29	5.00		6.77	6.69	4.44	3.93	3.29	3.28	3.58	3.54	3.44	
30	4.83		8.23	6.50	4.32	3.88	3.24	3.26	3.41	3.48	3.50	
31	4.72		8.20		4.38		3.32	3.23		3.40		

NOTE.—Ice was present at this station from Jan. 1 to about Mar. 6 and from about Dec. 5 to 31. Gage readings during these periods probably to water surface. The thickness of ice from January to March varied from 1.7 feet to 0.1 foot.

SACO RIVER AT WEST BUXTON, MAINE.

During October, 1907, a hydroelectric plant was completed at West Buxton, Maine, by the Portland Electric Co. Records of flow at this point have been furnished the United States Geological Survey by J. A. Fleet, engineer for the company.

The dam is of concrete, with a rollway about 300 feet long, and a head of about 25 feet is utilized by three 750-kilowatt units. The discharge is based upon gage readings taken every hour and the results are considered excellent.

Information in regard to this station is contained in the annual reports of the Maine State Water Storage Commission.

Daily discharge, in second-feet, of Saco River at West Buxton, Maine, for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	764	2,006	3,772	9,322	a10,790	2,622	1,761	857	763	727	811	875
2	a496	1,685	4,639	10,114	10,298	3,423	1,663	844	673	a 626	721	813
3	939	1,599	4,900	a10,100	9,422	3,253	a 945	566	723	1,032	740	1,008
4	905	1,396	5,020	10,914	9,025	3,429	1,201	658	a 460	1,000	737	a 424
5	841	1,413	5,074	10,203	8,540	a3,049	1,529	1,039	797	818	1,053	842
6	803	a1,019	a4,806	9,969	7,602	3,377	1,576	1,398	1,193	693	a 693	930
7	838	1,381	5,551	9,668	7,012	3,454	1,226	a1,407	774	823	1,694	814
8	879	1,318	6,043	9,421	a 6,837	3,369	1,114	1,872	792	877	1,608	749
9	a 570	1,277	5,698	9,533	6,243	3,449	1,091	1,667	1,046	a 457	1,541	581
10	1,029	1,218	5,500	a 9,331	5,799	3,452	a 857	1,510	1,149	750	1,519	443
11	929	1,073	5,356	9,214	5,323	3,562	856	1,519	a 714	806	1,318	a 208
12	900	1,050	5,159	8,320	4,989	a3,275	995	1,357	1,193	646	1,221	638
13	868	a 810	a4,678	7,597	4,617	4,365	781	1,285	1,212	694	a1,131	799
14	835	1,128	5,218	6,871	4,321	4,108	766	a 896	1,039	667	1,294	654
15	838	1,051	5,142	6,123	a 3,809	4,128	898	1,472	1,239	735	1,458	909
16	a 465	1,009	5,017	5,611	4,915	3,909	897	1,132	1,099	a 481	1,083	1,113
17	811	991	4,917	a 4,802	3,839	2,698	a 698	1,109	1,039	831	877	733
18	776	1,033	4,544	4,919	3,509	2,887	1,352	1,197	a 816	782	1,182	a 472
19	833	965	4,177	2,721	3,652	a2,925	1,203	1,221	1,424	712	1,025	975
20	845	a 681	a3,868	4,796	3,612	3,545	1,223	1,482	1,125	735	a 445	885
21	833	994	4,784	5,195	3,435	3,218	867	a1,144	1,137	638	1,149	799
22	1,235	963	4,940	5,586	a 3,047	2,892	959	1,618	899	538	1,096	786
23	a2,366	1,019	5,906	6,835	3,351	2,649	961	1,532	913	a 265	847	717
24	1,356	1,020	5,734	a 6,866	2,921	2,475	a 639	1,300	899	971	522	940
25	2,294	1,040	6,197	7,701	2,800	2,482	1,164	1,186	a 493	792	936	a 433
26	2,085	1,100	7,422	8,092	2,757	a2,157	1,120	1,045	1,029	709	843	743
27	1,988	a 752	a7,221	13,148	2,610	2,391	990	601	921	759	a 568	1,071
28	1,999	1,397	8,238	10,761	2,606	2,720	874	a 729	770	476	1,110	890
29	2,053	....	8,137	10,741	a 2,100	1,893	809	1,088	657	693	940	936
30	a1,832	....	8,734	10,900	2,565	1,757	845	1,014	909	a 359	834	1,056
31	2,155	....	9,104	....	2,358	....	a 521	673	....	874	....	1,309

a Sunday.

Monthly discharge of Saco River at West Buxton, Maine, for 1910.

[Drainage area, 1,550 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Minimum.	Maximum.	Mean.	Per square mile.	
January	2,370	465	1,170	0.755	0.87
February	2,010	681	1,160	.748	.78
March	9,100	3,770	5,660	3.65	4.21
April	13,100	2,720	8,180	5.28	5.89
May	10,800	2,100	4,990	3.22	3.71
June	4,360	1,760	3,100	2.00	2.23
July	1,760	521	1,040	.671	.77
August	1,870	566	1,170	.755	.87
September	1,420	460	930	.600	.67
October	1,030	265	709	.457	.53
November	1,690	445	1,030	.655	.74
December	1,310	208	792	.511	.59
The year	13,100	208	2,490	1.61	21.86

MERRIMAC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Merrimac River is formed near Franklin, N. H., by the union of Pemigewasset and Winnepesaukee rivers. The Winnepesaukee is a short stream flowing southwestward from Lake Winnepesaukee; the Pemigewasset is the outlet of Profile Lake in Franconia, N. H., 50 to 60 miles north of Franklin and less than 10 miles from Mount Washington. From Franklin the Merrimac flows southward for about 60 miles, crosses into Massachusetts, and a few miles below the State line, as it approaches the city of Lowell, turns abruptly and runs for some 40 miles to the ocean at Newburyport. Its total length is about 110 miles. Of its 5,015 square miles of drainage area, about 1,200 square miles is in Massachusetts, 211 square miles lying in the Nashua, Sudbury, and Lake Cochituate drainage areas, from which water is permanently diverted for the supply of the metropolitan district adjacent to Boston.

Important tributaries of the Merrimac, other than the headwater streams, are Contoocook, Suncook, Piscataquog, Souhegan, and Nashua rivers. Nashua River lies nearly all in Massachusetts, but enters the Merrimac near Nashua, N. H. The other tributaries mentioned are all in New Hampshire.

The headwaters of the Pemigewasset reach an elevation approximately 2,000 feet above the sea; at Franklin the river is at an elevation of about 270 feet. The upper portion of the basin is rough and mountainous and very largely in forest. Below Franklin the country is more uniform in topography and much of it is farm land.

The main river flows in reaches of moderate slope separated by fall over rock ledges. It is navigable as far as Haverhill, and for small boats as far as Lawrence.

The mean annual rainfall in this basin is about 42 inches, ranging from about 46 inches at Lowell to about 38 inches at Plymouth, but is probably much greater in the mountainous regions near the head of the Pemigewasset than elsewhere in the area. During the winter the streams are generally frozen, and especially in the northern parts of the region there is usually a heavy fall of snow.

The basin of the Merrimac is well supplied with natural facilities for storage, the combined area of lakes and ponds amounting to approximately 183 square miles. About 105 square miles of this is contained in Lake Winnepesaukee—next to Moosehead Lake the largest body of water in New England—which has about 4 feet of available depth of storage, corresponding to somewhat less than 8 billion cubic feet.

An act approved April 7, 1911, provides that between June 1 and September 15 of any year not more than an average of 250 second-feet for any week shall be drawn from the lake when the level is 21 inches or less. From records maintained from 1860 to date it appears that the highest gage height recorded is 44 inches, which occurs when the lake is full. This stage has been recorded during 30 years since 1860. The lowest recorded stage was 11¼ inches, and occurred in February, 1911, the total recorded range thus being 55¼ inches.

Squam Lake, tributary to the Pemigewasset through Squam River at Ashland, is nearly 15 square miles in area. This lake can be drawn down 50 inches. Newfoundland Lake, with half the water area of Squam Lake, is also tributary to the Pemigewasset. It can be drawn down 58 inches.

The storage on all of these lakes and on numerous smaller ones is controlled by users of water power on the river and greatly improves the regimen of low-water flow. In a general way, the most favorable opportunities for storage on the Merrimac are being utilized, but in the upper portions of the drainage basin there are still many unutilized reservoir sites.

The Merrimac is world famous for its developed water powers. Lawrence, Lowell, and Manchester are great industrial centers, largely devoted to cotton and woolen manufactures, that owe their location to the excellent water power available at their sites. There are only one or two sites remaining for power development on the main river, but on the tributaries, especially the Pemigewasset and its tributaries, there is a large amount of unutilized fall. The longest available run-off record of flow on the Merrimac is that at Lawrence, extending back to 1890; the driest year was 1893; the wettest 1890; the total flow during these two years was about in the ratio of 1 to 1.93.

PEMIGEWASSET RIVER AT PLYMOUTH, N. H.

This station, which is located about 40 feet above the covered wooden highway bridge a short distance below the mouth of Bakers River in the town of Plymouth, was established September 5, 1903, in cooperation with the New Hampshire Forestry Commission.

Two gages have been maintained at this point. From September 4, 1903, to June 30, 1907, the station was maintained by the United States Geological Survey and readings were taken with the chain gage. Since the latter date gage heights have been furnished by the Locks & Canals Co., of Lowell, Mass., from readings taken on the staff gage.

The nearest dam is at the pulp mills at Livermore Falls, 3 miles upstream. Downstream the nearest dam is at Franklin, 25 miles distant.

The datum of the chain gage, which is attached to the upstream side of the bridge, has remained the same during the maintenance of the station. The datum of the staff gage belonging to the Locks &

Canals Co., which is about 40 feet above the bridge and on the same side of the river as the chain gage, is 1.11 feet higher than the chain-gage datum. All gage readings prior to 1910 were reduced to chain-gage datum. At low stages the difference in reading between the two gages is 1.11 feet, and at 8.1 feet (staff) the difference is 0.99 feet. Owing to the slight difference in relation of stage to discharge between the locations of the two gages and the fact that gage readings are now taken on the staff gage, it was considered advisable to publish all future gage heights, beginning with 1910, exactly as received from the Locks & Canals Co., namely, as referred to the staff-gage datum.

Discharge measurements are made from the bridge at ordinary and high stages. At low water the right channel is measured from the bridge and the left channel is measured by wading.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge data are good, except at low stages, when the control of the flow at Livermore Falls affects the accuracy of the computed values of daily discharge. A good discharge rating curve has been developed.

Prior to 1903 a record of gage heights at Plymouth was obtained by the Locks & Canals Co., extending back to 1886, and estimates of discharge of the river were made covering this period and published in Water-Supply Paper 124, pages 97–101. At the time of publishing these estimates of discharge it was believed that conditions of flow were stable.

Two radical changes in conditions of flow have since occurred, one in 1905 and one in 1910, the discharge at a stage of 1.2 feet (chain gage) having varied as follows: 1904, discharge 110 second-feet; 1905, discharge 158 second-feet; 1910, discharge 213 second-feet. Hence, these earlier estimates of discharge should be used with caution for low stages, although they are probably essentially correct for medium and high stages.

The following discharge measurement was made by R. H. Bolster and C. C. Covert:

November 21, 1910: Width, 152 feet; area, 244 square feet; gage height,[1] 0.51 foot; discharge, 379 second-feet.

Daily gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.25	1.4	7.5	6.2	......	3.1	1.0	0.6	0.25	0.85	0.65	0.6
2	......	1.25	8.9	6.0	3.0	2.9	.9	.5	.33	......	.65	.5
3	1.0	1.1	7.0	......	2.8	2.4	......	.42	.33	.9	.6	.5
4	.9	1.0	5.7	4.4	4.0	2.1	.75	.42	......	.9	3.0	......
5	.9	1.5	4.0	5.0	3.4	......	.85	6.1	.85	.75	2.5	.65

[1] Staff gage; chain gage read 1.62 feet.

Daily gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
6	1.15			6.2	3.1	1.6	0.65	2.2	2.6	0.65		0.65
7	1.1	1.8	3.1	7.6	2.4	2.8	.65		3.0	.6	1.8	.6
8	1.1	1.8	4.4	5.6		2.7	.6	1.25	1.9	.5	1.4	.6
9		2.0	3.0	4.2	2.1	2.4	.6	1.0	1.25		1.25	.85
10	1.5	1.7	2.5		1.9	2.2		.9	1.1	.6	1.15	.9
11	1.4	1.5	2.1	3.1	2.3	1.8	.5	.85		.5	1.1	
12	1.25	1.25	2.0	2.6	2.0		.5	1.1	.9	.5	1.0	.65
13	1.35			2.5	1.8	3.2	.42	1.0	.75	.42		.6
14	1.35	1.15	1.9	2.2	1.8	2.6	.42		1.0	.42	.9	1.0
15	1.15	1.5	1.6	2.4		2.2	.33	.75	1.35	.33	.85	.9
16		1.4	1.5	2.2	1.7	1.9	.42	2.2	1.1		.85	.85
17	.75	1.4	1.35		1.6	1.7		1.15	.85	.5	.9	.85
18	.65	1.5	1.15	2.1	1.4	2.2	.5	1.1		.42	.85	
19	1.35	1.5	.9	3.2	2.2		.33	.9	.75	.42	.65	.65
20	1.25			4.5	2.0	2.0	.33	1.25	.65	.33		.9
21	1.25	1.4	2.1	4.6	1.8	1.8	.33		.65	.42	.6	.9
22	8.5	1.6	1.9	3.8		1.7	.25	.85	.6	.33	.6	.85
23		2.5	2.4	5.8	1.7	1.35	.33	.65	.6		.5	.75
24	3.2	2.2	2.5		1.6	1.4		.6	.5	.5	.65	3.0
25	3.2	2.0	3.7	3.8	1.6	1.25	.25	.6		.5	.65	
26	2.5	1.7	7.5	3.4	2.2		.25	.5	.6	.42	.5	1.5
27	2.1			7.8	2.5	1.0	.25	.5	.5	.6		1.1
28	1.9	1.9	4.1	5.2	2.2	1.7	.25		1.15	.6	.5	2.1
29	1.7		4.2	3.6		1.5	.5	.33	1.5	1.15	.42	2.2
30			6.6	3.4	2.1	1.25	.42	.25	1.0		.6	2.3
31	1.5		6.4		1.8			.25		.75		2.0

NOTE.—All gage heights for 1910 were taken from the record of the Locks & Canals Co. and refer to the staff gage.

Ice existed at the station from Jan. 1 to about Jan. 21, from about Feb. 1 to about Mar. 6, and from about Dec. 9 to 31. It is not known whether the gage readings were taken to water surface or to the top of the ice.

Daily discharge, in second-feet, of Pemigewasset River at Plymouth, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				7,000	2,670	2,560	665	425	269	570	452	425
2				6,660	2,440	2,340	600	375	301	585	452	375
3				5,420	2,230	1,820	555	339	301	600	425	375
4				4,190	3,640	1,530	510	339	436	600	2,440	414
5				5,060	2,900	1,320	570	6,830	570	510	1,920	452
6				7,000	2,560	1,100	452	1,620	2,020	452	1,590	452
7			2,560	9,590	1,820	2,230	452	1,230	2,440	425	1,260	425
8			4,190	6,000	1,680	2,120	425	835	1,350	375	945	425
9			2,440	3,920	1,530	1,820	425	665	835	400	835	
10			1,920	3,240	1,350	1,620	400	600	730	425	765	
11			1,530	2,560	1,720	1,260	375	570	665	375	730	
12			1,440	2,020	1,440	1,960	375	730	600	375	665	
13			1,400	1,920	1,260	2,660	339	665	510	339	632	
14			1,350	1,620	1,260	2,020	339	588	665	339	600	
15			1,100	1,820	1,220	1,620	301	510	908	301	570	
16			1,020	1,620	1,180	1,350	339	1,620	730	338	570	
17			908	1,580	1,100	1,180	357	765	570	375	600	
18			765	1,530	945	1,620	375	730	540	339	570	
19			600	2,660	1,620	1,530	301	600	510	339	452	
20			1,160	4,330	1,440	1,440	301	835	452	301	438	
21			1,530	4,470	1,260	1,260	301	702	452	339	425	
22	11,400		1,350	3,380	1,220	1,180	269	570	425	301	425	
23	6,000		1,820	6,320	1,180	908	301	452	425	338	375	
24	2,660		1,920	4,850	1,100	945	284	425	375	375	452	
25	2,660		3,260	3,380	1,100	835	269	425	400	375	452	
26	1,920		9,400	2,900	1,620	750	269	375	425	339	375	
27	1,530		6,590	9,980	1,920	665	269	375	375	425	375	
28	1,350		3,780	5,360	1,620	1,180	269	338	765	425	375	
29	1,180		3,920	3,140	1,580	1,020	375	301	1,020	765	339	
30	1,100		7,710	2,900	1,530	835	339	269	665	638	425	
31	1,020		7,350		1,260		382	269		510		

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge for Sundays and other days when the gage was not read was interpolated, except that for Jan. 23, which was estimated from the discharge at Franklin Junction. The accuracy of the computed daily discharge at low stages is affected by control of the discharge at the pulp mills at Livermore Falls, about 3 miles above Plymouth.

Monthly discharge of Pemigewasset River at Plymouth, N. H., for 1910.

[Drainage area, 615 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	11,400	....	1,190	1.93	2.22	D.
February	....	....	530	.862	.90	D.
March	9,400	600	3,240	5.27	6.08	C.
April	9,980	1,530	4,210	6.85	7.64	A.
May	3,640	945	1,660	2.70	3.11	A.
June	2,660	665	1,490	2.42	2.70	A.
July	665	269	380	.618	.71	B.
August	6,830	269	818	1.33	1.53	A.
September	2,440	269	691	1.12	1.25	A.
October	765	301	426	.693	.80	B.
November	2,440	339	698	1.13	1.26	A.
December	....	....	504	.820	.94	D.
The year	11,400	....	1,320	2.15	29.14	

NOTE.—The discharge for the periods during which ice was present was estimated by means of climatological records and the discharge records at Franklin Junction and Garvins Falls.
Mean discharge Jan. 1 to 21, estimated, 295 second-feet; practically constant. The discharge for February varied from about 350 to 1,000 second-feet. Mean discharge Mar. 1 to 6, estimated, 4,920 second-feet, ranging from 8,000 to 3,000 second-feet. Mean discharge Dec. 9 to 31, estimated, 534 second-feet, ranging from 300 to 1,500 second-feet.

MERRIMAC RIVER AT FRANKLIN JUNCTION, N. H.

This station, which is located at the wooden bridge near Franklin Junction, about 1 mile below the union of Pemigewasset and Winnepesaukee rivers, was established July 8, 1903.

Since June 30, 1907, gage heights at this point have been furnished by the Locks & Canals Co., of Lowell, Mass.

The records at this station, in conjunction with those at Garvins Falls and Lawrence, furnish fairly complete information regarding the daily distribution of flow of the main river.

There are dams on both Pemigewasset and Winnepesaukee rivers within 2 miles of the station. The nearest dam downstream is at Sewall Falls, near Concord, distant some 15 miles.

The datum of the chain gage attached to the railroad bridge has remained the same since the establishment of the station.

The operation of mills above the station causes more or less fluctuation in stage each working day. It is not known how much this affects the reliability of the records.

Discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge data are good; a good discharge rating curve has been developed for this station.

The following discharge measurement was made by C. C. Covert and R. H. Bolster:

Nov. 22, 1810: Width, 214 feet; area, 700 square feet; gage height, 3.99 feet; discharge, 1,050 second-feet.

Daily gage height, in feet, of Merrimac River at Franklin Junction, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.15	5.55	......	8.80	......	5.85	4.38	4.18	3.92	4.32	4.00	4.00
2	......	5.48	7.90	8.45	6.35	5.92	4.30	4.20	3.90	......	3.90	4.02
3	4.22	5.42	7.05	......	6.20	5.82	......	4.22	3.95	4.22	4.15	4.02
4	4.15	5.38	6.72	7.25	......	5.78	......	4.22	......	4.25	5.40	3.75
5	4.10	5.30	6.68	6.85	6.80	......	4.30	4.70	......	4.10	5.38	3.92
6	4.30	......	......	7.45	6.28	5.62	4.28	4.80	......	4.08	5.00	3.90
7	4.32	5.42	6.52	......	6.22	5.72	4.30	......	......	4.20	5.18	3.95
8	4.30	4.72	6.40	8.25	......	5.80	4.28	4.72	......	4.12	5.02	3.88
9	......	......	6.15	7.55	6.22	5.88	4.32	4.55	4.20	3.85	4.90	3.85
10	......	4.62	6.12	......	6.08	5.80	......	4.52	4.12	4.10	4.82	3.90
11	......	4.52	6.02	6.22	5.95	5.98	4.30	4.42	......	4.05	4.75	......
12	......	4.5	5.90	6.15	5.92	......	4.25	4.45	4.05	3.95	4.68	3.82
13	4.32	......	......	6.02	5.50	5.90	4.25	4.40	4.02	3.90	4.25	3.80
14	4.30	4.52	5.98	5.88	5.38	5.62	4.22	......	4.10	3.88	4.42	3.82
15	4.32	4.58	5.90	5.72	......	5.35	4.20	4.35	4.10	4.00	4.40	3.80
16	......	4.60	5.82	5.62	5.20	......	4.18	4.45	4.12	......	4.35	3.82
17	4.30	4.52	5.70	......	5.12	5.18	......	4.40	4.02	3.85	4.28	3.82
18	4.35	4.55	5.72	5.25	5.02	5.05	4.20	4.52	......	3.92	4.20	......
19	4.20	4.48	5.62	5.30	4.95	......	4.15	4.50	4.10	4.00	4.12	3.80
20	4.22	......	......	6.52	......	4.98	4.12	4.40	4.12	4.02	......	3.78
21	4.20	4.68	5.62	7.00	......	4.90	4.10	......	4.02	4.05	4.02	3.75
22	6.30	4.60	5.85	6.68	......	4.80	4.05	4.38	4.00	4.02	4.00	3.80
23	11.10	4.62	5.90	6.05	4.82	4.78	......	4.30	3.98	4.10	4.00	3.88
24	7.05	4.70	6.20	......	5.10	4.70	......	4.22	3.92	4.10	3.92	......
25	6.15	4.75	......	5.90	5.02	4.72	......	4.10	......	4.05	4.00	......
26	6.15	......	10.00	6.50	4.95	......	......	4.05	3.85	4.12	3.98	......
27	5.95	......	......	10.50	5.80	4.65	4.18	4.00	3.98	4.02	3.75	4.38
28	5.72	......	7.75	8.75	5.65	4.60	4.20	......	4.02	4.05	3.92	4.42
29	5.65	......	7.10	7.40	......	4.52	4.22	3.95	4.12	4.00	4.00	4.38
30	......	......	9.58	......	......	4.48	4.20	4.02	4.42	3.80	3.92	4.40
31	5.62	......	9.50	......	5.38	......	......	3.92	......	3.98	......	4.35

NOTE.—Ice was present at this station from Jan. 1 to about Jan. 21, from about Jan. 26 to about Feb. 13, and from about Dec. 7 to about Dec. 26. It is not known whether the readings were to water surface or to the top of the ice.

Daily discharge, in second-feet, of Merrimac River at Franklin Junction, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	4,000	9,400	5,290	3,740	1,520	1,280	972	1,450	1,060	1,060
2	......	......	7,600	8,700	4,630	3,860	1,420	1,300	950	1,380	950	1,080
3	......	......	5,940	7,510	4,360	3,690	1,420	1,320	1,000	1,320	1,240	1,080
4	......	......	5,310	6,320	4,910	3,630	1,420	1,320	1,100	1,360	3,000	800
5	......	......	5,230	5,560	5,460	3,490	1,420	1,950	1,200	1,180	2,970	972
6	......	......	5,010	6,700	4,500	3,350	1,400	2,090	1,700	1,160	2,380	950
7	......	......	4,940	8,500	4,400	3,520	1,420	2,040	1,800	1,300	2,650	......
8	......	......	4,720	8,300	4,400	3,660	1,400	1,980	1,500	1,200	2,410	......
9	......	......	4,270	6,900	4,400	3,800	1,450	1,740	1,300	900	2,230	......
10	......	......	4,220	5,650	4,140	3,660	1,440	1,710	1,200	1,180	2,120	......
11	......	......	4,040	4,400	3,920	3,970	1,420	1,580	1,160	1,120	2,020	......
12	......	......	3,830	4,270	3,860	3,900	1,360	1,620	1,120	1,000	1,920	......
13	......	......	3,900	4,040	3,160	3,830	1,360	1,550	1,080	950	1,360	......
14	......	1,710	3,970	3,800	2,970	3,350	1,320	1,520	1,180	930	1,580	......
15	......	1,780	3,830	3,520	2,820	2,920	1,300	1,480	1,180	1,060	1,550	......
16	......	1,810	3,690	3,350	2,680	2,780	1,280	1,620	1,200	980	1,480	......
17	......	1,710	3,490	3,060	2,560	2,650	1,290	1,550	1,080	900	1,400	......
18	......	1,740	3,520	2,760	2,410	2,460	1,300	1,710	1,130	972	1,300	......
19	......	1,650	3,350	2,840	2,300	2,400	1,240	1,680	1,180	1,060	1,200	......
20	......	1,780	3,350	4,940	3,000	2,350	1,200	1,550	1,200	1,080	1,140	......

Daily discharge, in second-feet, of Merrimac River at Franklin Junction, N. H., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	......	1,920	3,350	5,840	2,600	2,230	1,180	1,540	1,080	1,120	1,080	......
22	4,540	1,810	3,740	5,230	2,400	2,090	1,120	1,520	1,060	1,080	1,060	......
23	14,200	1,840	3,830	4,090	2,120	2,060	1,300	1,420	1,040	1,180	1,060	......
24	5,940	1,950	4,360	5,000	2,530	1,950	1,200	1,320	972	1,180	972	......
25	4,270	2,020	8,130	3,830	2,410	1,980	1,200	1,180	936	1,120	1,060	......
26	......	2,100	11,900	4,900	2,300	1,930	1,200	1,120	900	1,200	1,040	......
27	......	2,100	9,600	13,000	3,660	1,880	1,280	1,060	1,040	1,080	800	1,520
28	......	2,100	7,300	9,300	3,400	1,810	1,300	1,030	1,080	1,120	972	1,580
29	......	......	6,030	6,600	3,260	1,710	1,320	1,000	1,200	1,060	1,060	1,520
30	......	......	11,000	5,940	3,110	1,650	1,300	1,080	1,580	850	972	1,550
31	......	......	10,900	......	2,970	......	1,290	972	......	1,040	......	1,480

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. Discharge interpolated for Sundays and other days when the gage was not read, except Feb. 26 to Mar. 1, Apr. 7 and 24, May 20 to 22, July 23 to 26, and Sept. 4 to 8, when the discharge was estimated from the discharge record at Garvins Falls.

Monthly discharge of Merrimac River at Franklin Junction, N. H., for 1910.

[Drainage area, 1,460 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	14,200	....	2,040	1.40	1.61	C.
February	....	....	1,680	1.15	1.20	C.
March	11,900	3,350	5,430	3.72	4.29	B.
April	13,000	2,760	5,810	3.98	4.44	B.
May	5,460	2,120	3,450	2.36	2.72	B.
June	3,970	1,650	2,880	1.97	2.20	B.
July	1,520	1,120	1,320	.904	1.04	B.
August	2,090	972	1,480	1.01	1.16	B.
September	[a]1,800	900	1,170	.801	.89	B.
October	1,450	850	1,110	.760	.88	B.
November	3,000	800	1,530	1.05	1.17	B.
December	1,580	....	903	.618	.71	C.
The year	14,200	....	2,400	1.64	22.31	

[a] Estimated.

NOTE.—Discharge for the periods during which ice was present, estimated from the discharge record at Garvins Falls and on climatologic records.

Mean discharge Jan. 1 to 21 estimated 910 second-feet; nearly constant.
Mean discharge Jan. 26 to 31 estimated 2,550 second-feet; ranging from 3,500 to 2,000 second-feet.
Mean discharge Feb. 1 to 13 estimated 1,460 second-feet; practically constant.
Mean discharge Dec. 7 to 26 estimated 720 second-feet; nearly constant.
The accuracy is marked low because there is reason to believe that the daily gage readings by the observer, from which the discharge was derived, were not good.

MERRIMAC RIVER AT GARVINS FALLS, N. H.

The power at Garvins Falls, 4 miles below Concord, is one of the best on Merrimac River. There has been a dam at this point since 1815, first in connection with the Old Bow canal, and later to furnish power for a pulp mill. This privilege has since become the property of the Manchester Traction, Light & Power Co., and has been more completely developed. During 1903–4 an overfall dam of the ogee type, somewhat similar in cross section to the dam at Holyoke, was completed. This dam is 550 feet long between abutments and about 800 feet over all, including head gates, and is of stone masonry, substantially built. A canal has been completed which is about 500 feet long and 74 feet wide at the water line, and wasteways are provided from the sides of this, one 90 feet long at elevation 102 (the main crest of the dam being taken as elevation 100) and another 45 feet long at elevation 103. A waste gate 10 feet wide and capable of being lowered to elevation 93 is also provided, for use especially in floating out any obstructions which lodge against the racks. The new dam and head gates to the canal are situated about 800 feet downstream from the old dam, which was destroyed on the completion of the new structure. There are six triplex turbines, of somewhat over 1,000 horsepower each, and one small duplex turbine, of 75 horsepower, used in running exciters. Each large unit has three 39-inch runners, mounted on a horizontal shaft, which revolves at 180 revolutions a minute. Two of the wheels in each set discharge through a common T center and draft tube near the fore-bay wall. The third wheel is set opposite a quarter turn at the downstream end of the casing and discharges through this quarter turn into a smaller draft tube. The top of the penstock opening is at elevation 95.5; the lower ends of the draft tubes are horizontal and are about 2 feet below the level of usual tail water. The gates for the runners are of the plain cylindrical pattern, without fingers, and are controlled by governors. The average head on the wheels is about 29 feet, and there are six 650-kilowatt 3-phase generators direct connected with the turbines. The power developed is transmitted at 12,000 volts tension to Manchester, about 14 miles away, where it enters a substation and is transformed to a lower voltage and through a distributing switchboard utilized for light and power. The Garvins Falls station is one of a system of three water-power plants and one steam-power plant operated by this company.

Careful records of the pond and tail-race levels, wheel openings, etc., have been kept by the company since the completion of the new dam in 1904, and have been furnished for computations of flow by J. Brodie Smith, manager. The original computations for 1910 have been furnished by Hollis French and Allen Hubbard, consulting engineers for the power company. A number of current-meter measurements have been made from time to time by the hydrographers of the Survey for the purpose of rating turbines and to assist in computing flow over the dam.

Conditions are favorable at this station for accurate records of discharge. The flow over the dam is affected somewhat by ice during the winter.

The maximum daily discharge during the maintenance of the station occurred March 31, 1905, and was about 33,970 second-feet. Discharge for the minimum week occurred December 17 to 23, 1910, and averaged 800 second-feet.

Daily discharge, in second-feet, of Merrimac River at Garvins Falls, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	953	2,490	5,297	14,221	a7,856	2,591	2,206	1,289	1,031	1,541	1,273	1,596
2	a667	2,174	12,934	13,120	6,958	3,594	1,430	1,436	967	a1,071	1,161	1,604
3	1,450	2,468	14,018	a12,295	6,479	3,459	a1,352	1,568	1,107	1,481	1,309	1,416
4	1,324	2,166	12,564	8,172	5,896	3,615	1,355	1,619	a769	1,360	1,446	a807
5	1,373	2,098	9,982	8,040	7,648	a2,538	1,598	2,260	1,094	1,469	2,626	1,587
6	1,396	a1,654	a9,485	8,937	6,729	2,465	1,659	4,013	1,161	1,612	a2,624	1,410
7	1,346	1,759	8,402	10,750	5,611	3,367	1,577	a2,351	2,137	1,374	2,628	1,324
8	1,222	2,013	10,161	10,931	a4,946	4,000	1,545	1,867	2,440	1,305	2,217	1,145
9	a731	2,197	10,109	8,625	4,046	3,981	1,345	1,945	2,082	a730	2 042	1,285
10	1,131	2,195	8,682	a6,395	3,964	3,418	a1,218	1,850	1,784	1,144	2,010	1,141
11	1,211	2,268	5,937	5,280	4,260	3,115	1,661	1,904	a1,277	1,341	1,970	a771
12	1,683	2,184	6,086	4,518	3,934	a3,624	1,446	1,798	1,545	1,242	1,859	1,246
13	1,477	a2,099	a5,778	4,314	3,668	4,817	1,467	1,686	1,589	989	a1,187	1,241
14	1,384	2,111	5,531	3,839	3,267	5,046	1,289	a1,248	1,615	1,207	1,909	1,042
15	1,264	2,071	4,745	3,499	a3,127	3,961	1,114	1,056	1,720	1,047	1,922	796
16	a918	2,126	4,888	3,246	3,177	3,322	1,273	1,662	1,785	a740	1,735	917
17	1,366	2,268	4,532	a2,997	2,968	3,221	a884	2,039	1,741	1,194	1,540	895
18	1,467	2,200	3,608	2,879	2,718	3,391	1,363	1,919	a1,183	1,135	1,510	a728
19	1,317	2,302	4,105	3,471	2,887	a4,358	1,232	1,820	1,752	965	1,353	626
20	1,405	a2,285	a4,202	6,959	3,814	3,747	1,218	1,725	1,511	1,135	a549	788
21	1,298	2,206	4,687	7,267	3,301	3,260	1,425	a1,278	1,190	1,123	1,693	924
22	4,065	2,068	5,498	6 353	a3,267	2,671	1,415	1,688	1,245	1,070	1,755	826
23	a12,613	2,766	5,966	7,646	2,861	2,504	1,187	1,594	1,360	a663	1,600	810
24	13,020	2,968	6,372	a9,755	2,945	2,333	a1,023	1,588	1,065	1,115	746	1,088
25	8,261	3,158	7,430	7,062	2,822	2,229	1,581	1,230	a822	1,241	1,627	a677
26	6,270	3,010	12,523	6,607	3,070	a1,831	1,288	1,228	1,211	1,143	1,445	734
27	5,007	a3,157	a11,847	10,064	3,699	1,856	1,291	1,114	1,300	1,376	a862	1,470
28	4,111	3,272	12,823	12,761	3,583	1,783	1,302	a673	1,219	1,235	1,428	1,858
29	3,773	....	9,948	11,195	a2,851	2,050	1,261	1,155	1,182	1,199	1,711	1,611
30	a3,020	....	12,550	7,939	2,492	2,500	1,165	1,155	1,277	a686	1,497	1,998
31	2,867	....	13,927	....	2,403	....	a1,007	1,159	....	1,278	....	1,742

a Sunday.

Monthly discharge of Merrimac River at Garvins Falls, N. H., for 1910.

[Drainage area, 2,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	13,020	667	2,880	1.23	1.42
February	3,272	1,654	2,350	1.00	1.04
March	14,018	3,608	8,210	3.51	4.05
April	14,221	2,879	7,640	3.26	3.64
May	7,856	2,403	4,100	1.75	2.02
June	5,046	1,783	3,150	1.35	1.51
July	2,206	884	1,360	.581	.67
August	4,013	673	1,640	.701	.81
September	2,440	769	1,410	.603	.67
October	1,612	663	1,170	.500	.58
November	2,628	549	1,640	.701	.78
December	1,998	626	1,160	.496	.57
The year	14,221	549	3,060	1.31	17.76

MERRIMAC RIVER AT LAWRENCE, MASS.

Records of flow of the Merrimac at Lawrence have been kept for more than 50 years, but have been published only since 1890. Data in regard to the flow are furnished by R. A. Hale, principal assistant engineer of the Essex Water Power Co.

The station is located at the dam of the Essex Co. in Lawrence, and a careful record is kept of the flow over the dam and through the various wheels and gates in connection with the sale of power. The nearest dam on the river upstream is at Lowell, about 12 miles away, while a short distance below the Lawrence dam the river is within reach of tidal effect at high tide.

Water is diverted from the drainage basins of Sudbury and Nashua rivers for use by the metropolitan district in the vicinity of Boston, but during a portion of the year water is wasted into the Merrimac at these diversion dams, consequently the drainage area is somewhat variable.

The drainage areas are as follows:

	Square miles.
Total of Merrimac River drainage basin above Lawrence	4,663
Nashua River drainage basin above gaging station at Clinton, Mass.	118
Sudbury River drainage basin, Framingham, dam No. 1	75
Cochituate River drainage basin	18
Total of Nashua, Sudbury, and Cochituate river drainage basins.	211
Net drainage basin of Merrimac River, excluding Nashua, Sudbury, and Cochituate river basins	4,452

The quantity as measured at Lawrence includes the water from Sudbury, Nashua, and Cochituate rivers, and in getting the absolute yield of the river this should be considered in reference to the drainage areas, either by deducting it from the Merrimac flow and using the net area and the net flow of the Merrimac, or by getting the total yield of both the Sudbury and Nashua rivers with the Merrimac and using the total area.

The accompanying tables, furnished by Mr. Hale, give the flow of the Merrimac at Lawrence, and also the quantity wasted from the Sudbury and Nashua drainage basins into the Merrimac, the latter being based on data furnished by the Metropolitan Water and Sewerage Board of Boston.

Much care is taken in procuring the base data used and in making computations, and these records are regarded as excellent.

The maximum daily discharge during the maintenance of the station occurred in March, 1896, and was about 82,150 second-feet, this being the greatest flood since that of 1846. The discharge for the minimum week occurred December 20 to 26, 1910, and averaged 1,060 second-feet. It should be observed, however, that this week included two storage days.

Average weekly discharge, in second-feet, arranged in order of dryness, of Merrimac River at Lawrence, Mass., for 1910.

[Total drainage area 4,663 square miles.]

Week ending Sunday—	Merrimac River at Lawrence (4,663 square miles).	Wasting into Merrimac from—				Net yield of Merrimac River from 4,452 square miles.	
		Nashua River at Clinton (118 square miles).	Sudbury River at dam No. 1 (75 square miles).	Lake Cochituate, Bannister Brook (18 square miles).	Total waste of these basins (211 square miles).	Per week.	Per square mile.
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
Dec. 18	1,131	2	8	0	10	1,121	0.252
25	1,187	3	21	0	24	1,163	.261
Oct. 30	1,251	3	2	0	5	1,246	.280
Sept. 4	1,279	3	2	0	5	1,274	.286
Oct. 23	1,332	6	2	0	8	1,324	.297
16	1,451	2	2	0	4	1,447	.325
Nov. 27	1,484	2	9	0	11	1,473	.331
Oct. 9	1,487	4	2	0	6	1,481	.333
Dec. 11	1,572	3	14	0	17	1,555	.349
July 24	1,577	4	2	0	6	1,571	.353
Oct. 2	1,614	3	2	0	5	1,609	.361
July 31	1,619	3	2	0	5	1,614	.363
Nov. 6	1,619	4	8	0	12	1,607	.361
Sept. 25	1,633	3	2	0	5	1,628	.366
Jan. 9	1,652	2	48	0	50	1,602	.360
Dec. 4	1,851	3	13	0	16	1,835	.412
Sept. 18	1,860	3	2	0	5	1,855	.417
July 10	1,918	3	4	18	25	1,893	.425
Aug. 28	1,948	3	2	0	5	1,943	.436
Jan. 1, 1911	1,948	2	33	0	35	1,913	.430
Sept. 11	1,997	3	2	0	5	1,992	.447
July 17	2,027	3	2	0	5	2,022	.454
Aug. 21	2,050	3	2	0	5	2,045	.459
Nov. 20	2,056	2	7	0	9	2,047	.460
Aug. 14	2,063	3	2	0	5	2,058	.462
Jan. 16	2,116	3	60	0	63	2,053	.461
Aug. 7	2,382	4	2	0	6	2,376	.534
July 3	2,749	2	18	39	59	2,690	.604
Nov. 13	2,947	5	34	0	39	2,908	.653
Feb. 20	3,730	3	101	44	148	3,582	.805
13	3,789	3	77	29	109	3,680	.827
June 26	4,415	2	47	47	96	4,319	.970
5	4,421	3	9	8	20	4,401	.989
Jan. 23	4,897	3	177	0	180	4,717	1.060
May 29	4,968	9	10	3	22	4,946	1.111
June 12	4,977	2	49	0	51	4,926	1.106
Feb. 6	5,118	3	122	0	125	4,993	1.122
27	5,209	3	152	65	220	4,989	1.121
May 22	5,222	10	10	11	31	5,191	1.166
June 19	6,439	2	91	51	144	6,295	1.414
Apr. 17	6,459	2	42	87	131	6,328	1.421
May 15	6,558	1	4	8	13	6,545	1.470
Apr. 24	9,248	3	50	47	100	9,148	2.055
May 8	10,117	11	28	16	55	10,062	2.260
Mar. 20	11,085	3	107	25	135	10,950	2.460
Jan. 30	11,158	3	195	0	198	10,960	2.462
Apr. 10	11,994	2	57	16	75	11,919	2.677
Mar. 27	13,324	3	108	22	133	13,191	2.963
May 1	14,182	2	64	29	95	14,087	3.164
Apr. 3	16,570	2	94	15	111	16,459	3.697
Mar. 13	17,781	3	197	57	257	17,524	3.934
6	21,557	3	402	112	517	21,040	4.726
Weekly average	4,904	3	48	15	66	4,838	1.087

Daily discharge, in second-feet, of Merrimac River at Lawrence, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,233	6,244	16,620	18,030	*a* **11,887**	3,808	2,466	2,573	1,704	1,224	1,452	2,490
2	*a* **115**	5,784	25,300	16,096	11,641	4,307	1,557	2,296	1,859	*a* 136	1,370	2,467
3	1,929	5,329	**28,420**	*a* 14,154	10,422	5,597	*a* 1,364	2,101	1,059	1,848	**1,563**	1,843
4	1,975	5,016	25,750	13,412	9,909	4,480	1,770	2,148	*a* **126**	1,795	1,869	*a* 110
5	1,829	3,034	24,730	11,799	10,374	*a* 3,417	2,841	2,374	221	1,818	1,515	1,961
6	1,669	*a* 2,996	*a* 21,774	11,266	10,966	4,898	2,129	2,080	2,370	1,810	*a* 2,005	1,948
7	2,145	4,880	21,182	12,915	9,630	3,757	2,119	*a* 3,103	2,108	1,831	**4,555**	1,969
8	1,761	3,771	21,677	13,361	*a* 7,880	4,832	2,059	**3,531**	2,300	1,146	4,144	1,988
9	*a* 257	4,014	21,685	11,618	7,904	5,862	1,425	2,543	**3,239**	*a* 163	3,402	1,915
10	2,481	4,205	18,476	*a* 9,586	7,413	5,495	*a* 1,085	2,050	2,254	1,848	3,172	1,139
11	2,511	4,225	16,030	9,020	7,167	4,684	**3,139**	2,173	*a* 1,489	**2,068**	3,046	*a* 87
12	2,485	2,730	13,427	7,777	6,928	*a* 5,310	2,450	2,191	2,817	1,218	1,870	1,588
13	2,520	*a* **2,696**	*a* 11,990	7,015	6,378	7,815	2,364	1,597	2,492	1,970	*a* 442	1,389
14	2,665	4,931	12,531	6,070	5,282	**8,036**	2,279	*a* 358	2,315	1,821	3,042	1,345
15	1,753	4,091	12,052	5,406	*a* 4,835	7,228	2,316	2,613	2,119	1,123	2,676	1,355
16	*a* 395	3,689	11,468	5,056	5,970	6,005	1,511	2,617	1,948	*a* 111	2,546	1,359
17	3,032	3,712	10,727	*a* **4,871**	5,175	5,307	*a* **128**	2,140	1,165	1,710	2,486	797
18	2,817	4,100	11,661	5,958	4,767	5,009	1,916	2,171	*a* 166	1,632	2,275	*a* **81**
19	2,756	2,783	10,965	5,170	4,941	*a* 5,674	1,956	2,746	1,962	1,630	1,192	1,365
20	2,901	*a* 2,807	*a* **8,189**	8,898	5,129	7,046	1,952	1,776	2,061	1,592	*a* **173**	1,392
21	2,937	4,991	10,016	11,276	5,398	5,974	1,956	*a* 289	2,048	1,651	1,792	1,377
22	5,588	4,771	10,825	10,911	*a* 5,175	5,075	1,916	2,823	2,004	1,003	2,185	1,389
23	*a* 14,245	5,209	11,583	10,207	6,092	4,499	1,201	2,708	1,988	*a* 105	2,195	1,414
24	**18,698**	5,817	11,842	*a* 12,315	5,367	3,759	*a* 140	2,384	1,233	1,551	517	948
25	15,123	5,908	12,725	11,759	5,097	**2,236**	1,978	2,033	*a* 137	1,380	2,091	*a* 421
26	11,927	5,055	16,044	10,211	4,714	*a* 2,318	2,312	2,229	1,898	1,429	1,427	464
27	10,059	*a* 4,712	*a* 20,231	12,793	4,774	4,341	2,185	1,340	2,012	1,573	*a* 183	2,856
28	8,351	**8,307**	18,353	**20,526**	4,465	3,491	1,968	*a* **120**	1,956	1,727	1,982	2,393
29	7,330	....	16,011	18,118	*a* 4,267	3,291	1,484	1,320	2,041	1,000	2,156	2,446
30	*a* 6,620	....	15,394	13,980	**3,953**	2,730	1,055	1,396	2,029	*a* **94**	2,266	**2,968**
31	7,421	....	17,953	....	5,385	....	*a* 351	1,486	....	1,560	....	1,949

a Sunday.

NOTE.—Maximum and minimum appear in bold-face type.

Monthly discharge of Merrimac River at Lawrence, Mass., for 1910.

[Total drainage area = 4,663 square miles.]

Month.	Mean discharge of Merrimac River at Lawrence as measured (4,663 square miles).	Average amount wasting into Merrimac River from watershed.				Average yield of Merrimac River from watershed of 4,452 square miles.		Run-off (depth on drainage area).
		Nashua River at Clinton (118 square miles).	Sudbury River at dam No. 1 (75 square miles).	Lake Cochituate, Bannister Brook (18 square miles).	Total (211 square miles).		Per square mile.	
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Inches.*
January	4,759	2	115	0	117	4,642	1.043	1.20
February	4,493	3	121	37	161	4,332	.973	1.01
March	16,311	3	184	49	236	16,075	3.611	4.16
April	10,986	2	57	42	101	10,885	2.445	2.73
May	6,751	8	14	10	32	6,719	1.509	1.74
June	4,876	2	49	30	81	4,795	1.077	1.20
July	1,786	3	3	7	13	1,773	.398	.46
August	2,042	3	2	0	5	2,037	.458	.53
September	1,771	3	2	0	5	1,766	.397	.44
October	1,341	4	2	0	6	1,335	.300	.35
November	2,053	3	15	0	18	2,035	.457	.51
December	1,511	3	18	0	21	1,490	.335	.39
Yearly average.	4,890	3	48	15	66	4,824	1.084	14.72

NOTE.—Total drainage area 4,663 square miles, less diverted area 211 square miles = 4,452 square miles

SOUHEGAN RIVER AT MERRIMAC, N. H.

Souhegan River is formed in the hills and mountains of southern New Hampshire, in the townships of Temple and New Ipswich, one branch starting from the township of Ashby, Mass. The stream flows in a general northeasterly direction to Wilton, where it is joined by Stony Branch, then flows eastward, and joins Merrimac River at Merrimac, N. H. Baboosic Stream enters near its mouth, just below the mill of the W. H. McElwain Co.

The fall of the stream is very large, its bed and banks are rocky, and it affords numerous power sites.

The mean annual precipitation in this basin is about 42 inches. Winters are rather severe. The average depth of snowfall in January and February is about 18 inches.

The gaging station, which was established July 13, 1909, in cooperation with the W. H. McElwain Co., is located about 1½ miles upstream from this company's dam and just above Atherton Falls. The slope of the river below the station is very great, falls and rips extending for three-fourths of a mile.

A vertical staff gage is located on the left bank about 40 feet above the falls. A chain gage for use during high water is attached to a tree a short distance upstream from the staff gage. All published readings are referred to the staff gage. Discharge measurements are made by wading or from bridges above and below the station. There is a relatively sharp crested control at the head of the falls immediately below the gage and hence there is usually no great amount of ice effect at the station until ice lodges at this point.

There is mill control on this stream at Milford about 8 to 10 miles above the station. This control is shown by a few hundredths of a foot difference between the morning and afternoon gage readings. It is assumed in publishing the following discharge values that the average of these readings gives essentially the true 24-hour mean. No information is available regarding night storage at Milford.

Discharge measurements of Souhegan River at Merrimac, N. H., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 3[a]	D. M. Wood	145	823	5.65	1,910
29[b]	.....do			4.22	730
Apr. 11[c]	.....do	54	203	3.06	255
21[d]	.....do	117	1,110	3.64	518
June 3	.....do	52	77.6	2.65	115

[a] Ice present. Ice 1.3 feet thick. Gage height probably not materially affected on account of the sharp crest of the control point below the station.
[b] Made from railroad bridge; probably affected by storage in the mill pond between the gage and the point of measurement.
[c] Made from covered highway bridge 1½ miles above gage.
[d] Made from railroad bridge.

Daily gage height, in feet, of Souhegan River at Merrimac, N. H., for 1910.

[G. M. Norton, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.35	3.25	7.60	4.07	3.54	2.66	2.51	2.22	2.00	2.14	2.38	2.42
2	2.37	3.17	6.80	4.02	3.48	2.65	2.49	2.29	2.00	2.28	2.37	2.42
3	2.35	3.15	5.65	3.92	3.37	2.66	2.44	2.24	2.00	2.33	2.41	2.32
4	2.36	3.10	4.95	3.52	3.40	2.64	2.35	2.11	2.04	2.11	2.48	2.31
5	2.38	3.00	4.42	3.32	3.42	2.61	2.34	2.24	2.10	2.14	2.57	2.03
6	2.40	2.95	......	3.27	3.41	2.69	2.31	2.18	2.10	2.12	2.62	2.06
7	2.47	2.94	5.22	3.23	3.34	3.12	2.28	2.17	2.32	2.12	2.56	2.05
8	2.50	3.00	5.20	3.32	3.12	3.04	2.27	2.22	2.40	2.14	2.52	2.12
9	2.37	3.02	5.74	3.29	2.96	2.96	2.31	2.19	2.42	2.15	2.52	2.11
10	2.40	2.95	5.42	3.27	3.14	2.96	2.36	2.40	2.37	2.20	2.47	2.12
11	2.45	2.95	5.23	3.10	3.14	3.20	2.33	2.34	2.41	2.18	2.41	2.12
12	2.50	2.93	5.18	3.12	3.15	3.33	2.32	2.27	2.28	2.30	2.34	2.12
13	2.47	......	5.02	3.22	3.04	3.58	2.27	2.33	2.17	2.14	2.32	2.11
14	2.45	3.00	4.52	3.12	3.04	3.40	2.26	2.29	2.11	2.20	2.33	2.09
15	......	2.85	4.62	3.07	3.00	3.22	2.24	2.16	2.11	2.16	2.32	2.07
16	2.51	2.90	4.67	3.12	2.96	3.01	2.24	2.20	2.08	2.23	2.37	2.06
17	2.50	2.95	4.64	3.04	2.93	3.00	2.18	2.19	2.08	2.24	2.28	2.08
18	2.50	3.05	4.62	3.02	2.97	3.16	2.13	2.38	2.11	2.15	2.23	2.08
19	2.51	3.10	4.52	4.52	3.12	3.14	2.13	2.40	2.14	2.17	......	2.08
20	2.50	3.15	4.62	4.02	3.07	3.16	2.10	2.40	2.23	2.20	2.32	2.06
21	2.51	3.20	4.72	3.65	3.00	3.14	2.07	2.50	2.22	2.20	......	2.05
22	3.35	3.90	4.72	3.57	3.38	3.12	2.08	2.23	2.05	2.20	......	2.04
23	5.60	3.98	4.55	3.54	3.14	3.06	2.05	2.19	2.04	2.23	......	2.16
24	5.27	3.70	4.44	3.64	2.94	3.00	2.02	2.14	2.06	2.30	......	2.76
25	4.50	3.60	4.94	3.62	2.84	2.94	2.06	2.13	2.12	2.28	......	......
26	3.70	3.50	5.44	3.58	2.82	2.88	2.09	2.10	2.14	2.30	......	2.86
27	3.52	3.52	5.02	5.10	2.72	2.78	2.10	2.10	2.14	2.28	......	2.47
28	3.50	4.50	4.42	4.37	2.64	2.64	2.08	2.04	2.16	2.24	......	2.62
29	3.52	......	4.22	3.70	2.60	2.58	2.10	2.04	2.13	2.22	......	2.58
30	3.41	......	4.14	3.44	2.58	2.54	2.12	2.03	2.12	2.34	......	2.64
31	3.50	......	4.09	......	2.63	......	......	2.02	......	2.40	......	2.59

NOTE.—Gage heights at this station may be somewhat in error as a result of mill control at Milford, about 8 or 10 miles upstream.

Ice existed from Jan. 1 to 21 and from about Feb. 7 to 27. There was probably little or no backwater from ice during December. Gage heights probably to water surface.

Daily discharge, in second-feet, of Souhegan River at Merrimac, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	43	333	3,750	752	467	121	85	39	21	32	61	68
2	44	298	2,960	722	438	118	81	48	21	47	60	68
3	43	290	1,920	664	387	121	72	42	21	54	66	52
4	40	269	1,340	457	400	115	56	29	24	29	79	50
5	40	230	960	364	409	108	55	42	28	32	98	23
6	40	212	1,260	342	405	128	50	35	28	30	110	25
7	40	200	1,570	324	373	277	47	34	52	30	94	24
8	40	180	1,550	364	277	246	45	39	64	32	87	30
9	40	180	1,990	351	216	216	50	36	68	32	87	29
10	40	170	1,730	342	286	216	58	64	60	37	77	30
11	40	160	1,570	269	286	311	54	55	66	35	66	30
12	40	150	1,530	277	290	368	52	45	47	49	55	30
13	40	140	1,410	320	246	486	45	54	47	32	52	29
14	40	130	1,040	277	246	400	44	48	29	37	54	27
15	40	120	1,110	257	230	320	42	33	29	33	52	26
16	40	120	1,150	277	216	234	42	37	27	41	60	25
17	40	110	1,130	246	205	230	35	36	27	42	47	27
18	40	100	1,110	238	219	294	30	61	29	32	41	27
19	40	90	1,040	1,040	277	287	30	64	32	34	46	27
20	40	80	1,110	722	257	294	28	64	41	37	52	25
21	45	100	1,180	521	230	288	26	83	39	37	50	24
22	378	300	1,180	481	391	277	27	41	25	37	50	24
23	1,880	200	1,060	467	286	253	24	36	24	41	50	33
24	1,610	150	988	516	208	230	22	32	25	49	50	149
25	1,030	120	1,350	506	174	208	25	31	30	47	50	250

Daily discharge, in second-feet, of Souhegan River at Merrimac, N. H., for 1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	546	100	1,740	486	168	187	27	28	32	49	50	181
27	457	200	1,410	1,470	137	155	28	28	32	47	50	77
28	447	1,030	974	940	115	115	27	24	33	42	50	110
29	457		843	546	105	101	28	24	31	39	50	101
30	405		794	419	101	92	30	23	30	54	50	115
31	447		764		113		34	22		64		103

NOTE.—The discharge during the open water periods is based on a well-defined discharge rating curve. Discharge Jan. 1 to 21, Feb. 7 to 27, and Nov. 21 to 30, and Dec. 25 has been estimated from climatologic records and the discharge from near-by drainage basins. They are only approximate.
Discharge Jan. 15, Feb. 13, Mar. 6, July 31, and Nov. 19 interpolated.

Monthly discharge of Souhegan River at Merrimac, N. H., for 1910.

[Drainage area, 168 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,880	a 40	275	1.64	1.89	B.
February	1,030	a 80	206	1.23	1.28	C.
March	3,750	764	1,400	8.33	9.60	B.
April	1,470	238	499	2.97	3.32	A.
May	467	101	263	1.57	1.81	A.
June	486	92	227	1.35	1.51	A.
July	85	22	41.9	.249	.29	A.
August	83	22	41.2	.245	.28	A.
September	68	21	35.4	.211	.24	A.
October	72	29	39.8	.237	.27	A.
November	110	41	61.5	.366	.41	B.
December	a 250	23	59.3	.353	.41	B.
The year	3,750	21	264	1.57	21.31	

a Estimated.

SOUTH BRANCH OF NASHUA RIVER (WACHUSETT DRAINAGE AREA) AT CLINTON, MASS.

Nashua River is formed by the union of its North and South branches. The North Branch rises in the northern part of Worcester County and flows southeastward about 18 miles; the South Branch rises in the central part of the same county and pursues a circuitous course toward the south, east, and north. From the junction of these branches the Nashua takes a general northerly and easterly course, passing into Middlesex County and thence into New Hampshire, joining the Merrimac at Nashua. For 3 or 4 miles above its mouth the fall of the stream is rapid, its bed is rocky, and its banks are high; above that point its fall is less for a distance of 8 or 10 miles, but the banks are still high enough to confine the river except in high freshets. From Groton to the junction of the branches the stream is very sluggish, its bed and banks are sandy and gravelly, and considerable areas of meadow land bordering the streams are at times inundated.

The South Branch of Nashua River has been measured at Clinton by the engineers of the Metropolitan Water and Sewerage Board since

July, 1896. The results of these measurements have been furnished by Dexter Brackett, chief engineer.

A large reservoir, storing about 8,500,000,000 cubic feet, has been constructed at Clinton, Mass., and water stored since 1903. Beginning with 1897, the estimates have been corrected for gain and loss of storage in reservoirs and mill ponds in the drainage basin, so that the results show the natural flow of the stream.

The yield reported per square mile is the yield of the drainage area, including the water surfaces. In the Wachusett basin this water surface from the years 1897 to 1902, inclusive, amounted to 2.2 per cent of the whole area; in 1903, 2.4 per cent; in 1904, 3.6 per cent; in 1905, 4.1 per cent; in 1906, 5.1 per cent; in 1907, 6 per cent; and in 1908 and subsequent years, 7 per cent.

The accompanying tables give data on discharge and precipitation for 1910, also the average for the years 1897–1910, inclusive, precipitation averages being based on records at several stations in the Nashua drainage basin.

Yield and rainfall in South Branch of Nashua River basin (Wachusett drainage area) at Clinton, Mass., for 1910, and summary for 1897–1910.

[Drainage area, 118.19 square miles.]

Month.	Total yield in million gallons.	Average yield per square mile.		Rainfall in inches.[a]	Rainfall collected.	
		Million gallons per day.	Second-feet.		Inches.[a]	Per cent.
1910.						
January	6,764.1	1.846	2.857	5.86	3.293	56.2
February	6,104.4	1.845	2.854	5.24	2.972	56.7
March	9,670.7	2.640	4.084	1.09	4.709	432.8
April	3,666.2	1.034	1.600	3.01	1.785	59.2
May	2,229.2	.608	.941	2.13	1.085	50.9
June	2,920.3	.824	1.274	4.36	1.422	32.6
July	226.6	.062	.096	1.52	.110	7.2
August	680.9	.186	.288	3.87	.331	8.6
September	513.2	.145	.224	2.86	.250	8.7
October	250.7	.068	.106	1.40	.122	8.7
November	1,256.5	.354	.548	4.17	.612	14.7
December	1,432.5	.391	.605	2.34	.697	29.8
The year	35,715.3	.828	1.281	37.85	17.388	45.9

Summary.

Month.	Total yield in million gallons.	Million gallons per day.	Second-feet.	Rainfall in inches.[a]	Inches.[a]	Per cent.
1897–1910.						
January	63,748.3	1.243	1.923	3.80	2.217	58.3
February	69,264.8	1.487	2.301	4.00	2.409	60.2
March	142,929.1	2.786	4.310	4.25	4.970	117.0
April	109,453.1	2.205	3.411	3.98	3.806	95.7
May	61,562.1	1.200	1.857	3.43	2.141	62.3
June	41,814.8	.842	1.303	4.16	1.454	35.0
July	22,639.5	.441	.683	4.22	.787	18.7
August	22,395.1	.437	.675	4.23	.779	18.4
September	19,916.6	.401	.621	3.93	.692	17.6
October	27,509.2	.536	.830	3.34	.957	28.7
November	40,632.7	.819	1.266	3.40	1.413	41.6
December	65,323.9	1.274	1.970	4.34	2.272	52.3
The year	687,189.2	1.137	1.760	47.08	23.897	50.8

[a] For 1910, total for month; 1897–1910, average of totals per calendar month.

SUDBURY RIVER AT FRAMINGHAM AND LAKE COCHITUATE AT COCHITUATE, MASS.

Sudbury River, a small stream of eastern Massachusetts, receives water from an area west of Framingham. It flows thence in a northerly course through meadows and swamps and joins Assabet River to form Concord River, which in turn continues northward, and enters Merrimac River immediately below the city of Lowell. Storage reservoirs have been constructed by the city of Boston and the Metropolitan Water and Sewerage Board, controlling the greater part of the flow from this basin.

Lake Cochituate drains into Sudbury River a short distance below Framingham. It is controlled as a storage reservoir by the Metropolitan waterworks.

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, and records of rainfall in the Sudbury basin have been kept since 1875, and in the Cochituate basin since 1852, but the latter are considered of doubtful accuracy previous to 1872.

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, as follows: From 1875 to 1878, inclusive, they amounted to 1.9 per cent of the total area; from 1879 to 1884, 3 per cent; 1885 to 1893, 3.4 per cent; 1894 to 1897, 3.9 per cent; 1898 and subsequent years, 6.5 per cent.

The recorded yields of both the Sudbury and Cochituate drainage areas are somewhat affected by the fact that the towns of Framingham, Natick, and Westborough have public water supplies drawn from within the basins, and systems of sewerage discharging outside, and although the quantities diverted are taken into consideration in determining the run-off, the results are probably less accurate since the sewage diversion works were constructed.

The public water and sewerage works were installed in these towns as follows:

Town.	Water supply.	Sewerage works.
Framingham	1885	1889
Natick	1874	1896
Westborough	1879	1892

All the water drawn from the Wachusett drainage area is passed through the reservoirs in the Sudbury basin, and as the measurement of these quantities must be used in determining the yield of the Sudbury basin the unavoidable small percentages of error in the measurement of large quantities of water render less accurate the figures giving yields of the Sudbury water supply during months of low yield for years subsequent to 1897.

The accompanying tables, furnished by Dexter Brackett, chief engineer, give data regarding discharge and precipitation for 1910, also the average for 36 years for Sudbury River and for 48 years for Lake Cochituate.

Yield and rainfall in Sudbury River basin at Framingham, Mass., for 1910, and summary for 1875 to 1910.

[Drainage area, 75.2 square miles.]

Month.	Total yield in million gallons.	Average yield per square mile.		Rainfall in inches.[a]	Rainfall collected.	
		Million gallons per day.	Second-feet.		Inches.[a]	Per cent.
1910.						
January	3,472.6	1.490	2.305	5.39	2.657	49.3
February	3,893.0	1.849	2.861	5.06	2.979	58.9
March	4,555.2	1.954	3.023	.85	3.486	408.7
April	1,504.0	.667	1.031	2.75	1.151	41.9
May	646.5	.277	.429	1.29	.495	38.3
June	1,164.8	.516	.799	4.68	.891	19.0
July	−238.4	−.102	−.158	2.03	−.182	−9.0
August	−169.5	−.073	−.113	2.62	−.130	−5.0
September	11.1	.005	.008	2.49	.008	.3
October	−118.2	−.051	−.078	1.86	−.091	−4.9
November	397.7	.176	.273	4.13	.304	7.4
December	515.9	.221	.342	2.49	.395	15.8
The year	15,634.7	.570	.881	35.64	11.963	33.6

Summary.

Month.	Total yield in million gallons.	Million gallons per day.	Second-feet.	Rainfall in inches.[a]	Inches.[a]	Per cent.
1875–1910.						
January	103,039.9	1.228	1.899	4.17	2.190	52.5
February	134,774.1	1.764	2.729	4.25	2.865	67.5
March	238,018.1	2.836	4.387	4.39	5.059	115.2
April	162,829.2	2.005	3.102	3.51	3.461	98.5
May	90,480.9	1.078	1.668	3.34	1.923	57.6
June	41,836.7	.515	.797	3.15	.889	28.2
July	14,321.0	.171	.264	3.56	.304	8.5
August	20,745.6	.247	.382	3.85	.441	11.5
September	20,355.0	.251	.388	3.52	.433	12.3
October	38,063.4	.454	.702	3.93	.809	20.6
November	65,747.0	.810	1.253	3.83	1.398	36.4
December	85,481.9	1.019	1.576	3.81	1.817	47.7
The year	1,015,692.8	1.027	1.589	45.31	21.589	47.6

[a] For 1910, total for month; 1875–1910, average of totals per calendar month.

Yield and rainfall in Lake Cochituate basin at Cochituate, Mass., for 1910, and summary for 1863–1910.

[Drainage area, 17.8 square miles.]

Month.	Total yield, in million gallons.	Average yield per square mile.		Rainfall, in inches.[a]	Rainfall collected.	
		Million gallons per day.	Second-feet.		Inches.[a]	Per cent.
1910.						
January	864.4	1.567	2.424	5.11	2.80	54.7
February	904.1	1.814	2.807	5.16	2.92	56.7
March	860.1	1.559	2.412	.77	2.78	361.1
April	395.8	.741	1.147	2.71	1.28	47.2
May	215.0	.390	.603	1.33	.70	52.3
June	353.4	.662	1.024	4.51	1.14	25.3
July	89.7	.163	.252	2.23	.29	13.0
August	4.8	.009	.013	1.58	.02	1.0
September	34.8	.065	.101	2.50	.11	4.5
October	12.5	.023	.035	1.80	.04	2.2
November	130.7	.245	.379	4.16	.42	10.2
December	180.6	.327	.506	2.61	.58	22.4
The year	4,045.9	.623	.964	34.47	13.08	37.9
Summary.						
1863–1910.						
January	29,600.1	1.118	1.729	3.95	1.99	50.5
February	37,449.0	1.552	2.402	3.98	2.52	63.3
March	57,366.6	2.166	3.351	4.31	3.86	89.6
April	42,848.4	1.671	2.586	3.61	2.89	79.9
May	25,359.5	.957	1.481	3.64	1.71	46.9
June	11,962.0	.467	.722	3.06	.81	26.4
July	7,486.1	.283	.437	3.94	.50	12.8
August	10,569.2	.399	.617	4.17	.71	17.1
September	10,759.8	.420	.649	3.59	.73	20.2
October	14,446.8	.546	.844	4.14	.97	23.5
November	20,048.8	.782	1.210	4.04	1.35	33.8
December	24,466.7	.924	1.429	3.56	1.65	46.3
The year	292,363.0	.937	1.450	45.99	19.69	42.8

[a] For 1910, total for month; 1863–1910, average of totals per calendar month.

TAUNTON RIVER.

GENERAL FEATURES OF AREA DRAINED.

The headwaters of Taunton River rise in the swamps and small ponds of Plymouth and Bristol counties, in the eastern part of Massachusetts. The main river is formed in the eastern part of the township of Bridgewater by the union of Matfield and Town rivers.

Matfield River rises near Holbrook and flows in a general southerly direction, receiving the drainage of several swamps and ponds in its course. Near East Bridgewater it is joined by Beaver Brook, which rises in the townships of Whitman and Abington, and near Elmwood it receives Satucket River, which drains several large swamps and ponds of East Bridgewater, Whitman, Abington, Halifax, and Hanson. The river then flows in a generally southeasterly course to its junction with Town River. Town River rises in Stoughton and Easton, flows southward into a swamp of about 7,000 acres, known as Great Cedar Swamp, and from this natural reservoir passes eastward through Bridgewater to its junction with Matfield River at Paper Mill village.

The principal tributaries of Taunton River are Wenatuxet, Namasket, Mill, and Threemile rivers, the last two entering below tidewater. Wenatuxet River rises in several small ponds in Plympton and Carver and flows in a general westerly course, receiving Raven Brook and Bartletts Brook from the south. Namasket River enters the Taunton near Titicut. In its drainage area are Assawompsett and Long ponds. Mill River rises in Foxboro, Mansfield, and Easton, flows southward into Great Cedar Swamp, and joins the Taunton in the city of Taunton. Threemile River rises in Foxboro and flows southeastward, joining the Taunton at North Dighton. The Taunton is tidal up to East Taunton, where there is about 2½ feet of rise and fall, and it is navigable to Weir Village.

On account of the large number of small ponds and swamps in the area the run-off through the year is fairly uniform, except in the Matfield drainage basin. There are several power plants on the main river and on the branches.

The average rainfall in this region is about 46 inches. On account of the proximity of this basin to the ocean the winters are not severe.

The country as a whole is very flat, swamps are numerous, and not much rock is found. The western portion of the drainage area is clay bottom and the eastern is sandy but fairly fertile. Nearly all the timber has been removed.

MATFIELD RIVER AT ELMWOOD, MASS.

This station, which is located at the stone arch bridge at Bedford Street, near the village of Elmwood, in the southern part of the town of East Bridgewater, was established September 29, 1909, in cooperation with the State of Massachusetts, for the purpose of determining the amount of water available for a canal (surveys for which have been made by the United States Army engineers) and to aid in an inquiry as to the pollution of Taunton River by sewage. It was discontinued July 10, 1910.

Above the station is a small unused mill dam. Below, at Paper Mill village, Bridgewater, there is a dam which materially affects the flow at times by creating backwater. In using the records from this station for any day it is necessary to take account of the conditions at this dam.

A staff gage is set in the river about 30 feet above the bridge and a chain gage is located on the bridge.

Measurements are made at medium and high water from the bridge and at low water by wading. During ordinary winters ice does not affect the flow. A fairly good rating curve has been developed, but there is great uncertainty regarding the time and the percentage effect of the backwater from the mill below the station.

Accurate computation of daily and monthly discharge has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date of its discontinuance. The gage heights for 1910 are withheld pending this investigation, since the gage heights recorded at this station are not always true indices of the daily discharge.

Discharge measurements of Matfield River at Elmwood, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 7	P. M. Churchill	30.5	128	4.98	324
22	....do	30.5	158	5.90	642
Feb. 15	Bartlett and Stanford	30	57	2.83	70
15	....do	28	54	2.79	66
19	P. M. Churchill	30.5	129	4.90	328
Mar. 5	L. W. Bartlett	26.5	109	4.72	236

SATUCKET RIVER NEAR ELMWOOD, MASS.

This station, which is located at a bridge owned by the Carver Cotton Gin Co., about 200 feet downstream from their dam, was established September 29, 1909, in cooperation with the State of Massachusetts, and was discontinued July 10, 1910. In conjunction with the station on the Matfield, records were obtained for use in the investigation of water supply, water power, and the pollution of the streams in this locality.

Water power is used at this place for a portion of the year. When the wheels are running it is necessary to make special computations of the flow.

On account of the large number of swamps and ponds in this drainage area the flow is more evenly distributed throughout the year than on the Matfield.

A staff gage was at first used at this station. This gage was soon replaced by a chain gage, which was set at a different datum. Discharge measurements were made from the bridge on which the gage is placed, and at low water by wading below the station. Ice does not usually interfere with the flow.

The plotting of the discharge measurements indicates variable backwater at this station. Gage heights are affected by the operation of the mill above, and at times the flow is affected by grass in the channel.

Accurate computation of the diurnal fluctuation of discharge due to these causes has been rendered impossible by insufficient funds.

It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date of its discontinuance. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indices of the daily discharge.

Discharge measurements of Satucket River near Elmwood, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 7	P. M. Churchill	26	98.2	4.54	168
22	.....do	30	141	5.75	291
Feb. 9	.....do	26	88.4	4.09	155
15	T. W. Norcross	27	30.6	a 2.01	36.0
15	W. S. Stanford	27	56.2	a 2.96	98.9
15	L. W. Bartlett	27	55.9	a 3.00	98.1
15	W. S. Stanford	26.5	54.4	a 2.90	105
19	P. M. Churchill	26	88	4.09	155
Mar. 5	Bartlett and Stanford	30	115	4.88	220
8	P. M. Churchill	29	102	4.63	191
16	.....do	26	62.3	2.99	92.3
17	Bartlett and Stanford	26	60.8	3.08	123
26	.....do	24	26.2	a 1.67	59.5
May 7	.....do	25	16.2	1.35	35.1
7	.....do	25	17.6	1.35	38.9

a Gage height fluctuating during measurement.

BLACKSTONE RIVER.

GENERAL FEATURES OF AREA DRAINED.

Blackstone River rises in Worcester County, near the city of Worcester, Mass., where it is formed by the run-off from several ponds. It flows in a general southeasterly direction, receiving from the west Singleton Brook, Cold Spring Brook, Mumford River, and Branch River, and from the east Quinsigamond River (the outlet of Quinsigamond Lake), West River, Mill River, and Abbot River, and empties into Seekonk River, the head of Narragansett Bay, below Pawtucket, R. I.

The Blackstone has always been important as a water-power stream and has been very fully utilized. The basin contains no large lakes, but its many small ponds and reservoirs are used for storage. The flow of the river is thus made fairly constant. The tributaries, though small, are also well developed for power.

The average rainfall on this drainage basin is about 45 inches.

BRANCH RIVER AT BRANCH VILLAGE, R. I.

Branch River rises near the western boundary of the State of Rhode Island, flows easterly and northeasterly through several small ponds, and receives the drainage from other ponds and swamps, and enters Blackstone River near Blackstone, Mass.

The gaging station, which is located at Branch village just below the mill of James Pitts & Son, three-fourths mile from Forestdale and about 2 miles from Woonsocket, was established September 2, 1909, in cooperation with the State of Rhode Island in its survey of the natural resources of the State.

A staff gage is bolted to a ledge outcrop about 500 feet below the dam and mill. A chain gage is attached to a tree on top of the ledge. All gage heights refer to the staff gage.

Discharge measurements are made by wading at low and medium stages and from the bridge above the dam or from a boat at high stages.

The conditions are fairly favorable for accurate measurements. The gage heights are affected by the mill control directly above the station and by similar control farther up the river. The storage above the Pitts mill is small, and water goes over the dam for a large portion of the time. During the winter ice affects the flow only in severe weather.

A fairly good discharge rating curve has been developed.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Branch River at Branch Village, R. I., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 4	C. A. Moore	77	444	3.03	480
4	.....do	77	441	2.96	434
4	.....do	77	464	3.03	486
4	.....do	77	467	[a] 3.05	560
4	.....do	77	466	3.04	513

[a] Gage height fluctuating.

NOTE.—All measurements made from highway bridge above dam.

WOONASQUATUCKET RIVER.

GENERAL FEATURES OF AREA DRAINED.

Woonasquatucket River, which is fed from the run-off of several ponds and reservoirs and lies wholly in the State of Rhode Island, is formed by the junction of two small branches. The northern branch, rising in North Smithfield, flows southward, uniting with the southern branch at Stillwater, in Smithfield, and the latter branch, rising in Gloucester, flows south, east, then north to its junction with the main stream. From this point the river flows in a general southeasterly direction, emptying into Providence River at the head of Narragansett Bay.

WOONASQUATUCKET RIVER AT OLNEYVILLE, R. I.

This station is located at the dam in Olneyville, near Providence, R. I., in the yards of the Atlantic Mills. It is maintained in cooperation with the Atlantic Mills Co., by whom the observations are taken, and was established March 16, 1910.

The staff gage is bolted to the right abutment of the dam of the company. There is also an auxiliary staff gage nailed to a tree on the right bank in the rips about one-half mile above the dam.

No measurements have been made during 1910. The water is not used for power development at the Atlantic Mills but there is more or less diversion of water for engine boilers and industrial purposes. It is not known whether mills farther up on the river affect the accuracy of the daily gage heights.

Daily gage height, in feet, of Woonasquatucket River at Olneyville, R. I., for 1910.

[H. R. Westcott, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		5.25		5.18	4.98	5.00	5.02		5.00	5.00
2		4.75	5.22	5.16	5.00	5.10	5.00		5.00	4.90
3			5.26	5.20		5.00	5.00	5.00	5.10	5.00
4		5.15	5.27	5.20		4.90		5.10	4.90	
5		5.08	5.24		4.80	5.00	5.10	4.92	5.00	5.10
6		5.10	5.19	5.20		5.00	5.10	4.94		5.10
7		4.99	5.20	5.24	5.00		5.10	5.00	4.90	5.00
8		5.13		5.20	5.20	5.10	5.18	5.00	5.00	5.10
9		5.00	5.14	5.14	5.10	4.55	5.10		5.00	5.10
10			5.26	5.20		5.15	5.00	4.70	4.90	5.10
11		5.20	5.29	5.10	5.10	5.10			5.00	
12		5.10	5.24		4.90	5.00	5.20	5.20	5.10	5.10
13		5.12	5.25	5.20	5.00	5.00	5.08	4.90		5.10
14		5.20	5.00	5.32	5.15		5.10	5.00	5.00	5.00
15		5.22		5.10	5.10	5.06	5.12	5.00	5.00	5.00
16	5.25	5.10	5.18	5.22	5.10	5.10	5.00		5.10	5.10
17	5.36		5.22	5.30		5.09	5.00	5.00	5.00	5.10
18	5.36	5.15	5.28	5.20	5.15	5.04		5.10	4.90	
19	5.30	5.26	4.95		5.09	5.15	5.10	5.00	5.00	5.00
20		5.20	5.01	5.18	5.04	5.00	4.72	4.90		5.00
21	5.39	5.21	5.00	5.12	4.55		5.10	5.00	5.00	5.10
22	5.26	5.16		5.19	4.60	5.00	5.00	4.90	5.10	4.90
23	5.10	5.10	5.05	5.20	5.10	5.00	5.02		5.00	4.90
24	5.29		5.15	5.20		4.90	5.00	5.00		5.00
25	5.33	5.16	5.10	5.00	5.15	5.10		4.90	5.00	
26	5.35	5.26	5.20		5.05	5.00	4.79	5.00	5.10	
27		5.34	5.20	5.05	4.45	5.00	5.00	5.00		4.90
28	5.07	5.26	5.10	5.14	4.96		5.02	5.00	5.00	5.00
29	5.12	5.15		5.10	4.66	5.14	5.04	5.00	5.10	5.00
30	5.11	5.15		5.14	5.10	5.10	5.00		5.00	5.10
31	5.22		5.08					4.80		5.00

NOTE.—No information regarding presence of ice is available.

PAWTUXET RIVER BASIN.

GENERAL FEATURES OF AREA DRAINED.

Pawtuxet River is formed near Richmond, R. I., by the union of Ponagansett and Moswansicut rivers. Ponagansett River rises in Ponagansett reservoir, in the town of Foster, R. I., and flows in a general southeasterly direction, receiving the drainage from several small ponds and swamps. Moswansicut River rises in a pond of the same name near North Scituate, R. I., and flows southward, receiving near its source several small brooks coming from the northwest. Pine Swamp reservoir and Quonopaug Brook also drain into this river. Below the junction of the two branches the river flows to the east and south to Riverpoint, where it is joined by the southwest branch of Pawtuxet River. This river drains a region of ponds and swamps, the largest of which is Flat River reservoir.

The Pawtuxet then flows to the northeast, receiving the Pocasset River from the north, and enters Narragansett Bay at Pawtuxet.

PAWTUXET RIVER AT HARRIS, R. I.

This station, which is located at the highway bridge near the Harris railroad station, was established August 12, 1909, and is maintained in cooperation with Natural Resources Survey of the State of Rhode Island.

The station is located between two mills, each about 2,000 feet distant. When the lower mill is not running backwater exists at the bridge. The rating curve is applicable for periods when both mills are running. When both are stopped the rating curve is applicable only for periods when the water is flowing over the lower dam.

The flow through the wheels at the mill above the station does not vary materially through the day except at times of extreme low water, when the amount of water is insufficient to run the mill for the entire day. Except for the difficulties caused by the mills the conditions for obtaining accurate discharge data are good. Careful observations of the many important conditions are made by the observer.

Discharge measurements are made from the highway bridge, where the conditions are good.

No change has been made in the datum of the chain gage located on the bridge.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since the gage heights recorded at this station are not always true indexes of the daily discharge.

Discharge measurements of Pawtuxet River at Harris, R. I., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 2[a]	C. A. Moore	75.5	271	3.72	1,060
2[a]	.....do	75.5	271	3.67	1,030
3	.....do	75.5	244	3.36	802
3	.....do	75.5	237	3.25	709
3	.....do	75.5	227	3.08	631
3	.....do	75.5	241	3.29	701
3[a]	.....do	75.5	234	3.22	704
3	.....do	75.5	229	3.14	611
8	.....do	75.5	196	2.68	384
8	.....do	75.5	203	2.77	433
8	.....do	75.5	192	2.64	382

[a] Subsurface velocity, coefficient used 0.90.

PAWCATUCK RIVER BASIN.

GENERAL FEATURES OF AREA DRAINED.

Pawcatuck River is formed near Wood River Junction, R. I., by the union of Wood and Charles rivers. Wood River rises in swampy land in Sterling, Conn., flows generally southeast to Mount Tom, R. I., where it is joined by Flat River, which rises in swamps at West Greenwich, R. I. Wood River then flows southward to its junction with Charles River. The Charles is formed by the outflow from Great Swamp and from Wordens Pond, flows westward, and receives the drainage of several small swamps and ponds. The Pawcatuck follows a winding course, in general westerly for about 8 miles, then turns to the south, and enters the ocean at Little Narragansett Bay.

The slope of the river is in general small, but several of the small power sites on Wood River are undeveloped. The natural storage on this drainage is good.

WOOD RIVER AT HOPE VALLEY, R. I.

This station, which is located just below the dam of the Taylor Manufacturing Co. and about half a mile below Hope Valley, was established August 13, 1909, in cooperation with the State of Rhode Island.

The low-water portion of the staff gage is bolted to a bowlder in the middle of the river a little below the outlet of the tailraces. The high-water portion is on the left bank nearly opposite the low-water portion. At low and moderately low water measurements are made by wading about one-fourth mile downstream, where the conditions are favorable for obtaining accurate measurements. At medium and high stages measurements must be made from the highway bridge just above the gage and from the bridge over the tailrace. The flow during the day is rather uniform, except as governed by the wheels at the Taylor plant.

The datum at the gage has remained the same during the maintenance of the station. During the winter months the discharge is somewhat affected by ice. A good discharge rating curve has been developed.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Wood River at Hope Valley, R. I., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 5	C. A. Moore	49	89.6	1.90	257
5	.....do	49	89.6	1.91	265
5	.....do	49	89.6	1.91	254
5	.....do	49	89.6	1.90	266

CONNECTICUT RIVER.

GENERAL FEATURES OF AREA DRAINED.

Connecticut River rises in the Connecticut Lakes in northern New Hampshire, flows in a southerly direction between New Hampshire and Vermont and across Massachusetts and Connecticut to Long Island Sound. It is the largest river in New England except the St. John, is about 345 miles long, and drains an area of 11,085 square miles, of which about 155 square miles lie in the Province of Quebec.

The river has many important tributaries, among which are Passumpsic, Ammonoosuc, Wells, White, Mascoma, Ottaqueechee, Sugar, West, and Ashuelot rivers, which join north of the Massachusetts line; Millers, Deerfield, Chicopee, and Westfield rivers, which enter in the State of Massachusetts; and Farmington River, which enters near Hartford, Conn.

From its headwaters in the Connecticut Lakes to Long Island Sound the Connecticut falls about 1,900 feet. The upper portions of the drainage area are rugged and the surface of the country is broken by undulating ridges, here and there rising to mountain height, and is for the most part forested. In central and southern New Hampshire and Vermont the country is hilly and most of the tributary streams have a good fall, but more of the area is in cultivation. Deerfield and Westfield rivers, rising in the Berkshires, in Massachusetts, are quick-spilling streams, with steep slopes and narrow valleys, largely wooded; Millers and Chicopee rivers on the east drain a flatter country with numerous ponds and reservoirs. In Connecticut the river valley is generally broad and the country rolling, its soil is very fertile, and it is an important farming district.

The rocks are in general granite, gneiss, mica slate, and mica schists. An exception to this is the red sandstone in the Connecticut Valley, extending from New Haven nearly to the northern boundary of Massachusetts. The prevailing surface material is glacial drift.

The mean annual precipitation in the Connecticut Valley is about 40 inches, ranging from about 47 inches at Hartford to probably about 35 inches in the extreme upper portions. In a general way, there is usually a difference of a month in the time of beginning of the spring season in the lower portion of the river and its headwaters, and this tends to diminish the severity of floods from melting snow and equalize the spring run-off. The range in winter conditions is also somewhat variable, the lower courses of the river being subject usually to several thaws, while the upper third of the river usually remains frozen throughout the winter. Snow accumulates to considerable depths. The river is navigable to Hartford and, by smaller boats, as far as Holyoke.

The natural facilities for storage on Connecticut River are perhaps less than on many of the New England rivers, although on Millers, Chicopee, and Farmington rivers some storage has been developed. There are, however, many localities in this basin where reservoirs could be constructed, and there is need of systematic effort in this direction as the low-water flow on the Connecticut could be much improved by utilizing some of these storage sites, especially in the upper portions of the basin. Sunapee Lake, tributary to the Connecticut through Sugar River, is 6.5 square miles in area and can be drawn down 60 inches.

The Connecticut and its tributaries are very important for water power. On the main river large power plants are in operation at Wilder, Bellows Falls, Turners Falls, and Holyoke. In 1909 a hydro-electric power station on the Connecticut at Hinsdale, N. H., was completed. This plant furnishes power for Fitchburg and Worcester. Many power sites in this basin are still undeveloped.

The longest record of flow in the Connecticut is at Holyoke, Mass., and extends back to 1880. This record was interrupted in 1899, but since 1904 the records of the station at Sunderland are available for purposes of comparison. The driest year during the period covered by these records was 1883, and the wettest 1888, the total flow during these two years being about in the ratio of 1 to 2.14.

CONNECTICUT RIVER AT ORFORD, N. H.

This station, which is located at the wooden highway bridge between Orford, N. H., and Fairlee, Vt., was established August 6, 1900, to obtain information regarding the daily distribution of flow of the upper Connecticut River. Several small streams enter the Connecticut near Orford, but the only one of any considerable size is Waits River, approximately 10 miles above the station. The nearest dam is at Wilder, about 18 miles downstream. Backwater from this dam reaches probably within a few miles of Orford. Upstream the nearest dam is at East Ryegate, Vt., about 20 miles distant.

The chain gage is attached to the bridge, from which discharge measurements are made. Its datum has remained the same during the maintenance of the station.

During the winter months the discharge is affected by ice, but numerous discharge measurements under ice cover have been made, and fairly good rating curves have been developed for these conditions.

Conditions for obtaining accurate discharge data during the open season are fairly good, and a good discharge rating curve has been developed for 1910. This curve is a revision of the 1909 curve for high stages, deduced from later measurements and vertical velocity curve measurements. It is also different at low stages, owing to probable change in conditions of flow.

Discharge measurements of Connecticut River at Orford, N. H., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 29	T. W. Norcross	317	4,710	15.38	17,000
Aug. 17	G. M. Brett	278	1,860	5.99	3,280

Daily gage height, in feet, of Connecticut River at Orford, N. H., for 1910.

[F. H. Gardner, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.0	8.9	....	18.5	11.1	10.3	5.2	4.6	3.1	6.0	5.6	4.6
2	3.9	8.5	14.2	18.95	11.3	10.4	5.0	4.2	3.1	5.5	5.4	4.4
3	3.9	8.5	17.5	18.8	11.2	12.0	4.7	4.1	3.1	5.5	5.2	4.2
4	3.8	8.1	16.9	17.25	11.1	14.0	4.5	4.65	3.3	5.1	5.4	4.2
5	3.7	7.0	15.6	15.9	11.0	10.1	4.5	8.5	3.1	5.7	6.2	4.0
6	3.8	6.5	15.7	15.0	14.5	9.3	4.4	8.3	4.8	5.5	5.5	4.1
7	4.0	....	16.3	16.85	13.4	9.3	4.8	6.9	5.8	5.2	6.8	4.0
8	4.0	....	15.2	18.3	11.1	9.2	4.4	6.1	5.5	5.0	6.5	4.0
9	4.1	....	14.4	18.35	11.1	10.0	4.0	5.2	5.4	4.9	6.4	4.1
10	4.2	....	13.2	17.6	10.2	9.7	4.0	5.1	4.7	4.7	6.4	4.0

Daily gage height, in feet, of Connecticut River at Orford, N. H., in 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	4.2	......	12.0	15.3	10.8	9.4	3.6	5.0	4.6	4.3	5.9	3.9
12	4.2	......	11.0	12.9	10.5	9.0	4.1	4.9	4.6	4.5	5.4	......
13	4.1	5.8	10.8	11.5	9.8	8.8	3.9	4.7	4.5	4.3	5.3	......
14	4.0	......	10.3	10.5	9.1	8.4	4.2	4.6	4.3	4.2	5.1	......
15	4.0	......	10.0	9.6	8.6	7.8	5.1	4.4	4.9	3.9	5.0	......
16	4.1	......	9.6	9.5	8.4	7.7	3.7	5.1	4.9	3.4	5.0	......
17	......	......	8.9	9.3	8.0	7.3	3.8	5.5	4.3	3.6	4.9	......
18	......	......	8.2	9.0	7.5	7.0	3.7	5.9	4.2	3.8	4.9	4.1
19	......	......	8.0	8.8	7.7	7.7	3.8	5.3	3.9	4.0	4.8	......
20	......	5.9	7.8	9.9	8.4	8.0	3.5	5.5	3.7	4.1	4.8	......
21	......	......	8.4	11.0	8.9	7.2	3.1	5.7	3.6	4.0	4.5	......
22	......	......	9.0	11.4	8.5	7.1	3.4	4.7	2.8	3.4	4.0	......
23	14.2	......	9.5	12.2	7.9	7.0	3.3	4.6	2.8	3.2	4.1	......
24	13.8	......	10.0	14.8	7.7	6.3	3.5	4.6	2.6	3.8	4.4	......
25	13.0	......	9.9	13.2	8.5	6.0	4.0	4.7	3.3	4.0	4.3	5.3
26	13.0	......	16.0	11.8	8.5	5.6	4.1	4.2	3.8	4.2	4.2	......
27	......	6.8	16.85	11.9	14.5	5.4	3.9	3.6	3.0	5.5	4.6	......
28	12.6	......	15.85	14.8	15.5	5.4	3.9	3.5	3.5	4.9	4.6	......
29	11.0	......	15.45	13.5	14.1	5.4	3.9	3.4	6.4	5.0	4.5	......
30	10.5	......	15.9	11.5	11.7	5.2	3.7	3.3	6.2	5.4	4.6	......
31	9.1	......	17.5	......	11.6	......	4.5	3.3	......	5.5	......	......

NOTE.—Ice existed at this station from Jan. 1 to Mar. 1 and from Dec. 6 to 31. Gage readings were to water surface except Jan. 1 to Feb. 6 and Dec. 6 to 11, which were to the top of the ice. The thickness of ice varied during January and February between 0.7 foot and 1.4 feet. During December it attained a thickness of about 0.8 foot.

Daily discharge, in second-feet, of Connecticut River at Orford, N. H., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,000	4,000	8,000	23,600	9,920	8,740	2,520	2,000	1,000	3,290	2,900	2,000
2	1,000	3,500	15,200	24,500	10,200	8,880	2,340	1,690	1,000	2,800	2,700	1,840
3	1,000	3,500	21,500	24,200	10,100	11,300	2,080	1,620	1,000	2,800	2,520	1,690
4	900	3,000	20,300	21,000	9,920	14,800	1,920	2,040	1,110	2,430	2,700	1,690
5	900	2,500	17,800	18,400	9,770	8,450	1,920	6,230	1,000	2,990	3,500	1,550
6	900	2,000	18,000	16,600	15,700	7,320	1,840	5,960	2,170	2,800	2,800	1,300
7	900	2,000	19,100	20,200	13,700	7,320	2,170	4,260	3,090	2,520	4,150	1,200
8	900	2,000	17,000	23,200	9,920	7,180	1,840	3,400	2,800	2,340	3,820	1,200
9	1,000	2,000	15,500	23,300	9,920	8,300	1,550	2,520	2,700	2,260	3,710	1,100
10	1,000	1,500	13,300	21,700	8,600	7,880	1,550	2,430	2,080	2,080	3,710	1,100
11	1,000	1,500	11,300	17,200	9,470	7,460	1,290	2,340	2,000	1,760	3,190	1,000
12	1,000	1,500	9,770	12,800	9,030	6,900	1,620	2,260	2,000	1,920	2,700	1,000
13	1,000	1,500	9,470	10,500	8,020	6,640	1,480	2,080	1,920	1,760	2,610	1,000
14	900	1,500	8,740	9,030	7,040	6,100	1,690	2,000	1,760	1,690	2,430	1,000
15	900	1,500	8,300	7,740	6,360	5,320	2,430	1,840	2,260	1,480	2,340	1,000
16	900	1,500	7,740	7,600	6,100	5,200	1,350	2,430	2,260	1,170	2,340	1,000
17	1,000	1,400	6,770	7,320	5,580	4,720	1,420	2,800	1,760	1,290	2,260	1,000
18	1,200	1,400	5,840	6,900	4,960	4,380	1,350	3,190	1,690	1,420	2,260	1,000
19	1,500	1,400	5,580	6,640	5,200	5,200	1,420	2,610	1,480	1,550	2,170	1,000
20	2,000	1,400	5,320	8,160	6,100	5,580	1,230	2,800	1,350	1,620	2,170	1,200
21	3,000	1,400	6,100	9,770	6,770	4,610	1,000	2,990	1,290	1,550	1,920	1,400
22	6,000	1,500	6,900	10,400	6,230	4,500	1,170	2,080	850	1,170	1,550	1,600
23	12,000	1,500	7,600	11,600	5,450	4,380	1,110	2,000	850	1,060	1,620	1,600
24	10,000	1,500	8,300	16,300	5,200	3,600	1,230	2,000	755	1,420	1,840	1,800
25	8,000	1,600	8,160	13,300	6,230	3,290	1,550	2,080	1,110	1,550	1,760	1,800
26	8,000	1,800	18,500	11,000	6,230	2,900	1,620	1,690	1,420	1,690	1,690	1,800
27	7,000	2,000	20,200	11,200	15,700	2,700	1,480	1,290	950	2,800	2,000	2,000
28	7,000	4,000	18,200	16,300	17,600	2,700	1,480	1,230	1,230	2,260	2,000	2,000
29	6,000	......	17,500	13,900	15,000	2,700	1,480	1,170	3,710	2,340	1,920	2,400
30	5,000	......	18,400	10,500	10,800	2,520	1,350	1,110	3,500	2,700	2,000	2,800
31	4,000	......	21,500	......	10,700	......	1,920	1,110	......	2,800	......	3,000

NOTE.—Daily discharge for open channel determined from a well-defined discharge rating curve. Discharge for the periods during which ice was present, Jan. 1 to Mar. 1 and Dec. 6 to 31, are only approximate and are obtained from approximate ice discharge rating curves developed in earlier years from climatologic records and observers' notes. No measurements were made during 1910 with ice present, but earlier measurements indicate that conditions are about the same each year.

Monthly discharge of Connecticut River at Orford, N. H., for 1910.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,000	900	3,130	0.948	1.09	C.
February	4,000	1,400	2,000	.606	.63	C.
March	21,500	5,320	12,800	3.88	4.47	A.
April	24,500	6,640	14,500	4.39	4.90	A.
May	17,600	4,960	9,080	2.75	3.17	A.
June	14,800	2,520	6,050	1.83	2.04	A.
July	2,520	1,000	1,630	.494	.57	A.
August	6,230	1,110	2,430	.736	.85	A.
September	3,710	755	1,740	.527	.59	A.
October	3,290	1,060	2,040	.618	.71	A.
November	4,150	1,550	2,510	.761	.85	A.
December	3,000	1,000	1,520	.461	.53	C.
The year	24,500	755	4,960	1.50	20.40	

CONNECTICUT RIVER AT SUNDERLAND, MASS.

This station, which is located at a five-span steel highway bridge at Sunderland, about 18 miles in an air line above the Holyoke dam and 10 miles in an air line below that at Turners Falls, was established March 31, 1904, to obtain information regarding the daily distribution of flow of the river.

A record of flow of the Connecticut at Holyoke was carried on from 1880 to 1899, but interrupted after that time, and as this station has practically the same drainage area, it is of especial value in continuing the Holyoke records, which have been very widely used in power, storage, and navigation studies both on the Connecticut and on streams of similar regimen.

Deerfield River enters the Connecticut a short distance below Turners Falls.

The chain gage attached to the bridge is read twice daily. Its datum has remained the same during the maintenance of the station. Discharge measurements are made from the bridge. During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge data are fairly good, although there have been some changes in the condition of the bed of the river requiring changes in the rating curve. A fairly good discharge rating curve has been developed for 1910.

Discharge measurements of Connecticut River at Sunderland, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 15[a]	D. M. Wood			5.86	5,580
Mar. 9	do	776	10,800	14.55	41,700
Sept. 15	W. G. Hoyt	633	2,640	3.26	4,230

[a] Ice 0.5 to 0.7 foot thick was present.

Daily gage height, in feet, of Connecticut River at Sunderland, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.90	6.30	21.20	17.20	9.98	8.32	4.05	1.88	2.15	3.75	3.48	3.02
2	......	6.10	25.35	17.05	7.60	8.28	3.90	2.55	2.20	3.92	3.48	3.25
3	......	6.05	23.65	16.45	8.90	8.50	3.42	2.70	2.25	3.60	3.58	3.15
4	......	6.30	21.25	14.72	9.15	8.25	3.30	2.62	1.45	3.42	3.95	2.20
5	......	5.90	18.25	14.30	9.78	7.75	3.30	2.90	1.08	3.45	4.35	2.10
6	......	5.95	15.62	13.60	10.52	8.18	3.48	5.98	1.82	3.35	5.60	3.45
7	......	6.25	14.65	13.00	10.50	9.15	3.25	5.50	3.00	3.35	5.38	4.95
8	5.15	5.75	15.45	13.25	9.60	9.42	3.18	4.65	3.20	3.40	5.15	4.35
9	......	6.10	14.70	13.65	8.92	9.10	2.92	4.25	4.10	2.52	4.95	3.65
10	......	5.85	12.72	13.80	8.15	8.55	2.70	3.42	3.75	2.25	4.65	3.35
11	......	5.40	11.40	11.75	8.05	8.25	2.55	3.38	3.05	3.25	4.25	2.55
12	......	4.90	10.20	11.42	8.02	9.38	3.25	3.40	3.10	3.50	4.00	2.10
13	......	5.75	9.75	10.05	7.85	9.90	3.20	3.50	3.40	3.40	3.52	2.95
14	......	6.20	9.95	9.20	7.35	9.00	2.92	3.20	3.35	3.25	2.78	3.00
15	4.50	5.70	9.32	8.35	7.00	7.65	2.65	2.82	3.18	2.85	3.85	3.20
16	......	......	8.95	8.30	7.00	7.35	2.55	3.25	3.42	1.65	3.70	3.10
17	......	......	8.60	7.28	6.65	7.05	1.88	3.25	3.15	1.50	3.65	3.05
18	......	6.25	7.90	7.25	6.55	7.32	1.90	3.20	2.28	2.08	3.55	2.40
19	......	......	7.60	8.15	6.35	6.80	2.08	3.30	1.95	2.08	3.65	2.15
20	......	......	7.45	8.55	6.45	6.88	2.42	3.18	2.70	2.40	2.75	2.92
21	......	6.30	9.05	8.45	6.45	6.50	2.50	3.10	2.90	2.40	2.90	3.05
22	15.30	......	10.25	8.30	7.10	5.80	2.55	3.05	2.60	2.25	3.50	3.10
23	18.35	......	10.60	8.40	5.85	5.42	2.30	3.42	2.65	1.60	3.75	3.10
24	14.12	......	11.80	8.92	6.48	5.00	1.68	3.20	2.52	1.68	3.40	3.50
25	12.25	8.00	13.05	9.72	6.20	4.65	1.30	3.32	1.70	2.58	2.42	3.00
26	10.70	......	18.08	10.65	6.40	5.02	2.05	3.28	1.42	2.60	2.65	3.00
27	9.65	......	18.60	12.50	8.20	3.32	2.32	2.78	1.95	2.55	1.50	3.22
28	8.58	10.60	16.90	12.35	10.15	4.10	2.70	1.75	2.15	2.50	2.02	3.80
29	8.10	......	16.40	11.78	10.12	3.90	2.55	1.70	2.35	2.95	2.50	4.55
30	7.30	......	17.18	10.90	9.62	4.25	2.65	2.20	2.25	2.50	2.80	4.90
31	6.25	......	17.50	......	8.80	......	1.95	2.45	......	2.35	......	5.45

NOTE.—The relation of gage height to discharge was affected by the presence of ice from Jan. 1 to 21, from Feb. 7 to 28, and from Dec. 6 to 31. Gage heights were taken to water surface, except Jan. 1, 8, and Feb. 7 to 15, and 28, which were taken to the top of the ice. During January the ice thickness varied from 0.2 to 0.9 foot and during February it attained a thickness of 0.7 foot. The ice effect during December was probably entirely backwater.

Daily discharge, in second-feet, of Connecticut River at Sunderland, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,600	11,600	73,100	54,800	24,400	18,200	5,720	2,060	2,380	5,100	4,550	3,710
2	3,500	11,000	92,200	54,100	15,800	18,100	5,410	2,940	2,450	5,450	4,550	4,120
3	3,400	10,800	84,400	51,400	20,300	18,900	4,440	3,170	2,520	4,790	4,750	3,940
4	3,200	11,600	73,400	43,800	21,200	18,000	4,210	3,050	1,580	4,440	5,520	2,450
5	3,000	10,400	59,600	41,900	23,600	16,300	4,210	3,500	1,210	4,500	6,380	2,320
6	3,200	10,500	47,700	38,900	26,500	17,700	4,550	10,600	1,980	4,300	9,470	2,500
7	3,800	9,000	43,500	36,400	26,400	21,200	4,120	9,190	3,670	4,300	8,870	2,500
8	5,000	7,000	47,000	37,400	22,900	22,200	3,990	7,060	4,030	4,400	8,280	2,500
9	6,000	6,000	43,700	39,100	20,400	21,000	3,530	6,160	5,830	2,900	7,780	2,300
10	5,000	5,600	35,200	39,800	17,600	19,000	3,170	4,440	5,100	2,520	7,060	2,200
11	4,500	5,300	29,900	31,300	17,300	18,000	2,940	4,360	3,760	4,120	6,160	2,000
12	4,000	5,000	25,200	30,000	17,200	22,100	4,120	4,400	3,870	4,590	5,620	2,300
13	3,700	5,200	23,500	24,600	16,600	24,100	4,030	4,590	4,400	4,400	4,630	2,500
14	3,500	5,400	24,200	21,400	14,900	20,700	3,530	4,030	4,300	4,120	3,300	2,500
15	3,200	5,580	21,900	18,300	13,800	15,900	3,100	3,360	3,990	3,420	5,300	2,200
16	3,000	5,600	20,500	18,200	13,800	14,900	2,940	4,120	4,440	1,800	4,990	2,200
17	2,800	5,800	19,200	14,700	12,700	13,900	2,060	4,120	3,940	1,630	4,890	2,200
18	5,000	6,000	16,800	14,600	12,300	14,800	2,080	4,030	2,550	2,300	4,690	2,200
19	8,000	6,000	15,800	17,600	11,700	13,100	2,300	4,210	2,140	2,300	4,890	2,000
20	12,000	6,000	15,300	19,000	12,000	13,400	2,750	3,990	3,170	2,720	3,250	2,500
21	20,000	6,000	20,900	18,700	12,000	12,200	2,870	3,870	3,500	2,720	3,500	3,000
22	46,300	6,000	25,400	18,200	14,100	10,000	2,940	3,760	3,020	2,520	4,590	3,000
23	60,000	7,000	26,800	18,500	10,200	8,970	2,580	4,440	3,100	1,740	5,100	3,000
24	41,200	8,000	31,500	20,400	12,100	7,900	1,830	4,030	2,900	1,830	4,400	3,500
25	33,300	10,000	36,600	23,400	11,200	7,060	1,430	4,250	1,850	2,990	2,750	3,500

Daily discharge, in second-feet, of Connecticut River at Sunderland, Mass., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	27,200	12,000	58,800	27,000	11,900	7,950	2,260	4,170	1,550	3,020	3,100	3,500
27	23,100	15,000	61,200	34,300	17,800	4,250	2,610	3,300	2,140	2,940	1,630	3,800
28	19,100	20,000	53,400	33,700	25,000	5,830	3,170	1,900	2,380	2,870	2,220	3,500
29	17,500	....	51,200	31,400	24,900	5,410	2,940	1,850	2,650	3,580	2,870	3,300
30	14,800	....	54,700	28,000	23,000	6,160	3,100	2,450	2,520	2,870	3,300	3,000
31	11,400	....	56,200	....	19,900	....	2,140	2,800	....	2,650	....	3,000

NOTE.—Daily discharge during the open periods determined from a well-defined discharge rating curve. Discharge for periods during which ice existed estimated from one measurement made Feb. 15, with ice present, from climatologic records, and from a consideration of the discharge of the Connecticut at Orford, Deerfield River at Shelburne Falls, and Chicopee River at Red Bridge.

Monthly discharge of Connecticut River at Sunderland, Mass., for 1910.

[Drainage area, 7,700 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	60,000	2,800	13,000	1.69	1.95	B.
February	20,000	5,000	8,340	1.08	1.12	C.
March	92,200	15,300	41,600	5.40	6.23	A.
April	54,800	14,600	30,000	3.90	4.35	A.
May	26,500	10,200	17,500	2.27	2.62	A.
June	22,200	4,250	14,600	1.90	2.12	A.
July	5,720	1,430	3,260	.423	.49	A.
August	10,600	1,850	4,200	.545	.63	A.
September	5,830	1,210	3,100	.403	.45	A.
October	5,450	1,630	3,350	.435	.50	A.
November	9,470	1,630	4,950	.643	.72	A.
December	4,120	2,000	2,810	.365	.42	C.
The year	92,200	1,210	12,200	1.59	21.60	

PASSUMPSIC RIVER NEAR ST. JOHNSBURY, VT.

Passumpsic River rises in several small ponds and lakes in the mountainous region of the eastern part of northern Vermont. The West Branch of the river is formed near the base of Mount Pisgah and flows in a general southeasterly direction to its junction with East Branch, which was formed about 8 miles to the north by the run-off from several hills and small mountains. The main river then runs in a general southwesterly direction, receiving several small tributary streams along its course and being joined at Lyndonville by an important branch which rises in the towns of Sheffield and Sutton; it then flows southward to join Connecticut River at East Barnet, having received from the east Sheldon Brook and Moose River, and from the west Millers River and West, Sleepers, and Joes branches.

The river is in general quick falling. There are many power plants along the main river and also on the tributaries, which furnish power chiefly for the manufacture of lumber and kindred products, and for electric lighting. The storage is rather small, but the opportunities for improvement are good.

The upper parts of the basin are fairly well forested; in the lower parts much of the land is cultivated. The whole area is hilly and a great portion of it is rocky. The prevailing rocks are granite and limestone. Clay is found throughout the drainage area, and drift sand is also abundant.

The mean annual precipitation on this basin is probably about 40 inches. The river is generally frozen throughout the winter. On account of the topography and geology the run-off in the freshet season is usually large.

The gaging station, which is located about 5 miles above St. Johnsbury and 2 miles above Centervale, Vt., at a footbridge a short distance below the plant operated by Pierce Bros. in the manufacture of leather board, was established May 26, 1909, in cooperation with the State of Vermont.

The nearest dam below the station is the electric-light plant just below Centervale. At high water this dam causes backwater at the gaging station, but as the power output at this plant is small the effect on the conditions at the Pierce mills is constant for any gage height. At usual stages the river below the station is quick falling, rips being found at several places. On account of the winding of the river in its course, and because of the dam below the station, jams of ice sometimes occur at the bends during the winter and spring.

The staff gage, in two sections, is located at the footbridge. It is read twice daily. The datum has remained unchanged since the establishment of the station. Measurements are made from a suspension footbridge, where the conditions for good results are excellent. As the storage at the Pierce mills is rather small and as the amount of water used during the day is rather uniform, it is believed that the gage heights fairly represent the flow, and the results are good. During the winter months the discharge is affected by ice. A good rating curve has been developed which is based on 1909–10 discharge measurements.

Discharge measurements of Passumpsic River near St. Johnsbury, Vt., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 25 a	T. W. Norcross	96	452	5.16	1,580
26 a	....do	98.5	504	5.62	1,790
26 a	....do	97	485	5.46	1,680
26 a	....do	96	476	5.36	1,610
26 a	....do	96.5	477	5.31	1,620
26 a	....do	96	454	5.16	1,520
26 a	....do	96	445	5.05	1,480
28	....do	94.5	318	3.71	938
Apr. 20	....do	90	263	3.05	624
July 13	G. M. Brett	79	107	1.31	76.7

a Measurement made 1 foot below surface, coefficient of 0.83 applied.

Daily gage height, in feet, of Passumpsic River near St. Johnsbury, Vt., for 1910.

[J. Cox, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.90	2.90	6.90	6.20	3.40	3.70	1.85	1.54	1.38	1.69	1.74	1.70
2	1.76	3.00	6.40	5.30	2.90	3.20	1.71	1.48	1.40	2.15	1.68	1.61
3	1.62	2.95	5.00	4.60	2.85	2.95	1.51	1.58	1.32	1.95	2.30	1.59
4	2.00	3.00	4.40	4.10	2.75	2.80	1.96	1.82	1.62	1.72	2.30	1.61
5	2.55	3.10	3.90	4.50	3.90	2.55	1.85	2.15	1.56	1.69	2.40	1.65
6	......	......	3.70	5.00	3.30	3.10	1.89	1.82	2.10	1.70	2.30	1.58
7	......	......	4.90	6.10	2.85	3.20	1.58	1.82	2.30	1.64	2.05	1.65
8	......	......	5.20	5.10	2.70	3.00	1.62	1.68	1.82	1.61	1.94	1.56
9	1.90	......	3.90	4.20	2.60	2.90	1.64	1.54	1.62	1.52	1.85	1.61
10	......	2.90	3.20	4.20	3.10	2.55	1.54	1.50	1.62	1.56	1.65	1.68
11	......	......	3.10	3.70	2.80	2.55	1.78	1.66	1.55	1.54	1.72	1.72
12	......	......	3.10	3.30	2.50	2.55	1.56	1.79	1.46	1.51	1.72	1.75
13	2.10	2.95	2.60	3.00	2.35	2.60	1.54	1.58	1.44	1.48	1.72	1.71
14	......	......	2.60	2.90	2.30	2.30	1.58	1.50	1.54	1.50	1.78	1.74
15	......	......	2.40	2.85	2.30	2.10	1.55	1.78	1.49	1.50	1.70	1.75
16	2.00	......	2.35	2.90	2.35	2.10	1.51	2.55	1.49	1.51	1.69	1.88
17	......	3.00	2.20	2.70	2.20	2.10	1.42	1.81	1.36	1.54	1.68	1.81
18	......	......	2.15	2.75	2.10	2.60	1.36	1.59	1.30	1.49	1.66	1.80
19	......	......	2.20	3.10	3.00	2.70	1.39	1.89	1.42	1.46	1.65	1.80
20	2.35	2.90	2.25	3.00	2.65	2.20	1.40	1.78	1.39	1.50	1.55	1.90
21	......	......	2.60	2.95	2.45	2.10	1.40	1.56	1.39	1.44	1.60	1.95
22	6.10	......	2.40	2.85	2.40	1.89	1.65	1.51	1.36	1.48	1.62	2.00
23	7.40	......	2.75	3.70	2.30	2.25	1.91	1.44	1.38	1.64	1.61	2.00
24	5.20	3.20	3.30	3.00	2.20	1.98	1.74	1.46	1.36	1.69	1.65	2.00
25	4.60	......	5.30	2.70	2.70	1.85	1.64	1.48	1.36	1.62	1.69	2.90
26	4.10	......	5.40	2.85	8.60	1.88	1.46	1.46	1.50	1.95	1.68	2.75
27	3.60	......	3.90	4.40	4.60	1.71	1.48	1.42	1.42	1.95	1.51	2.60
28	3.40	6.10	3.90	3.30	4.00	2.70	1.72	1.38	3.80	2.30	1.65	2.40
29	3.20	......	5.20	2.85	3.20	2.30	1.69	1.45	2.25	2.20	1.60	2.35
30	3.00	......	6.20	3.40	2.80	1.91	1.56	1.36	1.79	1.91	1.65	2.60
31	3.00	......	6.10	......	2.95	......	1.65	1.31	......	1.81	......	2.90

NOTE.—Ice existed at this station from Jan. 1 to 21, from about Feb. 4 to 27, and from about Dec. 7 to 31. During these periods gage heights were taken to water surface.

Daily discharge, in second-feet, of Passumpsic River near St. Johnsbury, Vt., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	577	2,320	2,000	780	906	216	134	96	172	186	175
2	......	616	2,100	1,600	577	697	178	119	100	306	170	152
3	......	596	1,470	1,290	558	596	126	144	82	245	355	146
4	......	......	1,210	1,080	519	538	248	208	154	180	355	152
5	......	......	992	1,250	992	444	216	306	139	172	390	162
6	......	......	906	1,470	738	656	227	208	290	175	355	144
7	......	......	1,430	1,960	558	697	144	208	355	159	275	......
8	......	......	1,560	1,510	500	616	154	170	208	152	242	......
9	......	......	992	1,120	463	577	159	134	154	129	216	......
10	......	......	697	1,120	656	444	134	124	154	139	162	......
11	......	......	656	906	538	444	197	165	136	134	180	......
12	......	......	656	738	426	444	139	199	114	126	180	......
13	......	......	463	616	372	463	134	144	110	119	180	......
14	......	......	463	577	355	355	144	124	134	124	197	......
15	......	......	390	558	355	290	136	197	122	124	175	......
16	......	......	372	577	372	290	126	444	122	126	172	......
17	......	......	322	500	322	290	105	205	91	134	170	......
18	......	......	306	519	290	463	91	146	78	122	165	......
19	......	......	322	656	616	500	98	227	105	114	162	......
20	......	......	338	616	482	322	100	197	98	124	136	......
21	......	......	463	596	408	290	100	139	98	110	149	......
22	1,960	......	390	558	390	227	162	126	91	119	154	......
23	2,540	......	519	906	355	338	233	110	96	159	152	......
24	1,560	......	738	616	322	254	186	114	91	172	162	......
25	1,290	......	1,600	500	500	216	159	119	91	154	172	......
26	1,080	......	1,650	558	3,080	224	114	114	124	245	170	......
27	864	......	992	1,210	1,290	178	119	105	105	245	126	......
28	780	1,960	992	738	1,040	500	180	96	949	355	162	......
29	697	......	1,560	558	697	355	172	112	338	322	149	......
30	616	......	2,000	780	538	233	139	91	199	233	162	......
31	616	......	1,960	......	596	......	162	80	......	205	......	......

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Monthly discharge of Passumpsic River near St. Johnsbury, Vt., for 1910.

[Drainage area, 237 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,540	....	453	1.91	2.20	C.
February	1,960	....	275	1.16	1.21	D.
March	2,320	306	994	4.19	4.83	A.
April	2,000	500	923	3.89	4.34	A.
May	3,080	290	635	2.68	3.09	A.
June	906	178	428	1.81	2.02	A.
July	248	91	155	.654	.75	A.
August	444	80	162	.684	.79	A.
September	949	78	167	.705	.79	A.
October	355	110	174	.734	.85	A.
November	390	126	199	.840	.94	A.
December	....	....	140	.591	.68	D.
The year	3,080	....	393	1.66	22.49	

NOTE.—Discharge for the periods during which ice existed determined from climatologic records and the run-off from White River at Sharon, Vt.
Mean discharge Jan. 1 to 21, estimated, 98 second-feet, ranging from about 60 second-feet to 200 second-feet.
Mean discharge Feb. 4 to 27, estimated, 165 second-feet; no great variation in discharge.
Mean discharge Dec. 7 to 31, estimated, 136 second-feet; no great variation in discharge.

WHITE RIVER NEAR SHARON, VT.

White River, one of the largest streams in Vermont and an important tributary of the Connecticut, rises in the mountainous region of north-central Vermont. It is formed of four main branches. The Third Branch rises in the town of Roxbury, Vt., flows in a general southeasterly direction, is joined near Randolph by Ayers Brook and joins the West Branch at Bethel. This latter branch has its origin in the hills and mountains of Hancock and Granville and flows easterly, being joined at Rochester by the South Branch, and near Bethel by the Locust Branch. The third important branch of the main river, called the Second Branch, rises in the township of Brookfield, flows southward, and joins White River at Royalston. The fourth branch, called the First Branch, is adjacent to the Second Branch, rising in the township of Washington, flowing south, and entering White River at South Royalston. Below South Royalston White River follows a general southeasterly direction to its union with Connecticut River at White River Junction.

A large portion of the drainage basin is characterized by steep wooded slopes. The river furnishes power for several plants used for quarrying or for electric lighting. The mean annual precipitation in this drainage at Strafford is about 40 inches. The winters are fairly severe.

The gaging station, which is 1½ miles from the post office at Sharon, is located about 1,500 feet below the dam of the Vermont Copper Co., and about 800 feet above Central Vermont Railway bridge. It was established May 13, 1909, in cooperation with the State of Vermont, to continue the records formerly obtained by the United States Geological Survey at a station on the highway bridge at Sharon.

An inclined staff gage reading to 10 feet is attached to a large rock on the left bank. A chain gage for use in high water is nailed to trees about 80 feet upstream from the staff gage. The table of daily gage heights, following, is referred to these two gages. There is no danger of backwater at the gage and the effect of the power station is not material.

An island divides the channel above the gages. Discharge measurements are made from two suspension footbridges, which connect the island with the banks. A good rating curve covering the medium and low flows has been developed. The gage datum has not been changed.

A gage record has also been obtained beginning January 20, 1910, of the height of water on the crest of the dam of the Vermont Copper Co. This dam is not used at present for power development, although the gates are sometimes operated in order to draw from the available stored water. The record at the dam is of value in constructing a rating curve to determine the discharge over it in case it should become desirable to abandon the meter station because of the starting of the operation of the power plant.

The conditions are good for obtaining reliable data, except that ice affects the flow of the meter station during the winter months.

By means of an approximate curve of relation between the daily gage readings at the dam and the daily discharge at the meter station fair records of discharge have been computed for the winter months from the gage heights at the dam.

Although there are several power plants above the station, it is assumed that the fluctuations in daily stage caused by them are sufficiently equalized at the dam of the Vermont Copper Co., so that the daily gage record at the current meter station is a fairly accurate index of the discharge.

The following discharge measurement was made by G. M. Brett:

August 17, 1910: Width, 79 feet; area, 151 square feet; gage height, 3.90 feet; discharge, 286 second-feet.

Daily gage height, in feet, of White River near Sharon, Vt., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				7.2	4.8	5.6	4.0	3.7	3.7	4.3	4.1	4.1
2				6.4	4.8	5.2	4.0	3.7	3.7	4.3	4.1	4.1
3				6.0	4.8	4.9	4.0	3.7	3.8	4.3	4.3	4.0
4	4.35			5.8	5.6	4.8	4.0	7.1	3.9	4.2	4.6	3.9
5			5.85	4.6	5.2	4.6	4.0	5.0	3.9	4.1	4.7	4.0
6				5.7	5.0	5.6	4.0	4.6	4.7	4.2	4.9	4.0
7	4.2			6.0	4.8	6.5	3.9	4.3	5.2	4.2	4.6	4.0
8			6.1	5.7	4.7	6.2	3.9	4.2	4.5	4.2	4.5	4.0
9				5.4	4.7	5.5	3.9	4.1	4.2	4.1	4.4	4.0
10				5.6	4.9	5.4	3.8	4.0	4.0	4.1	4.4	4.0
11	4.1		5.7	5.1	4.8	5.2	3.8	4.1	3.9	4.1	4.4	4.0
12				5.0	4.7	5.4	3.8	4.3	3.9	4.1	4.4	3.7
13				4.9	4.6	5.3	3.8	4.1	3.9	4.0	4.3	3.6
14	4.1			4.8	4.6	5.1	3.8	3.9	4.2	4.0	4.3	3.8
15			5.1	4.8	4.6	4.9	3.8	3.9	4.0	4.0	4.3	3.9

Daily gage height, in feet, of White River near Sharon, Vt., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	......	......	......	4.7	4.6	4.9	3.9	4.0	3.9	4.0	4.2	4.2
17	......	......	......	4.7	4.4	5.0	3.8	3.9	3.8	4.0	4.2	4.2
18	4.25	......	4.6	4.7	4.4	4.9	3.9	3.9	3.8	4.0	4.2	4.0
19	......	......	......	4.8	4.7	4.8	3.9	3.9	3.9	4.0	4.1	4.0
20	......	......	......	4.9	4.5	4.7	3.8	3.8	3.8	4.0	4.1	4.0
21	......	......	5.7	4.8	4.4	4.5	3.7	3.7	3.8	4.1	4.1	4.0
22	......	......	......	4.7	4.5	4.5	3.7	3.8	3.8	3.9	4.1	4.0
23	......	......	6.9	4.8	4.5	4.4	3.7	3.7	3.8	4.0	4.1	4.0
24	......	......	......	4.7	4.4	4.4	3.7	3.7	3.9	4.7	4.1	4.2
25	......	......	7.9	4.6	4.5	4.3	3.7	3.6	3.9	4.1	4.1	4.9
26	......	......	7.6	4.6	6.4	4.2	3.7	3.8	3.9	4.1	4.1	4.6
27	......	......	6.7	5.8	5.6	4.2	3.7	3.7	4.0	4.1	4.0	4.3
28	......	......	......	5.3	5.4	4.4	3.6	3.5	5.7	4.4	4.0	4.2
29	......	......	6.8	5.0	4.8	4.3	3.7	3.7	4.8	4.3	4.1	4.5
30	......	......	7.1	4.9	4.7	4.1	3.7	3.6	4.4	4.1	4.1	5.3
31	......	......	7.5	......	4.8	......	3.7	3.6	......	4.1	......	......

NOTE.—Ice existed at this station most of the time from Jan. 1 to about Mar. 25 and from about Dec. 14 to 17. The channel was probably clear of ice for a few days during the latter part of January, for most of the time from Mar. 1 to 25, and possibly during the last few days of December. The gage readings were probably to water surface during the periods when ice was present.

Daily discharge, in second-feet, of White River near Sharon, Vt., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	180	......	7,620	5,140	1,180	2,260	440	260	260	680	515	515
2	180	......	6,940	3,360	1,180	1,700	440	260	260	680	515	515
3	200	......	6,170	2,870	1,180	1,300	440	260	315	680	680	440
4	180	......	4,000	2,560	2,260	1,180	440	a4,940	375	595	965	375
5	180	......	1,750	2,260	1,700	965	440	1,430	375	515	1,070	440
6	200	......	2,260	2,410	1,430	2,260	440	965	1,070	595	1,300	440
7	200	......	4,000	2,870	1,180	3,740	375	680	1,700	595	965	440
8	180	......	3,040	2,410	1,070	3,200	375	595	865	595	865	440
9	180	......	2,000	1,970	1,070	2,120	375	515	595	515	770	440
10	160	......	1,670	2,260	1,300	1,970	315	440	440	515	770	440
11	160	......	1,440	1,560	1,180	1,700	315	515	375	515	770	440
12	160	......	1,590	1,430	1,070	1,970	315	680	375	515	770	260
13	160	......	1,360	1,300	965	1,830	315	515	375	440	680	215
14	160	......	1,360	1,180	965	1,560	315	375	595	440	680	250
15	160	......	1,560	1,180	965	1,300	315	375	440	440	680	250
16	180	......	1,290	1,070	965	1,300	375	440	375	440	595	345
17	180	......	1,290	1,070	770	1,430	315	375	315	440	595	250
18	200	......	810	1,070	770	1,300	375	375	315	440	595	440
19	400	......	1,010	1,180	1,070	1,180	375	375	375	440	515	440
20	620	......	1,670	1,300	865	1,070	315	315	315	440	515	440
21	560	......	2,170	1,180	770	865	260	260	315	515	515	440
22	1,720	......	1,510	1,070	865	865	260	315	315	375	515	440
23	2,540	......	3,130	1,180	865	770	260	260	315	440	515	440
24	1,510	......	3,450	1,070	770	770	260	260	375	1,070	515	595
25	1,360	......	6,170	965	865	680	260	215	375	515	515	1,300
26	1,080	......	5,980	965	3,560	595	260	315	375	515	515	965
27	940	......	4,130	2,560	2,260	595	260	260	440	515	440	680
28	810	7,620	3,500	1,830	1,970	770	215	175	2,410	770	440	595
29	680	......	4,320	1,430	1,180	680	260	260	1,180	680	515	865
30	680	......	4,940	1,300	1,070	515	260	215	770	515	515	1,830
31	680	......	5,770	......	1,180	......	260	215	......	515	......	1,200

a Discharge Aug. 4 from the gage record on the dam was 2,350 second-feet.

NOTE.—Daily discharge for Mar. 8, 15, 26, 27, Mar. 29 to Dec. 13, and Dec. 18 to 30 determined from a well-defined discharge rating curve referred to the gage at the current meter station.

Discharge Jan. 1 to 19 estimated and only approximate. Discharge Jan. 20 to 31, Feb. 28 to Mar. 7, Mar. 9 to 14, Mar. 16 to 25, Mar. 28, and Dec. 14 to 17 computed from a discharge curve which was developed from the gage readings on the crest of the dam, and the corresponding daily discharge as determined at the current meter station below the dam. The gage readings at the dam Feb. 1 to 27 were undoubtedly affected by ice lodging and freezing on the crest of the dam, and hence can not be used directly to obtain the daily discharge.

Discharge Dec. 3 to 11 and Dec. 18 to 22 relatively high as the result of draft on the storage back of the dam of the Vermont Copper Co.

The discharge Dec. 25 to 31 may be high because of backwater from ice below the current-meter station.

Monthly discharge of White River near Sharon, Vt., for 1910.

[Drainage area, 686 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,540	160	541	0.789	0.91	C.
February	7,620	....	700	1.02	1.06	C.
March	7,620	810	3,160	4.61	5.32	A.
April	5,140	965	1,810	2.64	2.94	A.
May	3,560	770	1,240	1.81	2.09	A.
June	3,740	515	1,420	2.07	2.31	A.
July	440	215	330	.481	.55	A.
August	4,940	175	562	.819	.94	B.
September	2,410	260	566	.825	.92	A.
October	1,070	375	530	.773	.89	B.
November	1,300	440	660	.962	1.07	A.
December	1,830	215	554	.808	.93	C.
The year	7,620	160	1,010	1.47	19.93	

NOTE.—Discharge for Jan. 1-19 and Feb. 1-27 estimated from climatologic records and the discharge from near-by drainage areas.

Mean discharge Feb. 1-27 estimated 444 second-feet; practically constant.

The accuracy for August and October was reduced on account of discrepancies, amounting to several per cent between the monthly mean discharge as obtained from the gage-height record at the dam and that obtained from the record at the current-meter station.

ASHUELOT RIVER AT HINSDALE, N. H.

Ashuelot River, a rather important power stream, rises in the town of Washington, Sullivan County, N. H., and flows in a general southwesterly direction about 45 miles to Connecticut River near Hinsdale. Its drainage basin, comprising approximately 442 square miles, includes Mount Monadnock and is to a considerable extent forested. Water is stored for power at several ponds and reservoirs in the basin.

The gaging station, which is located at the lower highway bridge in the town of Hinsdale, about one-fourth mile below the dam used jointly by the Fisk Paper Co. and the Haile & Frost Manufacturing Co., was established February 22, 1907, in cooperation with Charles Bigelow, treasurer of the Haile & Frost Manufacturing Co. Since June 13, 1909, records have been furnished by Frederick S. Leonard, of the Fisk Paper Co.

The station is about 2 miles above the mouth of the river, but as there is considerable fall below no backwater influence is shown except possibly at very high stages of the Connecticut. The use of water at the dam at Hinsdale causes great daily fluctuations in stage during low-water seasons.

The chain gage is attached to the bridge and is read twice daily. Its datum has remained the same during the maintenance of the station. Discharge measurements are made from the bridge. During the winter the discharge is affected by ice.

Conditions for obtaining accurate discharge measurements are good, and a good discharge rating curve has been developed.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Ashuelot River at Hinsdale, N. H., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 11[a]	T. W. Norcross	110	158	4.15	215
16	Borrows and Breed		91	2.87	87.9
16	....do		114	3.37	148
16	....do		119	3.71	150
16	....do		144	3.96	170
20[b]	D. M. Wood	111	161	4.15	238
July 21	H. K. Borrows		124	2.93	130

[a] Measurement made about 100 feet above the bridge under ice cover. Thickness of ice at the gage, 1.2 feet; water surface to top of ice, 0.15 foot.
[b] Measurement made about 100 feet above the bridge under ice cover. Average thickness of ice, 1.2 feet; average water surface to top of ice, 0.2 foot.

MILLERS RIVER AT WENDELL, MASS.

Millers River rises in several small ponds and lakes in the towns of Ashburnham and Winchendon in north-central Massachusetts, flows in a general southwesterly direction to its junction with Otto River near South Royalston, and thence westward to Millers Falls, where it enters Connecticut River. The principal tributary streams from the north are Tilly River, Moss Brook, and Kemp Brook; from the south, Beaver Brook.

The drainage basin is in general long and narrow. On account of the large number of ponds the river is not flashy, offering a striking contrast to Deerfield River, which enters the Connecticut from the west, and drains an area of about the same size.

Millers River is important because of its power sites, many of which are already developed. Below Erving the slope of the river is great.

The average precipitation through the basin ranges from 44 inches in the upper to 39 inches in the lower part.

A considerable portion of the drainage area is well wooded, hardwood growths predominating. Only a small part is farmed. Clay and sand are found in abundance and the predominant rocks are granites.

The gaging station, which is located at the railroad bridge just west of the Wendell railroad station, was established June 4, 1909.

The work is carried on in cooperation with the State of Massachusetts and the Orange Electric Light Co., which completed a dam on June 1, 1910, 600 feet below an old dam which it replaces and immediately above the gaging station. Power was first delivered at this new plant June 8, 1910. The wheels at the old dam have been run at irregular intervals prior to the completion of the new dam to furnish power and to divert water from the construction work. During the low-water period the use of these wheels interfered seriously with the determination of the correct daily flow of the river. By means of a series of frequent readings through the day and night, an attempt was made to determine the two most favorable times of day for reading the gage heights in order to give the true mean height of the river for the day.

During 1910 a new dam was also completed 1½ miles below the gage. This latter dam causes backwater at the gage at medium and high stages, requiring a new discharge rating curve. To what extent this backwater effect is variable is not known.

Discharge measurements are made from the railroad bridge or by wading. The conditions are only fair on account of the rough bed, swift velocity, and the distance from the bridge to the water. Two good discharge rating curves have been developed from 1909–1911 discharge measurements.

During the winter the formation of ice in the still water below the bridge causes backwater at the gage section. The chain gage is attached to the railroad bridge. The datum has been unchanged. The gage heights are observed under the direction of F. B. Saunders, superintendent of the Orange Electric Light Co.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the diurnal fluctuation in the daily gage heights provided the changed conditions since the construction of the two new dams will warrant it, thus making possible the publication of accurate computations of daily discharge at this station. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge. How far it will be possible to reclaim the records of gage heights taken prior to the construction of the two new dams is impossible to say, but every reasonable effort will be made to determine the discharges as accurately as possible for this station for 1909 and 1910 by means of a thorough study of the conditions during those years.

Discharge measurements of Millers River at Wendell, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 14[a]	D. M. Wood	108	211	2.34	400
Mar. 2[a]	.....do	119	702	6.40	3,360
5[b]	T. W. Norcross	116	437	4.21	2,300
9[b]	D. M. Wood	119	516	4.89	2,840
July 19[c]	H. B. Alvord	23	228	....	97
19[c]	.....do	28	238	....	131
Sept. 14[d]	W. G. Hoyt	54	38	.84	33.5

[a] Ice below the gage.
[b] River clear of ice.
[c] Measurement shows flow through gates only.
[d] Measurement made by wading above bridge shows leakage in wheel pit.

MOSS BROOK AT WENDELL, MASS.

Moss Brook, a small tributary to Millers River, rises in Lake Moore, in the town of Warwick, near the boundary between New Hampshire and Massachusetts, and flows southward into Millers River at Wendell, Mass. Its length from the lake to Millers River is approximately 4 miles, and it flows directly into the pond formed by the dam of the Athol Gas & Electric Co.

A gaging station was originally established June 4, 1909, at a small wooden highway bridge across the brook, about 100 feet above its junction with Millers River.

The vertical staff gage was bolted to the downstream side of the right abutment. Measurements were made from the bridge or by wading. The rough bed and low current velocities made the section at the bridge poor for discharge measurements.

As backwater from the new dam constructed on Millers River below Wendell extended to the bridge station, it was discontinued October 16, 1909. On April 25, 1910, a weir was constructed about one-fourth mile above the mouth of the brook. The weir was of the thin-edge type, made of wood faced with iron and constructed with two crests, the lower being 9.96 feet in length, and the upper (including the lower) 15.92 feet in length. The average elevation of the lower crest is 96.885 feet. The average elevation of the upper crest is 98.38 feet. The elevation of the top of the weir is 99.83 feet.

A staff gage is set in the pond above the weir, with its zero at the same elevation as the lower crest and is read twice daily. The gage heights for 1909 refer to the gage at the bridge, and those for 1910 refer to the gage at the weir.

Three test current-meter measurements indicate that the Francis formula is not strictly applicable to this weir. One of the measurements indicated leakage when the depth of water on the lower crest is more than 0.4 foot.

The discharge rating curve developed for the bridge section and used during 1909 is only approximate. The discharge rating curve used for 1910 is approximately a mean between the curve developed from Francis's formula and the curve developed by the discharge measurements. The discharge records for 1910 are also approximate.

Assistance in the construction of the weir and in the maintenance of this station was rendered by F. B. Saunders.

Discharge measurements of Moss Brook at Wendell, Mass., in 1909-10.

Date.	Hydrographer.	Gage height.	Discharge.
1909.		*Feet.*	*Sec.-ft.*
June 5	D. M. Wood	1.21	8
22	....do	1.18	6
Aug. 3	....do	.94	1.5
27	....do	.96	2
Oct. 8	Norcross and Wood	.99	6
Dec. 17	D. M. Wood	....	10.5
1910.			
Apr. 25[a]	....do	.55	19.3
July 19[b]	H. B. Alvord	.20	2.8
Sept. 14[b]	W. G. Hoyt	.10	1.77

[a] Measurement made from bridge. [b] Measurement made at wading section.

NOTE.—The gage heights for 1909 refer to the gage at the meter station at the bridge. The gage heights for 1910 refer to the gage at the weir.

Daily gage height, in feet, and discharge, in second-feet, of Moss Brook at Wendell, Mass., for 1909.

[W. P. Leonard, observer.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1	....	....	1.02	3.1	0.98	2.4	1.00	2.7	1.05	3.6
2	....	....	1.02	3.1	.97	2.2	1.00	2.7	1.05	3.6
3	....	....	1.02	3.1	.95	1.8	.99	2.5	1.05	3.6
4	1.22	7.4	1.02	3.1	.95	1.8	.98	2.4	1.05	3.6
5	1.22	7.4	1.04	3.5	1.03	3.3	1.00	2.7	1.03	3.3
6	1.68	25.8	1.02	3.1	1.02	3.1	1.00	2.7	1.03	3.3
7	1.52	17.4	1.02	3.1	1.02	3.1	.99	2.5	1.02	3.1
8	1.40	12.9	1.02	3.1	1.01	2.9	.99	2.5	1.10	4.6
9	1.31	9.9	1.00	2.7	1.00	2.7	.98	2.4	1.08	4.2
10	1.28	9.0	1.00	2.7	.98	2.4	.98	2.4	1.06	3.8
11	1.38	12.2	1.00	2.7	.95	1.8	1.00	2.7	1.03	3.3
12	1.33	10.6	1.00	2.7	.95	1.8	1.00	2.7	1.03	3.3
13	1.28	9.0	1.00	2.7	1.00	2.7	.99	2.5	1.02	3.1
14	1.27	8.8	1.00	2.7	.99	2.5	.99	2.5	1.02	3.1
15	1.25	8.2	1.00	2.7	.98	2.4	.99	2.5	1.00	2.7
16	1.22	7.4	.98	2.4	1.10	4.6	1.05	3.6	1.00	2.7
17	1.20	6.8	1.05	3.6	....	7.4	1.04	3.5	....	....
18	1.46	15.1	1.03	3.3	1.32	10.3	1.03	3.3	....	....
19	1.46	15.1	1.02	3.1	1.30	9.6	1.00	2.7	....	....
20	1.30	9.6	1.00	2.7	1.10	4.6	.99	2.5	....	....
21	1.28	9.0	1.00	2.7	1.10	4.6	.99	2.5	....	....
22	1.22	7.4	.98	2.4	1.04	3.5	.98	2.4	....	....
23	1.15	5.7	.98	2.4	1.02	3.1	.98	2.4	....	....
24	1.15	5.7	1.02	3.1	1.01	2.9	1.00	2.7	....	....
25	1.05	3.6	1.00	2.7	1.01	2.9	1.10	4.6	....	....
26	1.02	3.1	1.00	2.7	1.00	2.7	1.25	8.2	....	....
27	1.02	3.1	1.00	2.7	.99	2.5	1.37	11.9	....	....
28	1.10	4.6	1.00	2.7	.98	2.4	1.65	24.0	....	....
29	1.08	4.2	1.00	2.7	.98	2.4	1.50	16.5	....	....
30	1.04	3.5	.98	2.4	.98	2.4	1.25	8.2	....	....
31	....	....	.98	2.4	.97	2.2	....	....	....	....

NOTE.—Daily discharge determined from a poorly defined discharge rating curve. Discharge Aug. 17, 1909, interpolated.

Daily gage height, in feet, and discharge, in second-feet, of Moss Brook at Wendell, Mass., for 1910.

[F. B. Saunders, observer.]

Day.	April.		May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1	....	....	0.715	26	0.36	7.7	....	....	0.08	1.0
2	....	....	.66	23	.32	6.4	....	....	.08	1.0
3	....	....	.62	20	.30	5.7	....	....	.20	3.2
4	....	....	.75	28	.235	4.1	....	....	.155	2.3
5	....	....	.765	29	....	5.5	....	....	.285	5.3
6	....	....	.70	25	.335	6.9	....	....	.175	2.7
7	....	....	.60	19.0	.43	10.4	....	....	....	2.2
8	....	....	.64	21	.355	7.6	....	....	.12	1.7
9	....	....	.565	17.1	.30	5.7	....	....	.95	1.2
10	....	....	.60	19.0	.32	6.4	....	....	.09	1.2
11	....	....	.565	17.1	.85	34	....	....	.20	3.2
12	....	....	.525	14.9	....	27	....	....	.16	2.4
13	....	....	.50	13.5	.615	19.9	....	....	.10	1.3
14	....	....	.47	12.2	.475	12.4	....	....	....	1.4
15	....	....	.45	11.3	.37	8.1	....	....	....	1.5
16	....	....	.425	10.2	.32	6.4	....	....	....	1.6
17	....	....	.41	9.5	.52	14.6	....	....	....	1.7
18	....	....	.47	12.2	.48	12.6	....	....	....	1.8
19	....	....	.61	19.6	....	9.5	0.10	1.3	....	1.9
20	....	....	.50	13.5	.32	6.4	.15	2.2	....	2.0
21	....	....	.47	12.2	.25	4.4	.15	2.2	.15	2.2
22	....	....	.47	12.2	.20	3.2	.15	2.2	.15	2.2
23	....	....	.43	10.4	.17	2.6	.10	1.3	.145	2.2
24	....	....	.405	9.3	.12	1.7	....	1.2	.140	2.1
25	0.55	16.2	.35	7.4	.10	1.3	.08	1.0	.140	2.1
26	1.00	43	.34	7.1	.07	.9	.85	1.1	.132	1.9
27	1.40	70	.32	6.4	.06	.8	.07	.9	.130	1.9
28	1.04	45	.30	5.7	.08	1.0	.08	1.0	....	....
29	.835	33	.26	4.7	.05	.6	.08	1.0	....	....
30	.77	29	.22	3.7	.02	.3	.085	1.1	....	....
31	....	....	.32	6.4	....	....	....	1.0	....	....

NOTE.—The gage heights during the latter part of June are not good, owing to leakage through a hole underneath the weir.

Daily discharge determined from a discharge rating curve well defined below discharge of 20 second-feet. The values, however, are somewhat vitiated by variable leakage underneath the weir, particularly during the latter part of June.

The discharge for days when the gage was not read was interpolated.

Monthly discharge of Moss Brook at Wendell, Mass., for 1909–10.

[Drainage area, 12.5 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1909.						
June 4–30	25.8	3.1	8.98	0.718	0.71	D.
July	3.6	2.4	2.84	.227	.26	D.
August	10.3	1.8	3.39	.271	.31	D.
September	24.0	2.4	4.58	.366	.41	D.
October 1–16	4.6	2.7	3.43	.274	.16	D.
1910.						
April 25–30	70	16.2	39.4	3.18	.71	D.
May	29	3.7	14.4	1.16	1.34	D.
June	34	.3	7.80	.629	.70	D.
July 19–31	2.2	.9	1.35	.109	.05	D.
August 1–27	5.3	1.0	2.04	.165	.17	D.

DEERFIELD RIVER.

GENERAL FEATURES OF AREA DRAINED.

Deerfield River, the second largest tributary of Connecticut River, rises in the towns of Stratton and Somerset, Vt., follows a generally southerly course for about 45 miles, receiving several tributary streams, the most important of which are the East Branch, at Searsburg, Vt.; the North Branch, at Wilmington, Vt.; and the West Branch, at Readsboro, Vt. The river enters Massachusetts at Monroe Bridge and then flows southward to Hoosac Tunnel, where it turns to the southeast, and unites with Connecticut River near Greenfield, Mass.

The greater portion of the basin is wooded and but little land is under cultivation. In the lower part, however, there is considerable cultivated land. The slopes are for the most part steep, and upper portions of the basin attain elevations of over 3,800 feet above sea level. The average elevation of the basin at Shelburne Falls, Mass., is about 1,800 feet; at Hoosac Tunnel, Mass., 2,300 feet; and at Searsburg, Vt., 2,500 feet.

The mean annual precipitation for the upper part of the basin is probably about 48 inches; in the lower part it is probably several inches less. Winters are fairly severe. The average depth of snowfall for January and February at Jacksonville, Vt., is about 25 inches, and the mean temperature for these months is about 18°.

Several power sites have already been developed, but there are many undeveloped sites. The river throughout its course is quick falling and rapid.

On account of the steep slopes and the rocky formation of this basin the river is extremely flashy. The present storage is very small.

DEERFIELD RIVER AT HOOSAC TUNNEL, MASS.

This station, which is located at the highway bridge near the Hoosac Tunnel railroad station, was established July 17, 1909. With the other stations in this State it is being carried on in cooperation with the State of Massachusetts.

The bed of the river is rough, the current is very swift, and there is no danger of any artificial backwater. During the winter the relation of gage height to discharge is affected by the presence of ice.

Discharge measurements are made from the highway bridge to which the chain gage is attached. The datum of the gage has not been changed. A fairly good discharge curve has been developed from 1909 and 1910 measurements.

Owing to controlled flow at this station the gage height fluctuates greatly during each 24-hour period. Tests have been made to determine the relation between the average of the two daily readings of the gage and the true mean gage height for the day. These tests indicate no very definite law, but show that, although for any one day the discharge as determined from two readings may vary greatly from the true mean discharge for that day, the errors for a period of a month are almost entirely compensating. The gage heights for 1910 are withheld pending further investigation and improvement of computations of discharge from records obtained from an automatic gage.

Discharge measurements of Deerfield River at Hoosac Tunnel, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq.ft.*	*Feet.*	*Sec.-ft.*
Feb. 16[a]	D. M. Wood	158	229	2.36	328
Mar. 1[b]	....do	205	1,130	6.92	6,410
4[b]	T. W. Norcross	176	554	4.02	1,720
8[b]	D. M. Wood	177	548	4.01	1,590
25[b]	....do	193	797	5.37	3,390
Apr. 26[b]	....do	194	767	5.15	3,130
Sept. 16[c]	W. G. Hoyt	95	182	1.40	85.5
Oct. 25	C. C. Covert	......	....	1.45	107
Dec. 19[d]	W. G. Hoyt	105	95.4	1.26	34

[a] Measurement made under partial ice cover.
[b] Observations 1.0 foot depth; coefficient 0.80.
[c] Wading below bridge.
[d] Complete ice cover; gage height to top of ice 1.78; average thickness of ice 0.86 foot.

DEERFIELD RIVER AT SHELBURNE FALLS, MASS.

This station, which is located at the plant of the Greenfield Electric Light & Power Co., was established October 7, 1909.

Records have been kept at the power plant since the early part of 1907, but the early data were too incomplete for computation of daily discharge. Since the fall of 1908, when the dam was raised about 3 feet, the records have improved materially and the results are considered excellent.

The dam is of concrete, of ogee section, and is similar in form to one that has been rated. The flow through the wheels is computed from the gate openings and power readings made at half-hour intervals. The total electrical output is also measured twice a day. Readings are made three times daily of the height of water on the dam, in the forebay, in the tailrace, and at the wasteways.

Two units are now installed. Ratings have been made of one of these units by the Survey for use in conjunction with the Holyoke ratings of the wheels.

Owing to the extreme care with which the readings are made, winter and summer, the records at this station should prove valuable.

Daily discharge, in second-feet, of Deerfield River at Shelburne Falls, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	151	636	11,209	4,880	1,070	1,590	222	136	56	146	185	193
2	232	500	6,359	4,120	989	1,180	189	104	71	112	167	155
3	200	577	4,250	2,970	954	925	186	135	14	244	498	122
4	223	499	2,989	2,630	1,070	710	172	135	90	90	957	156
5	236	496	2,353	2,510	1,010	660	171	141	229	128	908	100
6	297	288	2,585	2,870	887	3,570	190	136	710	111	876	117
7	1,098	204	4,952	2,940	756	2,240	169	104	707	92	462	140
8	321	318	3,298	2,070	684	1,540	193	114	304	111	326	144
9	638	532	2,287	1,430	625	1,170	125	96	243	68	280	119
10	565	490	1,628	1,140	744	1,170	113	101	184	115	273	77
11	403	583	1,426	1,010	724	2,520	94	196	16	89	310	56
12	404	343	1,296	1,030	657	2,590	152	260	120	144	280	96
13	317	409	1,411	919	552	2,210	131	192	103	109	273	97
14	278	212	1,582	821	526	1,440	102	113	174	118	298	123
15	295	385	1,184	790	724	1,160	105	140	155	100	262	121
16	284	418	1,064	782	618	961	131	104	111	62	226	110
17	254	725	1,066	749	512	1,170	81	136	92	102	209	139
18	1,142	706	879	850	604	1,290	100	106	56	86	172	33
19	902	620	869	1,930	942	1,090	278	62	84	135	200	140
20	1,048	617	1,660	1,320	1,010	818	235	75	78	101	133	112
21	1,555	825	3,075	1,050	799	666	262	82	143	73	149	134
22	16,881	2,048	2,655	858	942	491	121	108	110	93	225	115
23	5,925	1,067	3,112	944	709	447	141	53	73	131	169	105
24	3,326	970	3,560	710	618	508	88	97	115	190	157	242
25	2,457	906	9,465	653	786	247	121	120	85	219	251	594
26	1,680	815	8,225	4,750	1,710	248	145	82	149	171	183	273
27	1,405	1,148	4,585	4,170	1,390	281	188	50	117	158	221	278
28	1,056	9,831	4,076	2,020	865	278	397	39	144	171	125	304
29	1,041	....	6,160	1,360	655	277	157	55	160	252	209	286
30	857	....	7,485	1,220	565	275	152	63	193	180	235	294
31	925	....	5,837	....	1,700	....	145	65	....	189	....	277

Monthly discharge of Deerfield River at Shelburne Falls, Mass., for 1910.

[Drainage area, 501 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	16,881	151	1,500	2.99	3.45
February	9,831	204	970	1.94	2.02
March	11,209	869	3,630	7.25	8.35
April	4,880	653	1,850	3.69	4.12
May	1,710	512	851	1.70	1.96
June	3,570	247	1,124	2.24	2.50
July	397	81	163	.33	.38
August	260	39	110	.22	.25
September	710	14	163	.33	.37
October	252	62	132	.26	.30
November	957	125	307	.61	.68
December	594	33	169	.34	.39
The year	16,881	14	914	1.82	24.77

CHICOPEE RIVER.

GENERAL FEATURES OF AREA DRAINED.

Chicopee River, the largest tributary of the Connecticut in respect to drainage area, is formed at Three Rivers, Mass., by the union near that point of Quaboag, Ware, and Swift rivers.

Ware River, formed in the town of Barre, Worcester County, by the union of several small streams, drains an area comprising about 162 square miles. This area is hilly and is for the most part square. The flow of the stream is well sustained in dry seasons.

Swift River has three main branches; the Middle Branch, which rises in North Pond near the town of Orange and flows southward, is joined a mile or two above Enfield by the East Branch and about 2 miles below that village by the West Branch. The distance by river from the North Pond to Three Rivers is 30 miles.

Quaboag River, the most southerly of the three streams, is formed near East Brookfield by the union of a number of small streams that drain a series of ponds, and takes a general southwesterly course to Three Rivers.

From Three Rivers the Chicopee flows westward 15 miles and joins the Connecticut approximately between Springfield and Holyoke. The country drained is hilly and the slope of the river is considerable, averaging 15 feet or more per mile. The bed of the Chicopee is composed chiefly of gravel with edges of red sandstone crossing at intervals, as at Chicopee Falls, Ludlow, and other points. The banks are of good height, rising in some places to low hills, on others being succeeded by level or gently rolling well-cultivated meadow land. The surrounding country is comparatively level along the river but becomes hilly toward Three Rivers. Many lakes and ponds drain to the river through its numerous tributaries and the dry season flow is well sustained. The Quaboag is one of the best-controlled streams in Massachusetts, as the natural pond area is large, and these ponds, together with artificial ponds formed at the numerous power plants, materially retard floods and equalize the flow throughout the year.

WARE RIVER NEAR WARE, MASS.

This station, which is located at the steel highway bridge about 2 miles above the village of Ware, was established September 15, 1904, in cooperation with the Otis Co. and the George H. Gilbert Manufacturing Co., of Ware.

The nearest dam downstream is that of the Otis Co., at Ware, about 2½ miles below the gage. Upstream the nearest dam is at Gilbertville, a little over a mile.

A chain gage is attached to the bridge from which discharge measurements are made. The gage datum has remained the same during the maintenance of the station.

During the winter months the discharge is usually affected by ice. The river does not usually freeze at the gage section, but backwater is caused by anchor ice and ice jams lodging on the river bottom below the gage. Conditions for making discharge measurements are good, but the measurements do not plot well on the rating curve, because of change in conditions of the channel, due to the growth of grass and weeds during the summer and backwater effect from the dam at Ware below. The daily gage heights do not represent the true 24-hour means, fluctuating with the operations of power plants above. When sufficient funds are available, it is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Ware River near Ware, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 2[a]	T. W. Norcross	83.3	4.44	6.80	2,240
2[a]	....do	83.3	4.44	6.76	2,230

[a] Measurements made by subsurface velocity method; coefficient of 0.85 used.

SWIFT RIVER AT WEST WARE, MASS.

This station, which was established July 15, 1910, is located at the footbridge about 400 feet below a wooden dam, near the West Ware station of the Athol branch of the Boston & Albany Railroad, about 6 miles by river downstream from Enfield.

A standard chain gage is attached to the downstream side of the bridge, and a staff gage is fastened to the crest of the dam.

Measurements are made from the bridge or by wading below the dam. By means of the measurements and comparison of the gage heights it is expected that the dam can be rated. A power house used in conjunction with the dam at which records were for a short time obtained has burned down.

Sufficient data have not been obtained to develop a discharge rating curve.

Conditions are fairly good for making current-meter measurements. The gage heights are affected by the operation of power plants above the station.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights at this station are true indexes of the daily discharge.

Discharge measurements of Swift River at West Ware, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 15	T. W. Norcross	51	56.3	2.82	102
15	H. B. Alvord	49	51.0	2.70	70.4
Sept. 9[a]	W. G. Hoyt	51	60.6	3.17	145

[a] Wading above bridge.

QUABOAG RIVER AT WEST BRIMFIELD, MASS.

This station, which is located at a highway bridge near the West Brimfield station of the Boston & Albany Railroad, was established August 23, 1909, in cooperation with the State of Massachusetts.

Discharge measurements are made from the bridge to which the staff gage is attached, or by wading. Conditions for making discharge measurements are good except during the winter months, when ice interferes with the flow.

During periods of low water gage heights show marked fluctuations during the day owing to the operation of the mills at and above West Warren. The gage is read twice daily, with and without the mills running, but it is not known what error remains in the resulting daily gage heights. The datum has remained unchanged.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Quaboag River at West Brimfield, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.	
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*	
Feb. 17[a]	D. M. Wood	55	104	2.81	316	4
17[a]	.....do	55	114	3.02	353	5
Mar. 2	T. W. Norcross	54	214	4.71	1,480	6
2	.....do	54	214	4.68	1,470	
6	.....do	54	189	4.17	1,110	
6	.....do	54	189	4.17	1,100	
10	D. M. Wood	55	177	4.00	908	
23[b]	.....do	54	98	2.85	222	
23[c]	.....do	54	121	3.18	406	
23	.....do	54	117	3.11	389	
July 11	R. C. Rice	54	79	2.30	125	
16[d]	H. B. Alvord	43	33	1.70	16	
16	.....do	52	118	2.35	136	
Sept. 11[e]	W. G. Hoyt	52	45.1	1.97	64.6	

[a] Some ice in river.
[b] Gage height variable.
[c] Water fell 0.11.
[d] Partially estimated.
[e] Wading below bridge.

WESTFIELD RIVER.

GENERAL FEATURES OF AREA DRAINED.

The main branch of Westfield River rises in the Berkshire Hills, in the northeastern part of Berkshire County, Mass., and flows in a southeasterly direction to its junction with Swift River. Its course is then generally southward to Huntington, the tributary streams from the west being the Middle Branch and West Branch of Westfield River, and from the east the East Branch.

The Middle Branch of Westfield River rises in the hills near East Windsor, flows southeast, and enters Westfield River above Huntington, its total length being about 24 miles.

The West Branch of Westfield River rises near Washington, flows nearly parallel to the Middle Branch, and enters the Westfield at Huntington, about 2 miles below the Middle Branch. Its total length is about 22 miles.

From Huntington the Westfield flows in a general southeasterly direction, receiving from the west Freeland Brook and Westfield Little River. Where it flows through the town of Agawam it is known as Agawam River. It enters Connecticut River about half a mile below Springfield. Its total length is made up of a series of rapids and quick water. The amount of storage in the basin is insignificant. Several important power plants are installed at Agawam West Springfield, Westfield, and Woronoco, and there are smaller ones farther up the river. The opportunities for further development are numerous. The average rainfall in this area is more than 40 inches.

WESTFIELD RIVER AT KNIGHTVILLE, MASS.

This station, which is located at the steel highway bridge (locally known as the Pitcher Bridge) at Knightville, about 4½ miles north of the town of Huntington, 1 mile north of the outlet of Norwich Lake, and about 3 miles north of the junction with the Middle Branch of Westfield River, was established August 26, 1909, in cooperation with the State of Massachusetts.

The Westfield at this point is quick falling. The bed is rough, being formed of large gravel and ledge rock. There is no danger of artificial backwater, as the fall between this station and the nearest dam below, at Huntington, is great.

A chain gage is attached to the highway bridge.

Discharge measurements are made from the highway bridge, where the conditions are fairly good.

During the winter anchor ice and ice cover interfere materially with the flow.

The rating curve has been fairly well defined from 1909–1911 discharge measurements. During the year no change was made in the gage datum.

It is stated, and a study of the daily gage-height records tends to indicate, that there is no mill control on this stream above the Knightville station, hence for open-water periods the discharge data are considered reliable.

Discharge measurements of Westfield River at Knightville, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1910.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 3	T. W. Norcross	114	423	4.03	1,320
24	D. M. Wood	112	393	3.90	1,120
July 12	R. C. Rice	104	132	1.19	53.3
Sept. 7	W. G. Hoyt	105	321	2.89	614
Oct. 14[a]	F. J. Shuttleworth	53	35.9	.99	28.7

[a] Wading above bridge.

Daily gage height, in feet, of Westfield River at Knightville, Mass., for 1910.

[G. A. Fisk, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.10	2.16	4.90	3.67	2.28	2.62	1.56	1.18	0.70	1.03	0.89	1.53
2	2.10	2.10	4.25	3.48	2.12	2.45	1.46	1.10	.92	1.04	.98	1.39
3	2.18	2.12	4.00	3.41	1.98	2.22	1.38	1.05	.90	.93	2.32	1.58
4	2.09	2.16	4.10	3.10	1.92	2.08	1.32	1.14	1.43	.92	3.26	1.63
5	2.18	2.02	4.95	2.70	1.98	1.98	1.30	1.31	2.36	.91	3.10	1.62
6	2.39	1.89	4.70	2.55	1.88	3.36	1.31	1.26	2.38	.89	2.48	1.61
7	3.02	1.80	4.40	2.51	1.75	2.82	1.32	1.11	3.02	.94	1.30	1.51
8	3.05	1.78	4.80	2.50	2.08	2.53	1.18	1.10	2.45	1.04	1.14	1.54
9	3.04	1.97	3.84	2.42	2.62	2.41	1.10	1.07	1.68	1.04	1.36	1.52
10	2.98	2.09	4.15	2.38	2.38	2.65	1.10	1.15	1.42	.99	1.50	1.41

Detailed gage height, in feet, of Westfield River at Knightville, Mass., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	3.13	2.03	3.86	2.25	2.15	4.02	1.12	1.40	1.32	.96	1.27	1.31
12	3.32	2.00	3.60	2.20	2.24	3.25	1.18	1.25	1.15	.93	1.50	......
13	3.32	1.93	3.40	2.19	2.14	2.53	1.14	1.20	1.06	.95	1.46	......
14	3.02	2.00	3.10	2.10	2.22	2.38	1.11	1.18	1.12	1.00	1.40	......
15	3.09	2.00	3.01	2.12	2.92	2.20	1.10	1.14	1.08	.98	1.38	......
16	2.93	2.16	2.95	2.12	2.32	2.23	1.10	1.11	1.10	.98	1.32	......
17	3.09	2.27	2.78	2.10	2.05	2.58	1.07	1.00	1.08	.93	1.42	1.55
18	3.13	2.31	2.45	2.38	1.98	2.68	1.05	1.02	.96	.94	1.36	......
19	3.34	2.34	2.40	2.98	1.90	2.44	1.05	1.24	.94	.88	1.36	......
20	3.56	2.24	2.44	2.45	1.95	2.24	1.06	1.18	.91	.83	1.42	......
21	3.66	2.48	3.76	2.30	1.88	2.11	1.06	1.10	.88	.84	1.56	......
22	8.90	2.61	3.58	2.20	2.02	1.92	1.04	.94	.90	1.02	1.41	......
23	6.20	2.54	3.46	2.15	1.92	1.78	1.14	.94	.85	1.06	1.46	1.35
24	5.36	2.58	3.64	2.10	1.88	1.70	1.10	.92	.84	1.01	1.52	......
25	4.28	2.46	4.65	2.12	1.92	1.68	1.06	.96	1.08	.99	1.53	2.60
26	3.76	2.36	4.92	5.40	2.02	1.60	1.04	.98	1.16	.94	1.46	2.85
27	3.76	3.01	4.01	4.46	1.94	1.61	1.05	.80	1.10	.92	1.41	2.75
28	3.30	5.15	4.22	4.10	1.97	1.60	1.00	.85	1.08	.89	1.44	2.99
29	3.01	......	4.01	3.20	1.88	1.60	1.02	.82	1.12	.90	1.58	3.18
30	2.64	......	3.90	2.62	2.02	1.58	1.11	.82	1.12	.88	1.63	3.21
31	2.34	......	3.72	......	2.62	......	1.21	.80	......	.86	......	3.16

NOTE.—Ice existed at this station from Jan. 1 to 21, from about Feb. 9 to 27, and from about Dec. 3 to 31. Gage readings during these periods probably to water surface.

Daily discharge, in second-feet, of Westfield River at Knightville, Mass., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	295	1,320	1,040	342	484	113	46	12	31	20	107
2	......	273	1,390	929	280	410	92	37	22	32	27	78
3	......	280	1,240	890	231	318	77	32	21	23	358	......
4	......	295	1,300	720	212	266	66	41	86	22	808	......
5	......	245	1,850	520	231	231	63	65	374	22	720	......
6	......	202	1,680	452	199	863	65	57	382	20	422	......
7	......	175	1,480	434	161	580	66	38	680	24	63	......
8	......	169	1,740	430	266	444	46	37	410	32	41	......
9	......	......	1,140	398	484	394	37	34	142	32	73	......
10	......	......	1,320	382	382	498	37	42	84	27	100	......
11	......	......	1,150	330	292	1,250	39	80	66	25	58	......
12	......	......	995	310	326	802	46	56	42	23	100	......
13	......	......	885	306	252	444	41	48	33	24	92	......
14	......	......	720	273	318	382	38	46	39	28	80	......
15	......	......	675	280	630	310	37	41	35	27	77	......
16	......	......	645	280	358	322	37	38	37	27	66	......
17	......	......	560	273	256	466	34	28	35	23	84	......
18	......	......	410	382	231	511	32	30	25	24	73	......
19	......	......	390	660	205	406	32	54	24	20	73	......
20	......	......	406	410	222	326	33	46	22	18	84	......
21	......	......	550	350	199	277	33	37	20	18	113	......
22	5,120	......	984	310	245	212	32	24	21	30	82	......
23	2,780	......	918	292	212	169	41	24	18	33	92	......
24	2,140	......	1,020	273	199	147	37	22	18	29	104	......
25	1,410	......	1,650	280	212	142	33	25	35	27	107	......
26	1,090	......	1,830	2,160	245	122	32	27	44	24	92	......
27	1,090	......	1,240	1,520	218	124	32	16	37	22	82	......
28	830	1,990	1,370	1,300	228	122	28	18	35	20	88	......
29	675	......	1,240	775	199	122	30	17	39	21	118	......
30	493	......	1,180	484	245	118	38	17	39	20	130	......
31	366	......	1,070	......	484	......	50	16	......	19	......	......

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve.

Monthly discharge of Westfield River at Knightville, Mass., for 1910.

[Drainage area, 162 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,120		557	3.44	3.97	C.
February	1,990		245	1.51	1.57	D.
March	1,850	390	1,120	6.91	7.97	A.
April	2,160	273	581	3.59	4.00	A.
May	630	161	276	1.70	1.96	B.
June	1,250	118	375	2.31	2.58	B.
July	113	28	45.7	.282	.33	B.
August	80	16	36.7	.227	.26	C.
September	680	12	95.9	.592	.66	B.
October	33	18	24.7	.152	.18	C.
November	808	20	148	.914	1.02	B.
December			86.2	.532	.61	D.
The year	5,120	12	300	1.85	25.11	

NOTE.—Discharge for periods during which ice was present computed from climatologic records and the discharge from near-by drainage areas.
Mean discharge, Jan. 1 to 21, estimated 60 second-feet; practically constant.
Mean discharge, Feb. 9 to 27, estimated 154 second-feet; practically constant.
Discharge, Dec. 3 to 31, varied from about 30 second-feet to about 400 second-feet.

MIDDLE BRANCH OF WESTFIELD RIVER AT GOSS HEIGHTS, MASS.

This station, which is located at a single-span highway bridge in the hamlet of Goss Heights, about 1½ miles north of the village of Huntington and half a mile above the confluence of the North and Middle branches of Westfield River, was established July 14, 1910, by the United States Geological Survey in cooperation with the State of Massachusetts.

A standard chain gage is attached to the upstream side of the bridge and read twice daily. There is a power plant 2 miles above, but the gage-height record indicates that it probably has little effect upon the flow, so that it is assumed that the average of the two daily readings gives the correct mean gage height for the day.

Conditions are fair for making accurate discharge measurements, except in times of unusually low water.

Discharge measurements of Middle Branch of Westfield River at Goss Heights, Mass., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	Sq. ft.	Feet.	Sec.-ft.
July 14 [a]	T. W. Norcross 1	10.9	7.9	1.03	8.6
23 [a]	H. B. Alvord 2	10.0	11.4	1.00	3.7
Sept. 7 [b]	W. G. Hoyt 3	88	77.8	1.54	114
8 [b]	....do 4	88	58.1	1.32	57.7
Oct. 14 [c]	F. J. Shuttleworth 5	19	17.1	1.02	5.1
14 [c]	....do 6	16	9.4	1.02	4.4

[a] Wading below bridge. [b] Wading at bridge (regular section). [c] Wading above bridge.

Daily gage height, in feet, and discharge, in second-feet, of Middle Branch of Westfield River at Goss Heights, Mass., for 1910.

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	......	......	1.05	8	1.06	10	1.04	7	1.04	7	1.18	27
2	......	......	1.08	12	1.06	10	1.01	4	1.06	10	1.21	32
3	......	......	1.05	8	.85	2	.95	2	1.35	64	1.24	......
4	......	......	1.05	8	1.45	90	.92	2	1.70	155	1.44	......
5	......	......	1.20	30	1.62	134	.95	2	2.15	282	1.35	......
6	......	......	1.14	20	1.55	116	1.01	4	1.90	210	1.36	......
7	......	......	1.09	13	1.86	199	1.08	12	1.45	90	1.31	......
8	......	......	1.06	10	1.65	142	1.04	7	1.35	64	1.38	......
9	......	......	1.06	10	1.35	64	1.05	8	1.32	57	1.35	......
10	......	......	1.05	8	1.25	41	1.06	10	1.22	34	......	......
11	......	......	1.20	30	1.11	16	1.04	7	1.41	80	......	......
12	......	......	1.20	30	1.09	13	1.01	4	1.32	57	......	......
13	......	......	1.10	14	1.05	8	1.04	7	1.31	54	......	......
14	1.02	5	1.09	13	1.04	7	1.01	4	1.25	41	......	......
15	1.04	7	1.12	17	1.04	7	1.04	7	1.25	41	......	......
16	1.06	10	1.08	12	1.04	7	1.02	5	1.19	28	......	......
17	1.04	7	1.05	8	1.01	4	1.04	7	1.21	32	......	......
18	1.05	8	1.05	8	1.02	5	1.00	3	1.20	30	......	......
19	1.02	5	1.22	34	1.01	4	.88	2	1.26	43	......	......
20	1.05	8	1.24	39	1.01	4	.80	1	1.39	75	......	......
21	1.06	10	1.05	8	.96	3	.90	2	1.45	90	......	......
22	1.08	12	1.02	5	.80	1	1.09	13	1.29	50	......	......
23	1.05	8	1.02	5	.95	2	1.12	17	1.25	41	......	......
24	1.04	7	1.06	10	.95	2	1.10	14	1.28	48	......	......
25	1.05	8	1.04	7	.96	3	1.11	16	1.22	34	......	......
26	1.02	5	1.01	4	1.05	8	1.08	12	1.28	48	......	......
27	1.04	7	1.05	8	1.04	7	1.04	7	1.24	39	......	......
28	1.06	10	1.06	10	1.11	16	1.02	5	1.28	48	......	......
29	1.10	14	1.05	8	1.06	10	1.09	13	1.34	62	......	......
30	1.08	12	1.05	8	1.01	4	1.10	14	1.25	41	......	......
31	1.06	10	1.05	8	......	......	1.11	16	......	......	......	......

NOTE.—Ice existed at this station from about Dec. 3 to 31. The gage heights were probably slightly affected by controlled flow at mills above the station.

Daily discharge determined from a fairly well defined discharge rating curve.

Monthly discharge of Middle Branch of Westfield River at Goss Heights, Mass., for 1910.

[Drainage area, 53 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
July 14-31	14	5	8.50	0.160	0.11	C.
August	39	4	13.3	.251	.29	C.
September	199	1	31.3	.591	.66	B.
October	17	1	7.55	.142	.16	C.
November	282	7	65.2	1.23	1.37	A.
December	......	......	30.	.566	.65	D.

NOTE.—Discharge from Dec. 3 to 31 deduced from discharge from near-by drainage areas. During December the maximum attained was probably 100 second-feet and the minimum approximately 5 to 10 second-feet.

WESTFIELD LITTLE RIVER NEAR BLANDFORD, MASS.

Westfield Little River is formed by the union of Peebles and Borden brooks in the southern part of the town of Blandford. The headwaters of Peebles Brook are in North Blandford, at an elevation of about 1,400 feet above sea level; at its junction with Borden Brook it has an elevation of about 850 feet—a fall of 550 feet in a distance of about 8 miles. Below Borden Brook the river also falls rapidly, reaching an elevation of 200 feet above sea level in the vicinity of West Parish, a distance of 6 miles from Borden Brook. The drainage area at the junction of Peebles and Borden brooks is about 43 square miles; at the mouth of the river, 83.6 square miles. The slopes are very steep and in places precipitous. The greater part of the basin above West Parish is in forest.

The city of Springfield, Mass., has begun to use this river as a source of water supply. A large storage reservoir has been built in the upper part of Borden Brook and a concrete diversion dam near the corners of Russell, Westfield, and Granville. The water is then carried by a tunnel through the mountain, a distance of about a mile, to the filter plant at Mundale. There it is taken through a steel pipe line to Springfield. A distributing reservoir about 5 miles from Springfield is provided at Provin Mountain, Westfield.

The gaging station, which is located a short distance below Borden Brook, at Cobble Mountain, near Blandford, Mass., was established July 13, 1905, and has been maintained since that time in cooperation with the water board of the city of Springfield through its engineer, E. E. Lochridge.

Staff gages and a chain gage have been used to obtain gage heights. All gages have been referred to the same datum, which has remained the same during the maintenance of the station. Discharge measurements are made from a car and cable, or by wading. During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge data are good, and an excellent discharge rating curve has been developed.

On August 10, 1906, a sharp-crested weir, with crest about 30 feet long, capable of carrying a depth of flow of 1½ feet, was constructed a short distance downstream from the current-meter station. This was maintained with some interruptions until September, 1907, when it was destroyed by high water. Estimates of flow over the weir as given are based on the coefficients given on page 36 of Water-Supply Paper 200. The weir gage was read at approximately the same time as the current-meter gage, and considerable comparative information upon the accuracy at this station has been obtained.[1]

The discharge records are furnished each year by E. E. Lochridge, but are not yet available for publication for 1910.

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[1] See Water-Supply Papers U. S. Geol. Survey Nos. 201, pp. 105-110, and 241, pp. 164-168.

HOUSATONIC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Housatonic River rises in Berkshire County, Mass., and flows southward, entering Long Island Sound near the west end of Connecticut. It is about 125 miles long, and drains a total area of about 1,930 square miles. Its most important tributaries are Tenmile River, a stream lying almost entirely in New York State and entering the river near Gaylordsville, and Naugatuck River, with a drainage area of 313 square miles, which enters at Birmingham and is entirely in the State of Connecticut. In the vicinity of Pittsfield the Housatonic reaches an elevation of about 1,500 feet, this being a hilly and mountainous region. Through Connecticut the river in general runs through a wide valley, much of which is in farm land. In most places the bed of the river is of gravel, but in a few localities there are falls over ledges of limestone and granite. The basin is to some extent in forest cover, especially in its upper portions, but as a whole it may be said to consist largely of farm lands.

The mean annual precipitation is probably about 43 inches. In the upper portion of the basin the winters are severe, but as a whole the area is sufficiently far south so that the river is open during a considerable part of the winter season.

In the whole drainage basin there are some 15 square miles of lake and pond surface, but generally speaking storage has been very little developed and there are numerous opportunities for improvements of this nature.

Power has been developed at Birmingham, New Milford, and recently at Bulls Bridge above Gaylordsville, and at a number of other places, but there remains considerable unutilized power both on the main river and its tributaries.

HOUSATONIC RIVER AT GAYLORDSVILLE, CONN.

This station, which is located at the covered wooden highway bridge at Gaylordsville, about 2 miles below the mouth of Tenmile River, was established October 24, 1900.

Downstream the nearest dam is at New Milford, about 7 miles below the station; upstream the nearest dam is at Bulls Bridge. At high stages backwater from the dam below may slightly affect the relation between gage height and discharge.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station. The observer is paid by the United States Weather Bureau from November to April.

On account of the poor cross section at the bridge discharge measurements are made from a cable 1¼ miles below, or by wading.

The discharge is affected by ice during short periods of the winter.

Conditions for obtaining accurate discharge measurements are good and a good discharge rating curve has been developed.

Only one reading is taken each day at this station and, as is indicated by the low Sunday readings, the low-stage flow is greatly controlled by the power plants above, and consequently the daily gage heights do not correctly represent the averages for 24-hour periods.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

The following discharge measurement made in 1910 by W. G. Hoyt indicates that no change has occurred in conditions of flow:

Oct. 13: Width, 140 feet; area, 287 square feet; gage height, 3.05 feet; discharge, 308 second-feet.

HUDSON RIVER.

GENERAL FEATURES OF AREA DRAINED.

The principal sources of Hudson River lie in the wildest portion of the Adirondack Mountains, in Essex County, northeastern New York. A number of branches, any one of which might possibly be considered the main stream, form its upper waters; but if the highest collected and permanent body of water be assumed as the true head, then the source of the Hudson becomes Lake Tear-of-the-Clouds, which lies at an elevation of 4,322 feet above sea level, in the center of the triangle formed by Mounts Marcy and Skylight and Gray Peak.

The river flows rather deviously southward until it reaches the northern boundary of Saratoga County, where it makes a sharp turn and thence flows eastward about 12 miles, passing through the mountains and forming, as it cuts across the rocky strata, several falls of great height and beauty. At Sandy Hill, just below Glens Falls, it makes another abrupt turn and thence flows southward, continuing in this direction until it empties into New York Bay.

From Lake Tear-of-the-Clouds to the mouth of the river the distance by water is probably about 300 miles. The total area drained is 13,366 square miles. The river is tidal to Troy, at the head of navigation.

The headwater region is mountainous in character, is in general heavily wooded, and is dotted with numerous lakes and ponds. The rocks, belonging to the oldest formation and mainly granitic, are either bare or covered only with a layer of spruce duff, humus, and forest litter. The river emerges from the mountain region a few miles west of Glens Falls, and thence to Troy its valley is moderately rolling and the surface soil is chiefly sand. Below Troy the river follows the great depression which extends almost due north and south between New York Bay and the St. Lawrence, flowing in an open valley bordered by well-cultivated lands, which rise with moderate slope from the stream. The Catskill Mountain region is reached 20 or 30 miles below Albany, and thence to the mouth of the river the immediate valley is flanked by high hills, the Highlands of Orange County and the precipitous Palisades being especially noticeable.

The fall in the upper portion of the course is very rapid, amounting to about 64 feet per mile from Lake Tear-of-the-Clouds to the mouth of North Creek, a distance of about 52 miles. From the mouth of North Creek to the mouth of the Sacandaga the descent is nearly 14 feet per mile, distributed among rapids which diminish in frequency as the Sacandaga is approached. In the succeeding 26 miles to Fort Edward the river descends 418 feet more, but 175 feet of this is comprised within the three abrupt pitches at Palmer, Glens, and Bakers falls, and most of the remainder occurs in the rapids between Jessups Landing and the oxbow above Glens Falls. Between Glens Falls and Troy nearly the entire fall of the river is utilized for the development of water power.

The tributaries of the Hudson are numerous, and many of them are large and important. Indian River, Schroon River, and the Sacandaga unite with the main stream above Glens Falls, and between the latter point and Troy the river receives Battenkill River, Fish Creek, Hoosic River, and the Mohawk, the latter having several important tributaries, including West and East Canada and Schoharie creeks. The tributaries below Troy include Catskill, Esopus, and Rondout creeks and Wallkill River from the west, and Kinderhook Creek, Jansen Kill, Wappinger Creek, Fishkill Creek, and Croton River from the east.

The mean annual precipitation on the total basin of the Hudson is probably about 43 inches. It reaches a maximum of more than 55 inches in the heights of the Adirondacks, while in the eastern portion of the drainage area in southern Vermont the mean annual total is only about 39 inches. Conditions during the winter period range from the extreme cold and deep snow of the Adirondacks to the frequent winter thaws in the southern part of the basin.

The flow of the upper Hudson is controlled to some extent during the dry season by the use of Indian Lake storage reservoir, and the natural storage facilities in the Adirondack region are unsurpassed, including many large ponds and lakes fed from extensive drainage areas. Comprehensive plans for vast storage projects on the Sacandaga, Schroon, and upper Hudson are receiving the attention of the

New York State Water Supply Commission. It is probable that on the various tributaries of the Hudson an increase in storage capacity of some 75 billion cubic feet is possible, and if this were developed the Hudson would be probably the most important water-power stream in the country. Although a large amount of power has been developed in the Hudson drainage area, vast quantities are still unutilized, and the importance of this river basin is apparent when it is considered that in proportion to its size it contains a greater population than any other important drainage basin in the United States, with the single exception of that of the Delaware River.

The longest run-off record in the Hudson River drainage basin is that obtained at Mechanicville, which extends back to 1888.

HUDSON RIVER AT NORTH CREEK, N. Y.

This station, which is located on the steel highway bridge at North Creek, was established, in cooperation with the New York State Water Supply Commission, September 21, 1907.

North Creek, a small tributary of the Hudson, enters from the right a short distance below this point.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

All discharge measurements are made from the bridge.

During the winter months the discharge is affected by ice.

Conditions for obtaining accurate discharge are good, and a very good discharge rating curve has been developed.

The regimen of flow of the upper Hudson, especially during the low-water season, is considerably affected by storage in Indian Lake Reservoir. (See Indian Lake Reservoir at Indian Lake.)

Information in regard to this station is contained in the annual reports of the State Water Supply Commission of New York, and the State engineer and surveyor, State of New York.

Discharge measurements of Hudson River at North Creek, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 19[a]	W. G. Hoyt	240	320	3.32	276
Feb. 16[b]	C. C. Covert	252	556	4.60	652
Apr. 2	W. G. Hoyt	247	1,680	7.23	9,980
6	.....do	248	1,070	5.08	4,200
21	.....do	248	778	3.80	1,900
June 17	Covert & Phelan	248	668	3.48	1,420
July 12	W. A. James	238	480	2.62	645
Nov. 11	F. J. Shuttleworth	242	530	3.01	835
Dec. 31[c]	.....do	210	440	3.02	556

[a] Measurement made under complete ice cover. Gage height to top of ice, 3.35 feet; average thickness of ice, 1.3 feet.
[b] Measurement made under complete ice cover. Gage height to top of ice, 4.93 feet; average thickness of ice, 1.95 feet.
[c] Measurement made under partial ice cover. Gage height to top of ice, 3.03 feet; average thickness of ice, 1.2 feet.

Daily gage height, in feet, of Hudson River at North Creek, N. Y., for 1910.

[Gilbert Dean, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.01	......	......	7.20	3.90	4.65	2.52	2.92	3.05	2.95	3.55	2.90
2	......	......	......	7.15	4.22	4.40	2.49	2.86	3.22	2.78	3.50	2.89
3	......	......	6.3	6.25	4.52	3.98	2.45	2.88	3.15	2.69	3.50	2.95
4	......	......	6.55	5.50	5.25	3.78	2.42	3.12	3.20	2.64	3.48	2.92
5	......	4.41	5.75	5.35	5.08	3.72	2.37	3.40	3.20	2.64	3.18	2.85
6	......	......	5.15	5.35	4.58	4.00	2.34	3.20	3.37	2.63	3.45	2.80
7	......	......	5.17	5.42	4.62	4.57	2.30	3.05	3.55	3.35	3.45	2.78
8	3.12	......	5.19	5.72	4.52	4.79	2.30	2.82	3.62	3.28	3.25	2.98
9	......	......	5.02	4.75	5.08	4.67	2.27	2.70	3.50	3.20	3.10	3.00
10	......	......	4.78	4.20	4.28	4.37	2.24	2.80	3.42	3.24	3.00	3.00
11	......	......	4.60	4.62	4.45	4.15	2.21	3.38	3.25	3.28	2.95	3.02
12	......	4.52	4.44	4.75	3.70	4.19	2.68	4.00	3.10	3.22	2.98	2.85
13	......	......	4.12	4.28	3.48	4.07	2.68	3.58	3.04	3.22	2.90	2.75
14	......	......	3.95	4.01	3.52	3.85	2.65	3.32	3.02	3.20	2.84	2.82
15	3.12	......	3.85	3.00	3.35	3.72	2.60	3.00	2.98	3.12	2.79	2.87
16	......	4.60	3.68	3.88	3.15	3.57	2.64	3.30	2.90	3.05	2.75	2.82
17	......	......	3.61	2.72	3.02	3.46	2.64	3.20	2.84	3.02	2.70	2.75
18	......	......	3.50	3.48	2.92	3.64	2.64	3.20	2.80	3.02	2.60	2.85
19	3.32	4.50	3.48	3.85	3.00	3.75	2.60	3.15	2.78	3.18	2.54	2.90
20	......	......	3.42	5.98	3.02	3.55	2.60	3.08	2.76	3.20	2.40	3.00
21	......	......	3.50	4.52	3.26	3.48	2.60	2.95	2.76	3.18	2.28	2.88
22	4.25	......	3.66	3.68	3.32	3.30	2.61	2.95	2.80	3.22	2.92	2.88
23	......	......	4.18	4.28	3.45	3.10	2.60	2.95	2.77	3.25	2.95	2.90
24	......	......	4.18	3.38	3.35	2.98	2.60	2.90	2.75	3.30	2.95	2.90
25	......	......	5.40	3.68	3.68	2.88	2.60	2.84	2.74	3.28	2.95	2.95
26	......	4.80	6.30	3.22	4.84	2.78	2.59	2.81	2.79	3.35	2.94	3.00
27	......	......	5.90	4.90	5.45	2.75	2.56	2.80	2.85	3.60	2.98	3.15
28	......	......	5.55	3.50	4.68	2.70	2.62	2.80	3.36	3.70	2.92	3.10
29	5.01	......	6.12	3.18	4.25	2.62	2.90	2.79	3.40	3.80	2.90	3.05
30	......	......	6.82	5.42	4.05	2.55	2.85	2.76	3.15	3.72	2.91	3.02
31	......	......	7.08	......	4.28	......	2.92	2.75	......	3.70	......	3.08

NOTE.—Relation of gage height to discharge affected by the presence of ice and by backwater from log jams from Jan. 1 to about Mar. 22, and from about Dec. 8 to 31.

Gage read to top of ice Mar. 3 to 22, and to water surface for the rest of the period during which ice was present.

Relation of gage height to discharge may also have been affected by log jams at intervals during the remainder of the year, particularly through May.

Daily discharge, in second-feet, of Hudson River at North Creek, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	9,790	2,080	3,380	474	810	940	840	1,550	790
2	......	......	......	9,640	2,600	2,920	454	754	1,120	682	1,480	780
3	......	......	......	7,080	3,140	2,210	430	772	1,040	602	1,480	840
4	......	......	......	5,200	4,630	1,890	412	1,010	1,100	562	1,450	810
5	......	......	......	4,860	4,260	1,800	382	1,350	1,100	562	1,080	745
6	......	......	......	4,860	3,250	2,240	364	1,100	1,310	554	1,420	700
7	......	......	......	5,020	3,330	3,230	340	940	1,550	1,280	1,420	682
8	......	......	......	5,730	3,140	3,660	340	718	1,650	1,200	1,160	......
9	......	......	......	3,580	4,260	3,420	325	610	1,480	1,100	990	......
10	......	......	......	2,570	2,710	2,870	310	700	1,380	1,150	890	......
11	......	......	......	3,330	3,010	2,480	295	1,320	1,160	1,200	840	......
12	......	......	......	3,580	1,770	2,550	594	2,240	990	1,120	870	......
13	......	......	......	2,710	1,450	2,350	594	1,590	930	1,120	790	......
14	......	......	......	2,260	1,500	2,000	570	1,250	910	1,100	736	......
15	......	......	......	890	1,280	1,800	530	890	870	1,010	691	......
16	......	......	......	2,050	1,040	1,580	562	1,220	790	940	655	......
17	......	......	......	628	910	1,430	562	1,100	736	910	610	......
18	......	......	......	1,450	810	1,680	562	1,100	700	910	530	......
19	......	......	......	2,000	890	1,840	530	1,040	682	1,080	488	......
20	......	......	......	6,380	910	1,550	530	970	664	1,100	400	......
21	......	......	......	3,140	1,170	1,450	530	840	664	1,080	330	......
22	......	......	......	1,740	1,250	1,220	538	840	700	1,120	810	......
23	......	......	2,540	2,710	1,420	990	530	840	673	1,160	840	......
24	......	......	2,540	1,320	1,280	870	530	790	655	1,220	840	......
25	......	......	5,200	1,740	1,740	772	530	736	646	1,200	840	......

Daily discharge, in second-feet, of Hudson River at North Creek, N. Y., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26			7,220	1,120	3,760	682	523	709	691	1,280	830	
27			6,180	3,880	5,080	655	502	700	745	1,620	870	
28			5,320	1,480	3,440	610	546	700	1,300	1,770	810	
29			6,740	1,080	2,660	546	790	691	1,350	1,920	790	
30			8,650	5,020	2,320	495	745	664	1,040	1,800	800	
31			9,430		2,710		810	655		1,770		

NOTE.—Daily discharge determined from a well-defined discharge rating curve.
The daily discharge for Jan. 1 to Mar. 22 and Dec. 8 to 31 has not been published in the Federal report because it is only approximate.

Monthly discharge of Hudson River at North Creek, N. Y., for 1910.

[Drainage area, 804 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			593	0.738	0.85	C.
February			677	.842	.88	C.
March	9,430		3,640	4.53	5.22	C.
April	9,790	628	3,560	4.43	4.94	A.
May	5,080	810	2,380	2.96	3.41	A.
June	3,660	495	1,840	2.29	2.56	A.
July	810	295	508	.632	.73	A.
August	2,240	610	956	1.19	1.37	A.
September	1,650	646	986	1.23	1.37	A.
October	1,920	554	1,130	1.41	1.63	A.
November	1,550	330	910	1.13	1.26	A.
December			570	.709	.82	C.
The year	9,790	295	1,480	1.84	25.04	

NOTE.—Discharge Jan. 1 to Mar. 22 and Dec. 8–31, estimated by means of two measurements made with ice present, climatologic records, consideration of storage, and comparison of the discharge with that at other stations.
Mean discharge Jan. 1 to 21, estimated, 361 second-feet; practically constant.
Mean discharge Jan. 22 to 31, estimated, 1,080 second-feet, ranging from 1,800 to 700 second-feet.
Daily discharge during February practically constant.
Mean discharge Mar. 1 to 22, estimated, 2,690 second-feet, ranging from 6,000 to 1,200 second-feet.
Mean discharge Dec. 8 to 31, estimated, 514 second-feet.
Daily discharge Dec. 8 to 31 nearly constant.
The discharge for February was increased over 100 second-feet by draft on Indian Lake storage. Similarly discharge Nov. 22 to 30 was increased over 300 second-feet and that for December was increased 240 second-feet.
Comparisons with Schroon River and Hudson River at Thurman indicate that the monthly discharge for May may be too high.
Determinations of discharge for January, March, November, and December have been revised, and supersede those published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor.

HUDSON RIVER AT THURMAN, N. Y.

This station, which is located on the Delaware & Hudson Railroad bridge leading from Thurman to Warrensburg, about 950 feet below the highway bridge to Warrensburg and some 2,000 feet below the entrance of Schroon River into the Hudson, was established, in cooperation with the New York State Water Supply Commission, September 22, 1907.

There is a dam on Schroon River at Warrensburg, about 3 miles above the station. On the Hudson there is a dam at Luzerne, about 12 miles below.

During the winter months the discharge is affected by ice and the station temporarily discontinued by the Survey, but is usually maintained by the United States Weather Bureau.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

All discharge measurements are made from the bridge.

Conditions for obtaining accurate discharge data are excellent, and a very good discharge rating curve has been developed.

The regimen of flow of the upper Hudson, especially during the low-water season, is considerably affected by storage in Indian and Schroon Lake reservoirs. (See Indian Lake reservoir at Indian Lake and Schroon Lake at Pottersville.)

Gage heights from January 1 to March 26 and December 1–31 are taken from Part X of "Daily river stages," published by the United States Weather Bureau.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Hudson River at Thurman, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 1	W. G. Hoyt	312	2,050	7.14	15,200
2	.....do	315	2,120	7.28	15,400
5	.....do	308	1,580	5.69	9,300
21	.....do	284	1,200	4.21	4,580
21	.....do	293	1,280	4.30	4,850
June 16	Covert and Phelan	279	1,050	3.76	3,270
Aug. 7	Phelan and Carman	261	789	2.80	1,330
Nov. 1	J. J. Phelan	270	881	3.23	1,950

Daily gage height, in feet, of Hudson River at Thurman, N. Y., for 1910.

[S. H. Spencer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.0	4.2	6.8	7.25	4.02	4.76	2.78	2.60	2.71	2.85	3.22	2.8
2	......	4.1	7.2	7.37	4.63	4.60	2.49	2.66	2.91	2.69	3.17	2.7
3	3.2	4.0	7.3	6.52	3.72	4.30	2.36	2.46	2.92	2.73	3.18	2.7
4	......	3.8	7.1	6.05	4.35	4.10	2.34	2.85	2.89	2.64	3.19	2.6
5	3.0	3.9	6.9	5.98	4.23	3.94	2.69	3.03	2.97	2.65	3.26	2.6
6	3.0	3.8	6.7	5.42	4.51	4.34	2.59	2.89	3.00	2.56	3.34	2.7
7	3.2	3.8	7.2	5.71	4.24	4.75	2.56	2.70	3.14	3.00	3.30	2.7
8	3.8	4.0	7.8	5.90	4.50	4.79	2.52	2.62	3.34	2.96	3.21	4.1
9	......	4.1	7.2	5.16	4.25	4.70	2.37	2.48	3.13	2.94	3.56	4.0
10	3.2	4.3	6.7	4.72	4.37	4.66	2.28	2.38	3.08	3.01	3.02	3.9
11	3.3	4.4	6.5	4.27	4.34	4.37	2.35	2.64	2.93	2.99	2.92	3.7
12	3.3	4.4	6.0	4.61	3.88	4.38	2.33	3.38	2.90	2.91	2.87	3.6
13	3.3	4.3	5.5	4.31	3.67	4.27	2.57	3.19	2.82	2.95	2.76	3.3
14	3.3	4.2	4.2	3.74	3.67	4.07	2.49	3.75	2.75	2.97	2.75	3.3
15	......	4.1	4.1	3.89	3.64	3.91	2.46	2.76	2.64	2.90	2.80	3.6
16	......	4.0	4.0	4.09	3.38	3.73	2.35	2.86	2.57	2.78	2.78	3.2
17	3.2	4.2	3.8	3.52	3.27	3.73	2.28	2.88	2.59	2.80	2.66	3.4
18	3.1	4.4	3.7	3.42	3.31	3.72	2.50	2.87	2.60	2.82	2.53	3.5
19	3.3	4.4	3.6	4.37	3.14	4.12	2.50	2.86	2.68	2.91	2.51	3.7
20	......	4.5	3.6	6.00	3.08	3.68	2.48	2.69	2.56	2.95	2.48	3.8

Daily gage height, in feet, of Hudson River at Thurman, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	3.4	4.5	3.6	4.67	3.34	3.58	2.46	......	2.56	2.94	2.41	3.8
22	......	4.6	......	4.41	3.27	3.45	2.44	2.46	2.62	2.86	2.51	3.4
23	......	4.6	4.2	4.76	3.37	3.30	2.41	2.58	2.55	2.90	2.78	3.7
24	......	4.5	4.6	4.42	3.40	3.13	2.23	2.58	2.57	3.02	2.77	3.8
25	5.1	4.5	5.2	......	3.72	3.06	2.41	2.58	2.65	3.04	2.74	3.7
26	5.0	4.5	6.2	......	4.70	2.98	2.37	2.52	2.71	3.01	2.71	3.7
27	4.8	4.6	5.90	......	4.69	2.95	2.30	2.46	2.76	3.27	2.72	4.0
28	4.7	5.5	5.92	......	4.51	2.94	2.28	2.29	3.36	3.33	2.68	3.9
29	4.5	......	6.33	......	4.24	2.92	2.52	2.52	3.29	3.36	2.74	3.8
30	......	......	6.85	......	4.26	2.87	2.43	2.50	3.15	3.34	2.79	4.0
31	4.4	......	7.19	......	4.60	......	2.60	2.47	......	3.34	......	3.7

NOTE.—Ice present at this station from Jan. 1 to about Mar. 22 and from about Dec. 8-31. It is not known whether readings during this period were to water surface or to the top of the ice.

Gage heights Jan. 1 to Mar. 26 and Dec. 1-31 taken from Daily river stages, Part X, United States Weather Bureau.

Daily discharge, in second-feet, of Hudson River at Thurman, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	15,400	4,070	6,220	1,260	1,000	1,160	1,380	2,110	1,300
2	......	......	......	15,900	5,830	5,740	864	1,080	1,490	1,130	2,010	1,140
3	......	......	......	12,500	3,280	4,860	720	829	1,510	1,200	2,030	1,140
4	......	......	......	10,600	5,000	4,290	700	1,380	1,450	1,060	2,050	1,000
5	......	......	......	10,400	4,660	3,850	1,130	1,720	1,600	1,070	2,200	1,000
6	......	......	......	8,350	5,470	4,980	988	1,450	1,660	950	2,380	1,140
7	......	......	......	9,380	4,690	6,190	950	1,140	1,940	1,660	2,290	1,140
8	......	......	......	10,100	5,440	6,310	900	1,030	2,380	1,580	2,090	......
9	......	......	......	7,480	4,720	6,040	730	852	1,920	1,550	2,890	......
10	......	......	......	6,100	5,060	5,920	643	740	1,820	1,680	1,700	......
11	......	......	......	4,770	4,980	5,060	710	1,060	1,550	1,640	1,510	......
12	......	......	......	5,770	3,690	5,090	690	2,470	1,470	1,490	1,420	......
13	......	......	......	4,890	3,160	4,770	962	2,050	1,330	1,560	1,230	......
14	......	......	......	3,330	3,160	4,210	864	3,360	1,220	1,600	1,220	......
15	......	......	......	3,710	3,090	3,770	829	1,230	1,060	1,470	1,300	......
16	......	......	......	4,260	2,470	3,300	710	1,400	962	1,260	1,260	......
17	......	......	......	2,800	2,220	3,300	643	1,440	988	1,300	1,080	......
18	......	......	......	2,570	2,310	3,280	875	1,420	1,000	1,330	912	......
19	......	......	......	5,060	1,940	4,350	875	1,400	1,110	1,490	888	......
20	......	......	......	10,500	1,820	3,180	852	1,130	950	1,560	852	......
21	......	......	......	5,950	2,380	2,940	829	980	950	1,550	772	......
22	......	......	......	5,180	2,220	2,640	806	829	1,030	1,400	888	......
23	......	......	4,570	6,220	2,450	2,290	772	975	938	1,470	1,260	......
24	......	......	5,740	5,210	2,520	1,920	600	975	962	1,700	1,250	......
25	......	......	7,610	5,040	3,280	1,780	772	975	1,070	1,740	1,200	......
26	......	......	11,200	4,870	6,040	1,620	730	900	1,160	1,680	1,160	......
27	......	......	10,100	4,710	6,010	1,560	660	829	1,230	2,220	1,170	......
28	......	......	10,200	4,550	5,470	1,550	643	652	2,430	2,360	1,110	......
29	......	......	11,700	4,390	4,690	1,510	900	900	2,270	2,430	1,200	......
30	......	......	13,800	4,230	4,740	1,420	794	875	1,960	2,380	1,280	......
31	......	......	15,200	......	5,740	......	1,000	840	......	2,380	......	......

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Discharge interpolated Apr. 25 to 30 and Aug. 21.

The daily discharge for Jan. 1 to Mar. 22 and Dec. 8-31 not published, because it is only approximate.

Monthly discharge of Hudson River at Thurman, N. Y., for 1910.

[Drainage area, 1,550 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	....	....	900	0.581	0.67	C.
February	....	....	1,200	.774	.81	C.
March	15,200	....	6,500	4.19	4.83	C.
April	15,900	2,570	6,810	4.39	4.90	A.
May	6,040	1,820	3,950	2.55	2.94	A.
June	6,310	1,420	3,800	2.45	2.73	A.
July	1,260	600	819	.528	.61	A.
August	3,360	652	1,220	.787	.91	A.
September	2,430	938	1,420	.916	1.02	A.
October	2,430	950	1,590	1.03	1.19	A.
November	2,890	772	1,490	.961	1.07	A.
December	....	....	860	.555	.64	C.
The year	15,900	600	2,550	1.65	22.32	

NOTE.—Discharge for January, February, March, and December estimated from the combined flow at North Creek and Riverbank, plus an estimated inflow between Thurman and North Creek and Riverbank, due consideration being given to the effect of storage regulation at Indian Lake reservoir.

Discharge for January, February, and March revised, superseding that published in the sixth annual report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor.

Discharge Jan. 1-21, Feb. 1-28, and Dec. 8-31 relatively constant.

Mean discharge Jan. 1-21 about 570 second-feet.

Mean discharge Jan. 22-31 about 1,600 second-feet, ranging approximately from 1,200 to 2,300 second-feet.

Mean discharge Mar. 1-22 about 5,070 second-feet, ranging approximately from 7,500 to 2,500 second-feet.

Mean discharge Dec. 8-31 about 784 second-feet.

HUDSON RIVER AT MECHANICVILLE, N. Y.

This station is located at the dam of the West Virginia Pulp & Paper Co. at Mechanicville, a few miles down the stream from the entrance of Hoosic River into the Hudson. Records have been kept at this point by this company since 1888, and the results for 1910 have been furnished by R. P. Bloss, engineer of the company. The dam at Mechanicville was rebuilt in 1904 and now has a rounded or ogee section. A discharge curve has been calculated, using a coefficient of discharge derived from United States Geological Survey experiments on models of dams of ogee cross section, as published in Water-Supply Paper 200.

During 1910 an automatic gage was installed at this station for the purpose of obtaining more accurate readings of the depth on the crest of the dam.

The discharge of the Hudson at Mechanicville is diminished somewhat by water required in operating the Champlain canal.

Records at this station are under careful supervision.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

The following test-discharge measurements were made during 1910:

Discharge measurements of Hudson River at Mechanicville, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Apr. 9	C. C. Covert	475	6,550	4.08	22,000
June 1	W. G. Hoyt	474	5,920	2.63	17,300
14	Covert and Phelan	476	5,610	2.14	13,700
July 22	J. J. Phelan	443	4,560	.06	1,700
Aug. 13	.....do	430	4,930	1.02	2,900
Sept. 27	.....do	472	5,010	.68	2,130
Dec. 2	.....do	464	4,960	1.00	2,970

NOTE.—Measurements made from toll bridge just below the dam of the West Virginia Pulp & Paper Co. at Mechanicville. Construction work in connection with the barge canal affected the conditions of flow somewhat.

Daily discharge, in second-feet, of Hudson River at Mechanicville, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,533	5,570	31,537	35,906	a15,760	14,750	3,615	2,625	1,370	4,395	3,885	2,943
2	a1,331	4,247	30,930	36,054	11,459	14,665	3,588	1,562	1,238	a3,224	3,453	2,467
3	1,369	4,293	29,683	a37,809	11,422	12,967	a700	1,646	1,490	3,698	3,582	2,288
4	804	4,258	29,988	29,819	9,715	11,628	1,284	1,459	a809	2,880	3,667	a2,194
5	925	3,904	28,355	25,540	12,996	a8,173	2,979	2,333	1,488	2,274	4,059	2,499
6	1,745	a2,550	a25,211	23,072	12,485	14,025	2,640	2,402	2,658	2,314	a3,477	1,668
7	2,806	4,915	28,962	23,409	11,353	16,010	2,255	a2,425	2,807	2,281	6,071	2,190
8	2,163	3,814	29,088	23,808	a9,367	17,227	1,949	3,365	2,685	1,533	5,082	1,805
9	a1,982	3,345	24,586	23,659	11,015	16,959	1,742	2,355	2,899	a1,664	4,513	1,745
10	1,928	2,742	22,302	a17,722	9,227	15,728	a812	1,796	3,261	2,770	4,394	1,834
11	1,883	2,745	19,691	16,128	9,563	14,300	1,631	2,498	a3,400	3,557	3,692	a544
12	1,489	3,106	18,559	13,510	8,527	a14,028	1,421	1,748	3,500	2,027	3,598	1,552
13	1,528	a3,170	a15,818	14,426	7,355	14,848	1,464	2,993	2,134	2,896	a2,310	1,240
14	1,864	5,765	17,295	12,555	6,176	12,791	1,463	a2,658	2,393	2,692	4,403	1,260
15	1,866	3,344	14,250	9,997	a4,534	11,450	1,430	2,758	2,717	2,702	3,202	1,468
16	a2,134	3,858	12,778	9,429	7,166	9,759	1,385	2,061	2,701	a1,378	2,570	1,448
17	1,433	3,156	11,774	a8,469	5,696	8,896	a800	2,097	2,075	2,725	2,919	1,780
18	1,720	4,032	10,603	8,014	5,228	9,046	1,595	2,165	a345	2,388	3,013	a1,129
19	2,638	3,381	9,193	8,830	5,008	a8,827	1,394	2,555	2,080	1,765	2,130	1,466
20	4,583	a2,483	a9,684	13,313	4,795	9,760	1,328	2,527	1,766	1,926	a1,180	1,780
21	2,733	3,577	12,197	18,413	5,345	7,546	1,332	a796	1,604	1,242	2,533	1,376
22	31,151	5,528	12,314	14,457	a5,450	6,761	1,412	1,874	1,595	1,542	2,370	1,725
23	a15,692	6,002	12,622	12,279	7,341	6,078	1,465	2,389	1,429	a900	2,159	1,432
24	12,370	5,227	14,714	a12,885	6,312	5,425	a530	1,488	1,541	1,846	2,523	1,492
25	11,513	5,276	16,946	11,827	6,681	4,872	1,382	1,185	a1,036	3,548	2,098	a764
26	11,644	4,694	27,319	10,360	9,397	a3,283	1,395	1,629	1,987	2,800	4,771	3,234
27	8,514	a10,742	a28,173	16,735	13,668	5,064	1,473	2,212	1,537	2,584	a2,181	2,555
28	8,295	37,655	28,924	16,363	13,964	3,825	1,406	a867	2,744	3,335	2,799	3,191
29	7,358	....	27,375	13,283	a11,823	3,539	1,701	867	4,737	2,471	3,712	3,791
30	a6,822	....	29,529	11,221	12,297	3,064	1,410	1,180	6,143	a3,152	2,069	3,746
31	7,135	....	33,162	....	14,981	....	a717	1,243	....	4,289	....	3,601

a Sunday.

Monthly discharge of Hudson River at Mechanicville for 1910.

[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.	
January	31,200	804	5,190	1.15	1.33
February	37,700	2,480	5,480	1.22	1.27
March	33,200	9,190	21,400	4.76	5.49
April	37,800	8,010	17,600	3.91	4.36
May	15,800	4,530	9,230	2.05	2.36
June	17,200	3,060	10,200	2.27	2.53
July	3,620	530	1,600	.356	.41
August	3,360	796	1,990	.442	.51
September	6,140	345	2,270	.504	.56
October	4,400	900	2,540	.564	.65
November	6,070	1,180	3,280	.729	.81
December	3,790	544	2,010	.447	.52
The year	37,700	345	6,900	1.53	20.80

CHAMPLAIN CANAL AND GLENS FALLS FEEDER, N. Y.

The discharge of Hudson River at both Fort Edward and Mechanicville is diminished somewhat by the water required for operating the Champlain canal. In the northern stretch of this canal—from Northumberland to Lake Champlain, at Whitehall—the summit level (between Fort Edward and Fort Ann) is supplied (1) by the Glens Falls feeder, a branch canal leaving the Hudson about 2 miles above Glens Falls, and (2) by Wood Creek.

At Northumberland the canal crosses the Hudson and the southern portion receives its principal water supply here.

The quantity of water diverted from Hudson River for the Champlain canal has been measured occasionally during 1910 at various points, and a summary of the measurements follows:

Measurements of flow in Champlain canal, Glens Falls feeder, and spillways in 1910.

Date.	Locality.	Mean velocity (feet per second).	Discharge (second-feet).	Remarks.
	BELOW NORTHUMBERLAND.			
June 2	Champlain canal at Mechanicville	0.38	91.2	From Saratoga Street bridge.
2	Spillway near Mechanicville		a 3	This spillway is about 250 yards above mill of West Virginia Pulp Co., at Mechanicville; 90 feet across; water flowing over about ½ inch deep.
2	Bridge 34, Stillwater	.60	115	
2	Spillway below bridge 34		a 7	
2	Schuyler Creek near Stillwater	.33	39	Schuyler Creek flows into the canal opposite the Stillwater spillway. No measurement of this creek could be made, but flow was estimated at 10 or 15 second-feet.
2	Spillway at Bemis		a 5	From bridge at Stillwater.
2	Bridge 15, below Coveville	.62	170	From bridge opposite W. F. Curtis's.
3	Coveville foot bridge	.48	127	From bridge behind Coveville post office.

a Estimated.

Measurements of flow in Champlain canal, Glens Falls feeder, and spillways in 1910—Con.

Date.	Locality.	Mean velocity (feet per second).	Discharge (second feet).	Remarks.
	BELOW NORTHUMBERLAND—contd.			
June 3	Spillway below Coveville		a 5	Spillway just above bridge No. 51; estimated flow, 1 second-foot.
3	Spillway (small) 75 yards below Coveville.		a 5	
3	Champlain canal, Schuylerville	0.54	183	From bridge No. 63; 3 spillways just below this bridge.
3	Spillway below Schuylerville		a 5	Between bridges Nos. 46 and 47. Not sufficient flow for measurement; flow estimated 5 to 8 second-feet.
3	Lock at head of canal		a 5	Lock not in use at this time. Estimated leakage, 46 second-feet.
21	Champlain canal at Mechanicville	.30	75.4	From Saratoga Street bridge.
July 21	do	.72	164	Do.
Aug. 13	do	.23	60.5	Do.
Sept. 26	do	.38	88	Do.
	ABOVE NORTHUMBERLAND.			
June 3	Lock at end of canal		a 5	Estimated leakage, 3 to 5 second-feet.
4	Champlain canal at Fort Edward	.42	110	At East Street bridge.
3	Glens Falls feeder, Hudson Falls	.97	195	Brown Bridge.
4	Spillway above Fort Edward		a 5	From bridge 45 feet north of entrance of Glens Falls feeder. Current runs north.
4	Champlain canal above feeder bridge No. 100.	.36	135	There is but one bridge between Fort Edward and Glens Falls feeder, about 150 yards above Fort Edward Lock; barely a trace of current in canal; estimated flow over lock gates, 10 to 12 second-feet. Between Fort Edward and Glens Falls feeder is 1 small waste weir. Estimated flow, 1 second-foot.
4	Glens Falls feeder above Glens Falls	.87	216	At change bridge near feed dam, Glens Falls.
15	Champlain canal, Maple Street bridge above bridge No. 100.	.22	74.5	See remarks on measurement made June 4 at this point.
15	Glens Falls feeder above Glens Falls	.75	177	At change bridge near feed dam.
Aug. 12	Glens Falls feeder, Hudson Falls	.56	123	From change bridge west of trolley line at Hudson Falls.
12	Glens Falls feeder, Glens Falls	.77	208	At plate-girder highway bridge at Glens Falls.
Sept. 26	Glens Falls feeder, Hudson Falls	.79	182	From change bridge west of trolley line.
26	Glens Falls feeder, Glens Falls	.71	190	At plate-girder highway bridge.
Oct. 14	Glens Falls feeder, Hudson Falls	.88	188	At change bridge near feed dam.
14	Glens Falls feeder, Glens Falls	.83	210	At plate-girder highway bridge.

a Estimated.

From the foregoing table it appears that an average of about 200 second-feet passes under the first change bridge on the Glens Falls feeder above Glens Falls and an average of 170 second-feet under the Ferry Street bridge at Hudson Falls. This indicates that about 30 second-feet returns to Hudson River above Fort Edward and that about 170 second-feet enters Champlain canal and is diverted above Fort Edward. It is estimated that about 95 second-feet flows north toward Lake Champlain and is permanently diverted from the Hudson basin. The remaining 75 second-feet flows south and probably nearly all gets back into the Hudson at or above Northumberland.

The supply of water taken for the southern part of the canal below Northumberland is probably about 95 second-feet, which, with the

95 second-feet flowing north into Lake Champlain, makes a total of about 190 second-feet to be added to the recorded flow at Mechanicville.

It will be noted that the measurements were made at different times of the canal season, so that the usage is shown for the various periods and the average value given for the deductions.

In conclusion, it seems safe to assume that the following values are applicable during that portion of the year when the canal is in operation—May to November, inclusive: At Fort Edward add 170 second-feet to the recorded flow; at Mechanicville add 190 second-feet to the recorded flow.

These values are practically the same as found by Mr. Barrows in 1907, and as the measurements cover the period of operation of the canal, except for May and November, they are believed to be approximately correct; any great deviation therefrom would be temporary and due to lockage or breaks in the canal.

Results of discharge measurements to show diversion from Hudson River above Fort Edward and Mechanicville gaging stations, in 1910.

Date of measurement.	Feeder at—		Champlain canal.		
	Glens Falls.	Hudson Falls.	Fort Edward.	Above feeder.	Saratoga street, Mechanicville.
June 2, 3, 4	216	195	88	107	91
June 15–21	177	(160)	(72)	(88)	75
July 21					164
Aug. 12–13	208	123	55	68	60.5
Sept. 26	190	178	80	98	88
Oct. 14	210	188	85	103	(90)
Mean of observed quantities	200	170		94	96

INDIAN LAKE RESERVOIR AT INDIAN LAKE, N. Y.

This station is located at a masonry storage dam at the outlet of Indian Lake. It was established July 22, 1900, to determine the total outflow from this reservoir. The drainage area at this point is 131 square miles, including about 9.3 square miles of water surface of Indian Lake at the elevation of the spillway of the dam.

The flow of the upper Hudson has been controlled to a considerable extent during the dry season by the use of Indian Lake reservoir since its completion in 1899. The total storage provided is about 4,700,000,000 cubic feet, which affords a discharge of nearly 600 second-feet for a period of 90 to 130 days each year.

The record at this station includes the elevation of the water surface in the reservoir, the depth of water flowing over the spillway or flashboards, the depth of opening and the head on the main and subsidiary logways, and the depth of the opening and the effective head on each of the 5-foot sluice gates. A meteorologic station has also been established at the dam by the United States Weather Bureau, and records are kept of the rainfall, temperature, etc.

The crest of the dam is 106.05 feet long in the clear. To facilitate the calculation of discharge over the spillway a series of experiments was made at Cornell University in 1899 on a full-sized model of the spillway section, 6.58 feet long, from which the coefficient of discharge has been determined.

No computations of discharge have been made, pending some current-meter measurements to rate discharge through the gates, and at present the record of reservoir level alone is available.

The datum of the staff gage has remained the same during the maintenance of the station. The elevation of the spillway crest above mean sea level is 1,650 feet and 33.23 feet above the datum of the gage. Gage heights are obtained from the staff gage or by measuring down from a bench mark, which is at an elevation of 36 feet above the gage datum.

The maximum gage height of Indian Lake reservoir since the establishment of the station occurred April 27, 1908, and was 37.0 feet. The minimum gage height was 2.00 feet, and occurred from March 9 to 18, 1907, and from January 3–17, 1910.

Information in regard to this station is contained in reports of the State Water Supply Commission and of the State engineer and surveyor, State of New York.

Daily gage heights, in feet, of Indian Lake at Indian Lake, N. Y., for 1910.

[Lester Severie, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.17	6.25	6.17	21.00	30.96	34.75	34.29	30.79	27.92	23.46	16.83	16.08
2	2.08	6.42	7.83	21.79	31.13	34.79	34.25	30.58	27.67	23.54	16.67	15.92
3	2.00	6.54	9.08	22.42	31.46	34.75	34.25	30.38	27.42	23.67	16.50	15.75
4	2.00	6.62	9.83	23.00	31.88	34.71	34.21	30.62	27.17	23.79	16.50	15.58
5	2.00	6.75	10.42	23.42	32.25	34.71	34.12	30.67	26.92	23.88	16.62	15.42
6	2.00	6.88	10.75	23.92	32.38	34.88	34.12	30.62	26.75	23.71	16.79	15.25
7	2.00	7.00	11.08	24.33	32.50	35.08	34.00	30.71	26.58	23.54	16.88	15.04
8	2.00	6.96	11.54	24.67	32.63	35.21	33.96	30.79	26.42	23.46	17.04	14.75
9	2.00	6.88	12.21	25.00	32.71	35.21	33.92	30.83	26.17	23.29	17.17	14.58
10	2.00	6.66	12.58	25.13	32.79	35.17	33.88	30.75	25.92	23.08	17.25	14.46
11	2.00	6.46	12.75	25.33	32.92	35.13	33.83	30.83	25.67	22.83	17.33	14.33
12	2.00	6.25	12.92	25.50	33.00	35.17	33.67	30.92	25.38	22.58	17.42	14.21
13	2.00	6.08	13.08	25.63	33.08	35.17	33.42	31.00	25.25	22.38	17.50	14.04
14	2.00	5.88	13.25	25.75	33.13	35.08	33.29	31.08	25.00	22.17	17.58	13.88
15	2.00	5.66	13.42	25.88	33.17	35.04	33.17	31.17	24.75	22.00	17.67	13.71
16	2.00	5.50	13.62	26.13	33.21	35.00	33.04	31.21	24.50	21.83	17.75	13.54
17	2.00	5.29	13.79	26.25	33.25	34.92	32.92	31.08	24.25	21.67	17.83	13.38
18	2.08	5.08	13.92	26.50	33.33	35.00	32.79	30.83	24.04	21.42	17.92	13.21
19	2.17	4.88	13.04	27.67	33.46	35.00	32.67	30.67	23.88	21.08	18.00	13.04
20	2.17	4.67	14.00	28.42	33.58	35.00	32.54	30.50	23.75	20.75	18.04	12.88
21	2.29	4.46	14.08	28.92	33.67	34.92	32.42	30.29	23.54	20.42	17.96	12.71
22	2.62	4.25	14.20	29.25	33.83	34.83	32.29	30.08	23.38	20.08	17.75	12.51
23	2.96	4.04	14.38	29.42	33.92	34.75	32.17	29.88	23.17	19.75	17.54	12.38
24	3.79	3.83	14.54	29.54	34.00	34.67	32.04	29.62	22.96	19.42	17.38	12.20
25	4.75	3.62	15.17	29.67	34.17	34.58	31.92	29.42	22.75	19.08	17.21	12.08
26	5.16	3.42	16.00	30.00	34.46	34.50	31.79	29.21	22.75	18.75	17.04	11.96
27	5.42	3.50	16.67	30.33	34.58	34.42	31.67	29.00	22.75	18.42	16.88	11.83
28	5.58	4.67	17.25	30.50	34.58	34.38	31.50	28.79	22.96	18.17	16.67	11.71
29	5.75	......	18.00	30.67	34.58	34.33	31.33	28.58	23.17	17.83	16.46	11.58
30	5.92	......	18.83	30.83	34.58	34.33	31.17	28.46	23.38	17.50	16.25	11.46
31	6.08	......	20.00	......	34.71	......	31.00	28.21	......	17.17	......	11.33

Gate openings, in feet, of Indian Lake reservoir at Indian Lake, N. Y., for 1910.

Date.	Sluice gate A open.	Sluice gate B open.	Date.	Sluice gate A open.	Sluice gate B open.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Jan. 1-24	5.0	5.0	Aug. 16	2.0	
Feb. 8-28	5.0	5.0	Aug. 17 to Sept. 27 [a]	5.0	
July 1 to July 11	2.5		Oct. 5 to Nov. 1		5.0
Aug. 1 to Aug. 4	5.0		Oct. 18 to Nov. 3	2.5	
Aug. 5-6	2.0		Nov. 2-3		2.0
Aug. 9-10	5.0		Dec. 5-10	2.5	
Aug. 11	2.0		Dec. 1-31		5.0

[a] Main logway open about 9 feet Aug. 31 to Sept. 20 and open 15 feet Sept. 21 to 30.

This table supersedes the table published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor.

SCHROON RIVER.

GENERAL FEATURES OF AREA DRAINED.

Schroon River rises in Essex County, on the southern slopes of the highest mountains in the Adirondack group, flows in a general southerly direction for about 45 miles through Essex and Warren counties, and joins the Hudson near Thurman. Its total drainage area is 550 square miles. The elevation of its source is about 2,000 feet.

Its basin is largely forested and contains considerable wild land and numerous lakes and ponds. The most important of these is Schroon Lake, through which the river flows, which has a water-surface area of about 6.3 square miles. The river affords excellent opportunities for storage and power development, which are under investigation by the New York State Water Supply Commission. The only power developments are at Warrensburg.

SCHROON LAKE NEAR POTTERSVILLE, N. Y.

This station is located at the outlet of Schroon Lake, 1 mile from Pottersville post office, and is at the steamboat wharf. It was established July 8, 1908, in cooperation with the New York State Water Supply Commission, to obtain information concerning fluctuations in the level of Schroon Lake in connection with the gaging station on Schroon River at Riverbank. A staff gage fastened to the wharf is read once daily. The records are discontinued each year as the lake freezes and reestablished in the spring as soon as the ice breaks up, for which the following dates apply: Discontinued December 5, 1908; reestablished July 1, 1909;[1] discontinued Decem-

[1] No date of ice breaking up in 1909.

ber 4, 1909; reestablished April 17, 1910; and discontinued December 3, 1910. The gage datum was originally placed at elevation 803.75 feet above mean sea level. The gage was raised 0.17 foot by ice action during the winter of 1908-9. The 1909 and 1910 gage heights have been reduced to the original datum by making a plus correction of 0.17 foot.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission of New York.

Daily gage height, in feet, of Schroon Lake near Pottersville, N. Y., for 1910.

[Asel Galusha, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					4.26	5.37	2.87	1.87	2.67	1.97	1.27	1.07
2					4.87	5.47	2.77	1.87	2.57	1.87	1.27	1.07
3					5.07	5.47	2.77	1.97	2.47	1.87	1.37	1.07
4					5.17	5.37	2.77	2.02	2.47	1.77	1.37	
5					5.37	5.47	2.67	2.02	2.47	1.77	1.37	
6					5.37	5.47	2.67	2.02	2.67	1.67	1.37	
7					5.42	5.37	2.57	2.07	2.67	1.57	1.37	
8					5.37	5.57	2.27	2.17	2.57	1.47	1.37	
9					5.27	5.47	2.27	2.27	2.57	1.47	1.37	
10					5.27	5.37	2.07	2.47	2.57	1.47	1.37	
11					5.27	5.47	2.07	2.57	2.57	1.47	1.37	
12					5.27	5.37	2.07	2.57	2.47	1.37	1.37	
13					5.17	5.07	1.97	2.67	2.47	1.37	1.37	
14					5.07	5.07	1.97	2.77	2.37	1.37	1.27	
15					5.07	4.97	1.97	2.77	2.37	1.37	1.27	
16					4.97	4.77	1.97	2.87	2.37	1.37	1.17	
17				4.77	4.87	4.77	1.97	2.87	2.37	1.37	1.17	
18				4.77	4.87	4.77	1.97	2.87	2.37	1.37	1.17	
19				5.12	4.67	4.87	1.97	2.97	2.17	1.27	1.17	
20				5.47	4.47	4.87	1.97	3.07	2.07	1.27	1.17	
21				5.57	4.47	4.97	1.87	3.07	1.97	1.17	1.17	
22				5.57	4.47	5.07	1.87	3.07	1.97	1.17	1.17	
23				5.47	4.47	3.17	1.87	3.07	1.77	1.17	1.17	
24				5.37	4.57	3.57	1.87	3.07	1.77	1.17	1.07	
25				5.47	4.57	3.87	1.87	3.07	1.77	1.17	1.07	
26				5.17	4.77	3.67	1.87	3.07	1.87	1.17	1.07	
27				5.17	4.87	3.57	1.87	3.07	1.87	1.17	1.07	
28				5.17	4.97	3.47	1.87	2.97	1.87	1.07	1.07	
29				5.17	5.27	4.07	1.87	2.87	1.97	1.07	1.07	
30				5.17	5.27	3.97	1.87	2.77	1.97	1.07	1.07	
31					5.47		1.87	2.67		1.17		

SCHROON RIVER AT RIVERBANK, N. Y.

This station is located on the steel highway bridge near Riverbank post office, between the towns of Warrensburg and Bolton, about 9 miles north of the village of Warrensburg, and about 10 miles downstream from the outlet of Schroon Lake. It was established September 23, 1907, in cooperation with the New York State Water Supply Commission, to obtain general statistical data in regard to the flow of Schroon River.

There are several dams at the village of Warrensburg which are used for power development. During September, 1907, a timber crib dam for storage was constructed at Starbuckville, about 6 miles above the gaging station. This dam affords a head of about 8 feet and ponds water to Schroon Lake. Tumble Head Falls begin about 1 mile above the gaging station and extend upstream for about a mile farther, affording a total fall of some 30 feet.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station. During the winter months the discharge is affected by ice. Conditions for obtaining accurate discharge are good, and a very good rating curve has been developed. All discharge measurements are made from the bridge.

Since 1907 the regimen of flow of Schroon River during the low-water season has been somewhat affected by storage in Schroon Lake.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Schroon River at Riverbank, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 20[a]	W. G. Hoyt	62	138	1.73	139
Feb. 17[b]	C. C. Covert	72	194	2.63	358
Apr. 1	W. G. Hoyt	85	593	7.22	5,870
2	.....do	85	600	7.19	5,750
4	.....do	85	542	6.52	4,840
5	.....do	85	508	6.21	4,390
June 16	Covert & Phelan	78.6	284	3.54	1,310
Dec. 28[c]	F. J. Shuttleworth	62	166	1.70	186
28[d]	.....do	102	224	2.00	301

[a] Complete ice cover; gage height to top of ice, 1.83 feet; average thickness of ice, 1 foot.
[b] Complete ice cover; gage height to top of ice, 2.73 feet; average thickness of ice, 1 foot.
[c] Measurement made at bridge under complete ice cover. Gage height to top of ice, 1.70 feet; to bottom, 0.70 foot; average thickness of ice, 0.88 foot.
[d] Measurement made ½ mile below gage under complete ice cover. Gage height to top of ice, 2 feet; to bottom, 0.90 foot; average thickness of ice, 1.30 feet.

Daily gage height, in feet, of Schroon River at Riverbank, N. Y., for 1910.

[J. H. Roberts, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.60	2.45	3.20	7.22	4.25	4.72	2.75	1.35	1.95	2.20	2.15	1.85
2	1.65	2.45	3.45	7.18	4.18	4.55	1.75	1.45	2.00	2.10	2.20	1.90
3	1.60	2.50	3.65	6.88	4.28	4.30	1.65	1.35	2.10	2.20	2.10	1.95
4	1.60	2.50	3.70	6.52	4.20	4.15	1.75	2.00	2.00	2.15	2.15	1.75
5	1.55	2.45	3.70	6.18	4.28	4.05	2.58	1.60	2.00	2.15	2.30	1.80
6	1.60	2.40	3.75	5.90	4.38	4.15	2.35	1.50	2.10	2.15	2.25	1.80
7	1.65	2.45	3.98	5.78	4.45	4.12	2.35	1.45	2.10	2.10	2.30	1.90
8	1.70	2.50	4.22	5.62	4.30	4.35	2.20	1.50	2.15	2.05	2.30	1.85
9	1.75	2.50	4.50	5.45	4.35	4.35	2.20	1.50	2.10	2.00	2.30	1.90
10	1.65	2.50	4.45	5.20	4.30	4.30	2.00	1.45	2.05	2.05	2.30	1.75
11	1.70	2.45	4.52	4.75	4.25	4.15	2.00	1.50	1.95	2.05	2.30	1.70
12	1.70	2.50	4.48	4.30	4.25	4.15	1.65	1.45	2.00	2.10	2.25	1.65
13	1.75	2.60	4.38	4.45	4.20	4.00	1.70	1.40	2.10	2.05	2.15	1.50
14	1.70	2.75	4.22	4.30	4.15	3.72	1.70	1.30	1.55	2.00	2.25	1.55
15	1.70	2.75	4.10	4.20	3.85	3.50	1.60	1.45	1.45	2.00	2.15	1.75
16	1.65	2.60	4.00	4.08	3.85	3.55	1.65	1.50	1.50	1.85	2.10	1.70
17	1.70	2.70	3.90	3.98	3.72	3.50	1.50	1.45	2.00	2.10	2.15	1.65
18	1.70	2.70	3.80	3.72	3.20	3.40	1.55	1.45	1.95	2.10	2.20	1.50
19	2.00	2.75	3.62	3.88	3.20	3.35	1.50	1.45	1.95	2.05	2.20	1.70
20	1.70	2.70	3.58	4.22	3.15	3.25	1.50	1.40	1.90	2.00	1.90	1.70

Daily gage height, in feet, of Schroon River at Riverbank, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	1.65	2.65	3.52	4.65	3.22	3.20	1.45	1.40	1.85	1.90	2.10	1.65
22	2.00	2.85	3.52	4.72	3.00	3.15	1.40	1.45	1.90	1.95	2.10	1.60
23	2.05	2.80	3.65	4.62	3.12	3.05	1.55	1.65	1.85	1.85	2.10	1.60
24	2.10	2.75	3.92	4.50	3.45	3.00	1.35	1.70	1.85	1.90	1.85	1.80
25	2.20	2.80	4.50	4.48	3.50	2.90	1.40	1.65	2.05	1.95	2.00	1.70
26	2.30	2.75	5.12	4.40	4.25	2.75	1.35	1.60	2.05	1.95	2.00	1.80
27	2.40	3.00	5.48	4.48	4.18	2.95	1.40	1.50	2.15	1.95	1.80	1.80
28	2.45	3.00	5.88	4.42	4.40	2.95	1.40	1.55	2.40	2.10	1.90	1.70
29	2.40	......	5.18	4.40	4.30	3.00	1.35	1.65	2.35	2.15	1.80	1.75
30	2.50	......	6.58	4.35	4.60	2.85	1.30	1.60	2.20	2.00	1.85	1.80
31	2.40	......	6.95	......	4.68	......	1.20	1.80	......	2.15	......	1.90

NOTE.—Ice present Jan. 1 to about Mar. 12 and from about Dec. 7 to 31. Gage heights to water surface during these periods. There was also probably more or less backwater from log jams during the latter part of April, all of May, and the first part of June.

Daily discharge, in second-feet, of Schroon River at Riverbank, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	5,460	1,940	2,470	694	136	331	432	411	294
2	......	......	......	5,420	1,870	2,270	259	164	350	390	432	312
3	......	......	......	5,060	1,970	2,000	226	136	390	432	390	331
4	......	......	......	4,620	1,890	1,840	259	350	350	411	411	259
5	......	......	......	4,220	1,970	1,730	608	210	350	411	476	276
6	......	......	......	3,880	2,080	1,840	499	178	390	411	454	276
7	......	......	......	3,740	2,160	1,800	499	164	390	390	476	312
8	......	......	......	3,540	2,000	2,050	432	178	411	370	476	......
9	......	......	......	3,340	2,050	2,050	432	178	390	350	476	......
10	......	......	......	3,040	2,000	2,000	350	164	370	370	476	......
11	......	......	......	2,500	1,940	1,840	350	178	331	370	476	......
12	......	......	......	2,000	1,940	1,840	226	164	350	390	454	......
13	......	......	2,090	2,160	1,890	1,670	242	149	390	370	411	......
14	......	......	1,910	2,000	1,840	1,400	242	122	194	350	454	......
15	......	......	1,780	1,890	1,520	1,200	210	164	164	350	411	......
16	......	......	1,670	1,760	1,520	1,240	226	178	178	294	390	......
17	......	......	1,570	1,650	1,400	1,200	178	164	350	390	411	......
18	......	......	1,470	1,400	966	1,120	194	164	331	390	432	......
19	......	......	1,310	1,550	966	1,080	178	164	331	370	432	......
20	......	......	1,270	1,910	933	1,000	178	149	312	350	312	......
21	......	......	1,220	2,380	980	966	164	149	294	312	390	......
22	......	......	1,220	2,470	836	933	149	164	312	331	390	......
23	......	......	1,340	2,350	913	868	194	226	294	294	390	......
24	......	......	1,590	2,220	1,160	836	136	242	294	312	294	......
25	......	......	2,220	2,190	1,200	776	149	226	370	331	350	......
26	......	......	2,940	2,100	1,940	694	136	210	370	331	350	......
27	......	......	3,380	2,190	1,870	806	149	178	411	331	276	......
28	......	......	3,870	2,130	2,100	806	149	194	522	390	312	......
29	......	......	3,020	2,100	2,000	836	136	226	499	411	276	......
30	......	......	4,700	2,050	2,330	748	122	210	432	350	294	......
31	......	......	5,140	......	2,420	......	97	276	......	411	......	......

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Monthly discharge of Schroon River at Riverbank, N. Y., for 1910.

[Drainage area, 534 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			188	0.352	0.41	D.
February			363	.680	.70	C.
March	5,140		1,910	3.58	4.13	B.
April	5,460	1,400	2,780	5.21	5.81	A.
May	2,420	836	1,700	3.18	3.67	B.
June	2,470	694	1,400	2.62	2.92	A.
July	694	97	260	.487	.56	A.
August	350	122	186	.348	.40	A.
September	522	164	348	.652	.73	A.
October	432	294	368	.689	.79	A.
November	476	276	399	.747	.83	A.
December	331		219	.410	.47	C.
The year	5,460	97	843	1.58	21.42	

NOTE.—Discharge Jan. 1 to Mar. 12 and Dec. 8 to 31 has been computed from a special discharge rating curve based on three discharge measurements made with ice present. Determinations of daily discharge for these periods as published in the Sixth Annual Report of the New York State Water Supply Commission have not been revised in the Federal report. They are not published, however, because they are very approximate. The discharge during each of the three months—January, February, and December—was probably quite uniform.

Mean discharge Mar. 1 to 12 estimated 1,280 second-feet, ranging from 579 to 2,060.

Mean discharge Dec. 8 to 31 estimated 197 second-feet.

Discharge for May probably somewhat too high as a result of backwater from log jams.

SACANDAGA RIVER.

GENERAL FEATURES OF AREA DRAINED.

Sacandaga River is formed by three principal branches which unite in the southeastern part of Hamilton County in the Adirondack region. The West Branch is the outlet of Piseco Lake; the Middle Branch is the outlet of Sacandaga and Pleasant lakes; the East and principal branch issues from a series of small ponds and lakes in the southwestern part of Warren County. The East and Middle branches unite a few miles north of Wells and are joined by the West branch a short distance below Wells. The river then flows southeasterly to about 5 miles below Northville, where it turns and runs northeasterly to the Hudson River at Hadley. Its total drainage area comprises about 1,050 square miles.

Sacandaga Lake, the highest of the tributary lakes in the headwaters, is about 1,700 feet above mean sea level; at its entrance into the Hudson the Sacandaga is at an elevation of about 550 feet. Between Northville and the mouth of the river there is a fall of about 180 feet (chiefly concentrated in the 5 miles below Conklingville) entirely unutilized. There are, in fact, no power developments on the Sacandaga.

The drainage area of this river is largely in forest. Precipitation is high, the mean for the year being about 49 inches, whereas that of the whole Hudson drainage area above Mechanicville is only about 43 inches. Possibilities for storage on the Sacandaga are great, and the State Water Supply Commission of New York proposes a high dam at Conklingville, the reservoir storing about 25,000,000,000 cubic feet of water, with a water surface of about 40 square miles, and controlling practically the entire flow of the Sacandaga basin. Their plan proposes also to develop the total fall obtained between Conklingville and the Hudson—approximately 200 feet—which will afford 25,000 to 30,000 continuous horsepower.

SACANDAGA RIVER AT WELLS, N. Y.

This station is located on the steel highway bridge over the East Branch of Sacandaga River in the southern part of the village of Wells, about 2½ miles above the junction of the East and West branches. It was established August 25, 1907, in cooperation with the New York State Water Supply Commission, to obtain general statistical and comparative data regarding the flow of this river.

The datum of the chain gage attached to the bridge has been the same during the maintenance of the station.

Discharge measurements are made from the bridge and by wading.

During the winter months the discharge is usually affected by ice.

Conditions for obtaining accurate discharge are good, and a good rating curve has been developed.

Later information has led to the revision of all discharge determinations for this station prior to 1910, and particularly those for stages above a gage height of about 5.5 feet. The revised figures are published in the following tables.

The only discharge measurement affected by this revision was that of November 8, 1907, which is here republished.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Sacandaga River at Wells, N. Y., in 1907 and 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1907.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Nov. 8[a]	J. B. Pierson	95	384	7.50	2,670
1910.					
Jan. 9[b]	C. C. Covert	46	95	4.24	68
10[b]	....do	46	92	4.26	64
Mar. 26[c]	W. G. Hoyt	100	530	8.5	3,250
27[c]	....do	98	438	7.58	2,390
28[c]	....do	98	428	7.55	2,420
29[c]	....do	97	530	8.5	3,160
Apr. 13[d]	C. C. Covert	90	404	7.26	1,440
14[d]	....do	82	258	5.62	503
June 8	W. G. Hoyt	91	351	6.54	1,400
9	....do	89	319	6.30	1,170
July 15	J. J. Phelan	55	111	3.90	55
Aug. 21	....do	56	129	4.39	148
Oct. 27	W. G. Hoyt	73	172	4.75	248
27	....do	82	242	5.39	612
28	....do	80	216	5.23	490
Dec. 22[b]	F. J. Shuttleworth	65	124	4.60	112

[a] Measurement made with surface floats near bridge. Revised on the basis of a coefficient of 0.72.
[b] Measurement made under complete ice cover.
[c] Subsurface measurement; a coefficient of 0.72 used to reduce surface velocities to mean in vertical.
[d] Discharge affected by backwater from log jam below bridge.

NOTE.—Some of the discharge measurements for 1910, as published in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York, revised from vertical velocity curve measurements, which indicate that a coefficient of 0.72 should be applied to all measurements made by the subsurface method.

Daily gage height, in feet, of Sacandaga River at Wells, N. Y., for 1910.

[Frank Stanyon, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.12	5.32	8.48	8.92	5.90	6.98	4.35	3.92	3.95	5.30	4.78	4.38
2	4.12	5.65	8.25	8.55	5.85	6.78	4.36	3.90	4.00	5.12	4.74	4.38
3	4.14	5.56	7.65	7.78	6.00	6.58	4.29	3.92	4.15	4.95	4.78	4.38
4	4.15	5.50	7.12	7.52	6.05	6.51	4.22	4.75	4.68	4.84	5.02	4.38
5	4.18	5.35	6.85	7.62	6.00	6.58	4.19	5.20	4.62	4.72	5.50	4.58
6	4.22	5.90	6.70	7.52	6.00	6.90	4.10	4.70	4.70	4.72	5.48	4.90
7	4.24	6.00	6.75	7.40	6.00	7.20	3.90	4.35	4.58	4.65	5.45	4.98
8	4.25	5.85	6.45	7.05	5.90	......	4.00	4.22	4.45	4.60	5.38	4.78
9	4.25	5.58	6.34	6.45	5.90	6.10	3.96	4.16	4.35	4.62	5.28	4.62
10	4.25	5.42	6.28	6.45	5.72	5.90	3.90	4.15	4.24	4.58	5.22	4.58
11	4.24	5.42	6.18	6.38	5.68	5.92	3.94	5.02	4.16	4.48	5.14	4.50
12	4.26	5.35	6.02	6.30	5.58	6.20	3.90	4.75	4.10	4.40	5.10	4.58
13	4.26	5.28	5.92	6.80	5.52	6.08	3.89	4.45	4.11	4.50	4.88	4.52
14	4.26	5.30	5.80	6.72	5.52	5.72	3.86	4.28	4.28	4.52	4.78	4.58
15	4.26	5.25	5.65	5.95	5.52	5.48	3.84	4.22	4.22	4.48	4.76	4.58
16	4.26	5.26	5.48	6.05	5.62	5.35	3.88	4.92	4.16	4.44	4.72	4.62
17	4.26	5.21	5.49	6.05	5.52	5.48	4.00	4.82	4.10	4.40	4.72	4.68
18	4.36	5.18	5.44	7.50	5.60	5.58	3.99	4.75	4.05	4.35	4.62	4.68
19	5.10	5.15	5.44	8.85	5.75	5.42	3.95	4.62	4.06	4.32	4.55	4.68
20	5.22	5.05	5.42	8.00	5.70	5.18	3.91	4.45	4.04	4.32	4.58	4.66
21	5.22	5.08	5.68	6.12	5.95	4.98	3.88	4.32	4.00	4.32	4.55	4.62
22	7.28	5.35	6.18	6.10	5.80	4.82	3.92	4.28	3.99	4.38	4.52	4.62
23	6.70	5.49	7.22	6.25	5.82	4.78	4.00	4.22	3.96	4.68	4.52	4.62
24	6.20	5.55	8.10	5.15	6.12	4.69	3.97	4.16	3.94	4.55	4.56	4.78
25	6.05	5.50	8.65	5.70	6.58	4.60	3.95	4.18	4.30	4.58	4.50	4.95
26	5.70	5.39	8.70	5.85	7.30	4.50	3.96	4.14	5.05	4.72	4.48	5.12
27	5.35	5.55	7.59	5.72	6.58	4.50	3.96	4.10	7.68	4.84	4.48	5.12
28	5.19	9.48	7.52	5.85	6.12	4.45	4.00	4.05	6.60	5.28	4.42	5.14
29	5.12	....	8.42	5.90	6.02	4.46	4.11	4.02	6.22	5.22	4.42	5.14
30	5.08	....	9.05	5.90	6.08	4.38	4.02	4.00	5.92	5.20	4.40	5.75
31	5.18	....	9.05	......	6.12	....	3.95	4.00	....	4.92	....	6.78

NOTE.—Ice existed at this station Jan. 1 to about Jan. 20, about Feb. 1 to Feb. 28, and from about Dec. 3 to 31; gage readings to water surface during these periods.
Backwater from log jam affected gage heights Apr. 10 to 25.

Daily discharge, in second-feet, of Sacandaga River at Wells, N. Y., for 1907–1910.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.							1907.						
1	......	......	25	186	748	380	16	......	......	118	450	560	......
2	......	......	25	176	780	358	17	......	......	118	425	530	......
3	......	......	33	208	2,350	358	18	......	......	100	380	475	......
4	......	......	297	192	1,800	358	19	......	......	86	337	450	......
5	......	......	402	450	1,100	337	20	......	......	86	337	425	......
6	......	......	260	360	1,460	337	21	......	......	83	317	402	......
7	......	......	192	425	2,940	337	22	......	......	86	317	530	......
8	......	......	116	337	2,540	317	23	......	......	73	297	475	......
9	......	......	105	337	1,890	317	24	......	......	118	297	475	......
10	......	......	132	450	1,260	297	25	......	25	176	260	475	......
11	......	......	225	402	1,030	1,060	26	......	25	146	225	475	......
12	......	......	780	360	990	1,800	27	......	25	118	242	475	......
13	......	......	402	650	850	1,060	28	......	24	105	1,460	450	......
14	......	......	242	530	682	590	29	......	23	176	1,620	425	......
15	......	......	176	475	620	......	30	......	23	167	1,060	425	......
							31	......	23	......	1,290	......	......

Daily discharge, in second-feet, of Sacandaga River at Wells, N. Y., for 1907–1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1	......	......	475	1,540	3,560	715	77	32	16	43	129	188
2	......	......	425	1,380	5,210	780	70	26	16	64	121	161
3	......	......	425	1,260	2,840	590	64	25	16	68	105	95
4	......	......	450	955	2,840	530	60	29	16	68	64	225
5	......	......	450	885	3,140	530	64	31	15	45	68	173
6	......	......	450	990	2,540	475	60	46	14	39	60	129
7	......	......	380	1,380	2,260	402	70	50	16	37	53	225
8	......	......	358	2,070	2,350	380	86	45	16	29	48	475
9	......	......	358	2,940	2,160	358	73	33	16	27	46	560
10	......	......	358	2,540	1,460	358	60	41	14	25	46	530
11	......	......	358	3,140	2,840	337	52	36	14	64	70	475
12	......	......	380	2,640	1,540	297	46	29	14	53	155	450
13	......	......	402	2,160	1,300	260	43	28	13	48	135	402
14	......	......	402	2,640	990	242	41	32	12	41	108	380
15	......	1,890	920	2,350	1,220	225	36	29	12	37	105	358
16	......	3,560	1,030	1,620	1,220	192	31	28	12	32	105	317
17	......	2,070	955	1,460	990	176	33	29	12	31	79	278
18	......	1,460	850	1,260	1,140	192	138	33	12	29	73	225
19	......	1,340	748	1,980	715	225	167	31	12	26	70	225
20	......	1,100	682	1,890	715	225	100	31	11	25	86	225
21	......	955	590	1,710	590	186	75	30	10	24	93	192
22	......	955	590	1,710	748	161	81	25	10	23	75	186
23	......	780	560	2,070	650	146	68	29	10	23	77	192
24	......	682	682	3,560	715	146	57	25	11	25	79	192
25	......	650	885	4,000	850	146	50	22	11	25	116	186
26	......	530	850	3,670	486	126	60	21	10	38	192	176
27	......	530	1,300	3,890	560	100	62	20	11	278	402	180
28	......	530	2,260	3,560	530	93	57	18	12	161	297	176
29	......	475	3,350	3,140	530	86	58	17	111	260	161	173
30	......	......	2,350	3,040	530	79	46	17	77	225	149	180
31	......	......	1,890	......	685	......	33	17	......	161	......	186
1909.												
1	189	300	1,060	530	1,620	530	110	38	23	37	28	79
2	186	300	885	650	2,440	530	103	32	23	31	28	75
3	176	300	780	885	1,620	475	167	32	22	28	28	64
4	189	300	715	955	2,070	475	144	30	22	26	29	64
5	242	300	583	920	1,620	560	116	29	23	25	31	57
6	1,050	300	650	1,380	2,440	1,060	103	29	23	24	31	64
7	700	1,000	590	3,240	3,780	850	91	28	22	23	27	70
8	500	800	560	3,670	2,540	620	79	27	21	22	24	60
9	500	700	530	3,140	1,380	502	73	26	19	21	21	81
10	400	640	502	2,260	2,540	530	68	26	21	21	22	138
11	440	800	530	1,540	3,350	850	64	25	23	21	27	86
12	310	700	502	1,380	2,350	590	58	24	22	22	29	77
13	280	600	475	2,070	2,160	560	52	23	21	22	29	76
14	300	550	502	5,320	2,160	590	50	23	20	23	29	65
15	360	650	530	4,440	1,980	475	50	27	19	24	29	65
16	390	700	530	3,560	1,620	380	45	41	19	27	29	65
17	340	600	475	3,140	1,300	297	50	118	18	29	36	65
18	300	600	425	3,460	1,100	380	52	127	18	29	41	65
19	260	500	475	3,460	1,180	380	53	105	18	29	43	65
20	230	1,500	450	3,400	1,140	450	50	77	18	29	45	65
21	200	2,800	402	2,080	1,140	380	50	60	18	28	50	65
22	175	2,250	402	2,760	1,030	297	53	53	17	46	50	65
23	175	1,350	402	2,580	815	260	86	50	17	57	81	65
24	250	1,120	380	2,420	620	225	127	41	23	45	108	65
25	1,400	2,400	380	1,620	590	208	135	30	25	38	108	65
26	1,400	1,600	475	1,920	590	186	110	27	25	36	121	65
27	1,000	1,200	450	2,330	590	176	77	26	26	36	155	65
28	700	1,200	475	2,420	650	161	60	24	31	31	118	65
29	600	......	530	2,500	650	135	53	25	38	33	93	65
30	500	......	450	2,160	590	116	46	23	41	27	86	65
31	400	......	475	......	560	......	45	23	......	28	......	65

NOTE.—Daily discharge for 1907 and 1908 determined from a well-defined discharge rating curve. Tables supersede those published in the New York State and Federal reports.

Daily discharge, in second-feet, of Sacandaga River at Wells, N. Y., for 1907–1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1			3,240	3,670	920	1,800	146	46	52	530	297	155
2			2,940	3,350	885	1,620	149	43	60	425	278	155
3			2,350	2,540	990	1,460	129	46	93	358	297	
4			1,890	2,260	1,030	1,380	110	278	260	317	380	
5			1,620	2,350	990	1,460	103	475	225	260	650	
6			1,540	2,260	990	1,710	81	260	260	260	650	
7			1,620	2,160	990	1,980	43	146	225	242	620	
8			1,340	1,800	920	(1,500)	60	111	176	225	590	
9			1,260	1,340	920	1,060	53	95	146	225	530	
10			1,220	935	780	920	43	93	116	225	475	
11			1,140	905	780	920	50	380	95	186	450	
12			990	850	715	1,140	43	278	81	161	425	
13			920	1,140	650	1,060	42	176	83	192	337	
14			850	1,080	650	780	38	127	127	192	297	
15			748	670	650	650	36	110	110	186	278	
16			650	720	715	560	41	337	95	173	260	
17			650	720	650	650	60	297	81	161	260	
18			620	1,620	715	715	58	278	70	146	225	
19			620	2,670	815	590	52	225	73	138	208	
20			590	2,000	780	475	45	176	68	138	225	
21	475		780	745	955	380	41	138	60	138	208	
22	2,070		1,140	745	850	297	46	127	58	155	192	
23	1,540		1,980	822	850	297	60	110	53	260	192	
24	1,140		2,840	298	1,060	260	55	95	50	208	208	
25	1,050		3,350	545	1,460	225	52	100	132	225	192	
26	780		3,460	885	2,070	192	53	91	402	260	186	
27	560		2,350	780	1,460	192	53	81	2,440	317	186	
28	475		2,260	885	1,060	176	60	70	1,460	530	167	
29	425		3,140	920	990	180	83	64	1,140	475	167	
30	425		3,780	920	1,060	156	64	60	920	475	161	
31	475		3,780		1,060		52	60		337		

NOTE.—Daily discharge for 1909 and 1910 determined from a well-defined rating curve. Tables supersede those published in the New York State and Federal reports for 1909, in the Sixth Annual Report of the New York State Water Supply Commission, and in the 1910 report of the New York State engineer and surveyor.

Daily discharge Jan. 6 to Feb. 28 and Dec. 13 to 31, 1909, when ice was present, determined by means of climatologic records and a comparison of discharge of Sacandaga River stations. Discharge Apr. 20 to 29, 1909, corrected for effect of backwater from log jam.

Discharge Apr. 10 to 25, 1910, determined from a special curve obtained from two measurements made during that period, when backwater caused by log jam existed.

Monthly discharge of Sacandaga River at Wells, N. Y., for 1907–1910.

[Drainage area, 263 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1907.						
August 25-31	25	23	24.0	0.091	0.02	B.
September	780	25	172	.654	.73	A.
October	1,620	176	479	1.82	2.10	A.
November	2,940	402	936	3.56	3.97	A.
December	1,800	297	749	2.85	3.29	C.
1908.						
January			450	1.71	1.97	D.
February	3,560		724	2.75	2.97	C.
March	3,350	358	844	3.21	3.70	A.
April	4,000	885	2,250	8.56	9.55	A.
May	5,210	480	1,550	5.89	6.79	A.
June	780	79	292	1.11	1.24	A.
July	167	31	65.1	.248	.29	B.
August	50	17	29.2	.111	.13	B.

Monthly discharge of Sacandaga River at Wells, N. Y., for 1907–1910—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1908.						
September	111	10	18.4	.070	.08	B.
October	278	23	66.9	.254	.29	B.
November	402	46	112	.426	.48	A.
December	560	95	262	.996	1.15	C.
The year	5,210	10	554	2.11	28.64	
1909.						
January	....	....	456	1.73	1.99	D.
February	....	....	931	3.54	3.69	D.
March	1,060	380	535	2.04	2.35	A.
April	5,320	530	2,410	9.17	10.23	B.
May	3,780	560	1,560	5.93	6.84	A.
June	1,060	116	441	1.68	1.87	A.
July	167	45	78.1	.297	.34	B.
August	127	23	40.9	.156	.18	B.
September	41	17	22.5	.086	.10	B.
October	57	21	29.6	.113	.13	B.
November	155	21	52.5	.200	.22	B.
December	138	57	69.7	.265	.31	D.
The year	5,320	17	546	2.08	28.25	
1910.						
January	2,070	....	368	1.40	1.61	C.
February	....	....	300	1.14	1.19	D.
March	3,780	590	1,800	6.84	7.88	A.
April	3,670	298	1,420	5.40	6.02	A.
May	2,070	650	949	3.61	4.16	A.
June	1,980	156	826	3.14	3.50	A.
July	149	36	64.5	.245	.28	B.
August	475	43	160	.608	.70	A.
September	2,440	50	307	1.17	1.30	A.
October	530	138	262	.996	1.15	A.
November	650	161	320	1.22	1.36	A.
December	....	....	120	.456	.53	D.
The year	....	36	575	2.19	29.68	

NOTE.—Monthly discharge 1907–1910 revised from a new discharge rating curve. These tables supersede those previously published in the New York State and Federal reports for 1907–1909, and in the Sixth Annual Report of the New York State Water Supply Commission, and in the 1910 report of the New York State engineer and surveyor.

Discharge Dec. 15 to 31, 1907, and Jan. 1 to Feb. 14, 1908, estimated from study of general condition of run-off in the upper Hudson River drainage basin. Mean discharge Dec. 15 to 31, 1907, estimated 900 second-feet; mean discharge Feb. 1 to 14, 1908, estimated 250 second-feet.

Discharge for periods in 1910 during which ice existed determined by means of three discharge measurements made with ice present, climatologic records, and comparison of the discharge with that at other stations.

Mean discharge, Jan. 1 to 20, 1910, estimated 100 second-feet, being practically constant at about 65 second-feet Jan. 1 to 17.

Discharge Feb. 1 to 27, 1910, nearly constant; discharge Feb. 28, 1910, probably a few thousand second-feet. Discharge for December, 1910, nearly constant, ranging from about 100 second-feet to nearly 300 second-feet.

SACANDAGA RIVER AT NORTHVILLE, N. Y.

This station, which is located about three-fourths of a mile upstream from the steel highway bridge at Northville, was established August 26, 1907, has been maintained in cooperation with the New York State Water Supply Commission, and was discontinued December 1, 1910. The station is 1 mile below the outlet of East Stony Creek and about 2 miles below West Stony Creek. It is about 1¼ miles above a low storage dam at Sacandaga Park in Northville. Pondage from this dam extends to the highway bridge at certain stages.

A chain gage, attached to a cantilever arm fastened to a tree on the left bank, was read daily. The datum of the gage has remained the same during the maintenance of the station.

Discharge measurements were made during high water from the steel highway bridge in the village of Northville. Medium and low water measurements were made by wading a short distance above the gage.

During the winter months the discharge was usually affected by ice to such an extent that gage readings were discontinued.

Conditions for obtaining the accurate discharge during the remainder of the year were very good and an excellent discharge rating curve has been developed.

The United States Weather Bureau maintains a river and flood station at the steel highway bridge.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Sacandaga River at Northville, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 11[a]	C. C. Covert	117	188	2.35	255
Mar. 26	W. G. Hoyt	289	2,350	7.88	13,400
28	....do	287	1,730	6.14	7,170
29	....do	280	1,900	7.14	9,570
Apr. 2	E. H. Sargent	280	1,910	6.94	9,050
14	W. G. Hoyt	277	968	2.84	1,470
June 7	....do	284	1,790	5.90	6,610
8	....do	282	1,600	5.26	5,140
July 18	J. J. Phelon	266	784	1.20	247
Aug. 22[b]	....do	85.6	144	1.42	279
Oct. 28	W. G. Hoyt	270	914	2.74	1,310

[a] Measurement made about 1,000 feet above gage, under complete ice cover; ice at gage 1.95 feet thick.
[b] Measurement made at wading section.

Daily gage height, in feet, of Sacandaga River at Northville, N. Y., for 1910.

[E. E. Parks, jr., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	......	......	......	7.61	4.84	3.62	1.62	1.70	1.54
2	......	......	......	7.34	4.06	3.84	1.54	1.72	1.49
3	......	......	......	6.13	4.18	3.64	1.54	1.74	1.72
4	......	......	......	5.52	5.15	3.74	1.54	1.72	1.74
5	......	......	......	6.02	5.02	3.84	1.44	1.64	1.72
6	......	......	......	5.66	4.32	5.94	1.22	1.42	1.79
7	......	......	......	6.14	3.82	5.25	1.23	1.44	1.74
8	......	......	......	4.94	3.74	4.99	1.49	1.49	1.72
9	......	......	......	4.44	3.42	4.74	1.26	1.64	1.64
10	......	......	......	4.14	3.15	4.12	1.24	1.74	1.54
11	......	......	......	3.89	3.04	4.04	1.22	2.34	1.44
12	......	......	......	3.04	2.89	4.24	1.19	1.92	1.39
13	......	......	......	2.93	2.74	3.74	1.21	1.74	1.34
14	......	......	......	2.83	2.82	3.24	1.16	1.84	1.42
15	......	......	......	2.79	2.82	3.16	1.11	1.71	1.44

Daily gage height, in feet, of Sacandaga River at Northville, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
16				2.74	2.75	3.29	1.14	1.69	1.39
17				2.83	2.52	3.42	1.19	1.64	1.54
18				4.89	2.64	3.49	1.17	1.59	1.45
19				6.04	2.76	3.54	1.14	1.69	1.32
20			3.74	5.84	3.02	3.02	1.13	1.64	1.14
21			3.54	4.87	3.54	2.74	1.14	1.62	1.22
22			3.84	3.89	3.49	2.54	1.16	1.54	1.24
23			4.34	3.69	3.44	2.26	1.19	1.34	1.54
24			4.84	4.94	3.14	2.09	1.21	1.34	1.55
25			7.14	5.64	3.24	2.04	1.23	1.34	1.46
26			7.84	4.12	5.69	1.99	1.19	1.40	
27			6.29	4.99	5.54	1.94	1.21	1.36	
28			6.19	5.61	4.62	1.89	1.72	1.39	
29			7.64	4.91	3.64	1.76	1.44	1.34	
30			7.94		4.04	1.74	1.26	1.19	
31			8.48		3.74		1.22	1.39	

NOTE.—Ice present from Jan. 1 to about Mar. 23, and probably during practically all of December. Gage heights recorded Sept. 26 to Nov. 30 are greatly in error and hence are omitted.

Daily discharge, in second-feet, of Sacandaga River at Northville, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1				11,200	4,390	2,450	360	400	326
2				10,400	3,090	2,760	326	412	307
3				7,050	3,280	2,480	326	424	412
4				5,710	4,960	2,620	326	412	424
5				6,800	4,720	2,760	291	370	412
6				6,010	3,500	6,620	223	284	454
7				7,080	2,730	5,160	226	291	424
8				4,570	2,620	4,660	307	307	412
9				3,700	2,170	4,210	235	370	370
10				3,210	1,820	3,180	229	424	326
11				2,840	1,670	3,060	223	901	291
12				1,670	1,480	3,370	214	546	275
13				1,530	1,300	2,620	220	424	259
14				1,410	1,390	1,930	205	488	284
15				1,360	1,390	1,830	191	406	291
16				1,300	1,320	2,000	200	395	275
17				1,410	1,070	2,170	214	370	326
18				4,480	1,190	2,270	208	346	294
19				6,840	1,330	2,340	200	395	253
20				6,400	1,650	1,650	197	370	200
21				4,450	2,340	1,300	200	360	223
22				2,840	2,270	1,090	205	326	229
23				2,550	2,200	829	214	259	326
24			4,390	4,570	1,800	684	220	259	330
25			9,750	5,960	1,930	643	226	259	297
26			11,900	3,180	6,070	602	214	278	
27			7,440	4,660	5,750	562	220	266	
28			7,200	5,900	4,000	523	412	275	
29			11,300	4,520	2,480	436	291	259	
30			12,300	4,460	3,060	424	235	214	
31			14,100		2,620		223	275	

NOTE.—Daily discharge determined from a well-defined discharge rating curve.

Daily discharge for Mar. 20-23 and Sept. 26 to Nov. 30, published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the State engineer and surveyor, is greatly in error and has been revised. It is not published in the Federal report because only very approximate.

Monthly discharge of Sacandaga River at Northville, N. Y., for 1910.

[Drainage area, 740 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			900	1.22	1.41	D.
February			750	1.01	1.05	D.
March	14,100		5,300	7.16	8.26	B.
April	11,200	1,300	4,600	6.22	6.94	A.
May	6,070	1,070	2,630	3.55	4.09	A.
June	6,620	424	2,240	3.03	3.38	A.
July	412	191	245	.331	.38	A.
August	901	214	367	.496	.57	A.
September		200	520	.703	.78	B.
October			600	.811	.94	B.
November			850	1.15	1.28	B.
December			350	.473	.54	D.
The year	14,100	191	1,620	2.19	29.62	

NOTE.—Monthly discharge for periods for which no daily discharge is published determined by a close interpolation between run-off per square mile at Wells and at Hadley.
Mean discharge Mar. 1 to 23 estimated 3,740 second-feet.
Mean discharge Sept. 26-30 estimated 1,520 second-feet.
Discharge for March and September to November revised, superseding that published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the State engineer and surveyor.

SACANDAGA RIVER NEAR HADLEY, N. Y.

UPPER BRIDGE STATION.

This station, which was originally located at the steel highway bridge about 2½ miles west of Hadley, was established September 13, 1907, in cooperation with the New York State Water Supply Commission, and was discontinued December 31, 1910, on account of the almost continual backwater caused by log jams.

The nearest dam, which is partly washed away, is located at Conklingville, about 3½ miles upstream from the highway bridge.

The datum of the chain gage attached to the bridge remained the same during the maintenance of the station.

Discharge measurements were made from the bridge.

The relation of gage height to discharge was considerably affected by ice during the winter months, and by backwater from frequent log jams.

Conditions for obtaining accurate discharge records at this station are fair, except during the existence of log jams or ice The open water discharge rating curve is fairly well developed for high stages but not well developed for low stages.

CABLE STATION.

On November 12, 1910, a new station was established at a point about 1 mile above the mouth of Sacandaga River, in order to avoid inaccuracies in the records caused by backwater due to log jams which occurred at the upper bridge station. At this new location no backwater from log jams is known, but the channel was exceedingly rough. In order to improve the measuring section at the cable station, the channel was cleared of bowlders and irregularities as far as was feasible, so that fairly accurate discharge measurements can now be made at medium and high stages from a cable located about 30 feet above the gage. At low stages measurements are made about three-fourths of a mile above the cable where there is a smooth section with a gravel bottom; measurements at this point are made from a boat or by wading.

About 30 feet downstream from the cable and on the left bank a concrete well was built, 3 feet square, inside dimensions, in which a Barrett and Lawrence self-recording gage has been installed. The bottom of the well is about 2 feet below low water and 12 feet below ground surface; it is connected with the river by a 4-inch cast-iron water pipe, 48 feet long, its intake pointing downstream and protected by a fine wire screen. Inside the well and securely bolted to the side is a bed plank to which is fastened a staff gage (used for reference), the zero of which is at elevation 573.36 feet, referred to a United States Geological Survey aluminum tablet set in the foundation wall of the Union Bag & Paper Co.'s mill at Hadley. On top of the well is a concrete shelter 6 feet high and 3 feet square, inside dimensions, for protecting the recording gage.

During the winter the water in the well and in the intake pipe never freezes because the water level in each is below the frost line.

Owing to defective gage, the record for November and December was not recorded.

LOWER BRIDGE STATION.

On September 24, 1909, a station was established at the steel highway bridge near the mill of the Union Bag & Paper Co., at Hadley, to assist in interpreting the records at the upper bridge station when affected by backwater from ice and log jams.

No important tributaries enter the Sacandaga between the upper and lower bridge stations, and hence the determinations of daily and monthly discharge at the two stations should compare favorably under conditions of free flow. The lower station, however, is at times affected by backwater from the Hudson, when high or medium stages occur on that river. The Hudson passes the mouth of the Sacandaga about 1,000 feet below the station. Low stages in the Hudson undoubtedly cause no backwater in the Sacandaga at the lower bridge station, owing to a slight fall immediately below the lower bridge; during medium stages of the Sacandaga also there is usually sufficient pitch to practically eliminate the effect of backwater from the Hudson.

A chain gage is attached to the bridge from which the discharge measurements are made. The gage is read twice daily and the records are furnished by the Union Bag & Paper Co.

The measurements at the upper bridge station and at the cable station, in connection with the observer's gage heights at the lower bridge station, have been used in the development of the discharge rating curve for the lower bridge station.

Concerning the tables of daily discharge for the three stations at Hadley, the somewhat broad assumption may be made that when the upper bridge station apparently shows an appreciably greater discharge than the lower bridge station, the former is affected by backwater from ice or log jams; and, similarly, when the lower bridge station apparently shows an appreciably greater discharge than the upper bridge station, the lower bridge station is affected by ice, log jams, or backwater from the Hudson. At times backwater exists at both stations, and at the lower station backwater is also frequently caused by jams formed by logs floating from the Hudson and logs from the Sacandaga lodging at its mouth.

Daily discharge at the lower bridge station is not given for many periods when it was apparent that it was much in excess of the discharge at the upper bridge station, as determined by comparison with the discharge at the latter point and a study of the gage heights at Corinth on the Hudson, the latter indicating probable backwater from the Hudson.

Information in regard to this station is contained in the annual reports of the State Water Supply Commission and the State engineer and surveyor, State of New York.

Discharge measurements of Sacandaga River at upper bridge near Hadley, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 21[a]	W. G. Hoyt	207	1,340	3.92	716
Mar. 5	C. C. Covert	282	1,250	5.65	11,200
6	....do	274	1,190	5.50	9,740
31	W. G. Hoyt	286	1,420	6.15	14,500
Apr. 5	....do	285	1,020	4.68	7,840
Oct. 2	J. J. Phelan	254	383	2.62	1,320
Dec. 30[b]	F. J. Shuttleworth	214	414	4.12	741

[a] Measurement made through ice about 1 mile below upper bridge gage; average thickness of ice, 1.40 feet.
[b] Measurement made under partial ice cover.

Daily gage height, in feet, of Sacandaga River at upper bridge near Hadley, N. Y., for 1910.

[W. W. Jeffers, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.48	5.15	14.30	6.45	4.05	3.72	1.92	1.50	1.30	2.85	2.28	1.95
2	3.55	5.25	14.30	6.50	3.98	3.58	1.82	1.55	1.42	2.65	2.22	1.90
3	3.55	5.45	14.50	6.25	3.80	3.50	1.80	1.58	1.48	2.45	2.12	1.88
4	3.55	5.55	13.10	5.60	3.82	3.38	1.75	1.60	1.50	2.25	2.35	1.85
5	3.60	5.35	5.75	4.90	3.90	3.35	1.70	1.95	1.62	2.15	2.70	1.80
6	3.60	5.15	5.45	4.55	3.98	3.95	1.62	2.15	1.75	1.98	2.95	1.75
7	3.55	7.30	5.10	4.45	3.85	4.65	1.60	2.30	1.95	1.92	3.08	1.80
8	3.50	7.40	4.85	4.30	3.82	4.58	1.55	2.05	2.00	1.90	3.00	1.85
9	3.50	7.60	4.70	4.20	3.72	4.60	1.50	1.88	1.88	1.85	2.88	1.82
10	3.45	7.75	4.65	4.15	3.55	4.40	1.50	1.80	1.78	1.82	2.80	1.80

Daily gage height, in feet, of Sacandaga River at upper bridge near Hadley, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	3.40	7.85	4.55	3.75	3.32	4.42	1.50	1.75	1.75	1.80	2.68	1.90
12	3.30	8.00	4.40	3.55	3.28	4.35	1.45	2.05	1.70	1.78	2.60	2.05
13	3.18	8.00	4.25	3.48	3.05	4.40	1.45	1.95	1.62	1.75	2.55	2.50
14	3.85	......	4.20	3.40	3.02	4.30	1.40	1.75	1.68	1.78	2.50	2.60
15	2.55	......	4.10	3.25	2.92	4.10	1.40	1.70	1.82	1.75	2.48	2.75
16	2.50	......	4.00	3.05	2.90	3.75	1.40	1.68	1.78	1.70	2.42	2.95
17	2.50	......	3.90	2.95	2.80	3.52	1.42	1.62	1.72	1.65	2.38	3.12
18	2.55	......	3.75	3.60	2.85	3.22	1.50	1.65	1.68	1.65	2.28	3.22
19	2.90	......	3.55	4.20	2.70	3.55	1.48	1.70	1.62	1.60	2.20	3.28
20	3.38	7.20	3.25	4.42	2.78	3.52	1.40	1.75	1.58	1.60	2.15	3.32
21	3.80	7.20	3.05	4.50	2.95	3.38	1.40	1.70	1.52	1.55	2.10	3.40
22	4.45	7.28	3.40	4.35	3.05	3.15	1.42	1.60	1.50	1.58	2.08	3.45
23	8.00	7.32	3.75	4.15	3.32	2.92	1.42	1.58	1.45	1.70	2.02	3.50
24	8.35	7.38	4.15	3.95	3.35	2.75	1.40	1.52	1.40	1.78	1.98	3.55
25	7.85	7.35	4.50	3.88	3.52	2.48	1.40	1.50	1.50	1.88	1.90	3.58
26	7.45	7.25	4.85	3.92	4.15	2.25	1.40	1.45	1.58	1.92	1.98	3.60
27	6.80	7.15	5.35	4.10	4.50	2.18	1.45	1.40	1.75	1.98	2.00	3.65
28	6.20	7.60	5.55	4.35	4.28	2.12	1.50	1.40	2.85	2.05	2.05	3.70
29	5.90	......	5.75	4.35	4.32	2.05	1.55	1.40	3.20	2.40	2.02	3.75
30	5.50	......	5.95	4.12	4.05	2.00	1.60	1.35	3.10	2.50	2.00	3.78
31	5.15	......	6.15	......	3.85	......	1.52	1.32	......	2.38	......	3.80

NOTE.—Relation between gage height and discharge affected by backwater from ice and log jams from Jan. 1 to Mar. 4 and from about Dec. 7 to 31. During these periods the gage readings were taken to the water surface.

Daily discharge, in second-feet, of Sacandaga River at upper bridge near Hadley, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	1,540	8,350	15,000	4,930	3,930	606	340	250	1,830	966	630
2	......	1,250	13,300	15,200	4,710	3,340	534	370	300	1,490	894	590
3	......	1,250	15,800	14,000	4,160	3,320	520	388	330	1,190	782	576
4	......	1,160	12,500	11,100	4,220	3,010	490	400	340	930	1,060	555
5	......	1,080	11,700	8,050	4,460	2,940	460	630	412	815	1,570	520
6	......	960	10,400	6,660	4,710	4,620	412	815	490	654	2,020	490
7	......	750	8,890	6,290	4,310	7,040	400	990	630	606	2,300	......
8	......	750	7,840	5,760	4,220	6,770	370	715	670	590	2,120	......
9	......	725	7,240	5,420	3,930	6,850	340	576	576	555	1,880	......
10	......	805	7,040	5,260	3,460	6,110	340	520	508	534	1,740	......
11	......	700	6,660	4,020	2,860	6,180	340	490	490	520	1,540	......
12	......	605	6,110	3,460	2,760	5,940	315	715	460	508	1,410	......
13	......	640	5,590	3,270	2,230	6,110	315	630	412	490	1,340	......
14	......	685	5,420	3,060	2,160	5,760	290	490	448	508	1,260	......
15	......	628	5,090	2,690	1,960	5,090	290	460	534	490	1,230	......
16	......	628	4,770	2,230	1,920	4,020	290	448	508	460	1,150	......
17	......	628	4,460	2,020	1,740	3,370	300	412	472	430	1,090	......
18	......	560	4,060	3,590	1,830	3,620	340	430	448	430	966	......
19	......	560	3,500	5,420	1,570	3,460	330	460	412	400	870	......
20	......	599	2,690	6,180	1,710	3,370	290	490	388	400	815	......
21	716	628	2,230	6,470	2,020	3,010	290	460	352	370	760	......
22	3,000	805	3,060	5,940	2,230	2,460	300	400	340	388	742	......
23	6,000	930	4,060	5,260	2,860	1,960	300	388	315	460	688	......
24	4,020	1,440	5,260	4,620	2,940	1,660	290	352	290	508	654	......
25	3,200	1,340	6,470	4,400	3,370	1,230	290	340	340	576	590	......
26	2,500	1,340	7,840	4,520	5,260	930	290	315	388	606	654	......
27	2,000	1,500	9,960	5,090	6,470	848	315	290	490	654	670	......
28	1,800	3,310	10,800	5,940	5,690	782	340	290	1,830	715	715	......
29	1,700	......	11,700	5,940	5,830	715	370	290	2,570	1,120	688	......
30	1,600	......	12,700	5,160	4,930	670	400	270	2,340	1,260	670	......
31	1,500	......	13,600	......	4,310	......	352	258	......	1,090	......	......

NOTE.—Daily discharge determined from a discharge rating curve not very well defined.

Daily discharge Jan. 1 to Mar. 4 as published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the New York State engineer and surveyor, revised. Daily discharge Jan. 1-20 and Dec. 7-31 not published in Federal report on account of too great an error.

Discharge Feb. 1 to Mar. 3 determined from record of lower bridge station, where there was probably only slight backwater from ice. Discharge Jan. 22 to 31 and Mar. 4 estimated.

Monthly discharge of Sacandaga River at upper bridge near Hadley, N. Y., for 1910.

[Drainage area, 1,050 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	6,000	....	1,120	1.07	1.23	C.
February	3,310	560	1,020	.971	1.01	C.
March	15,800	2,230	7,710	7.34	8.46	B.
April	15,200	2,020	6,070	5.78	6.45	B.
May	6,470	1,570	3,540	3.37	3.88	B.
June	7,040	670	3,640	3.47	3.87	B.
July	606	290	358	.341	.39	B.
August	990	258	465	.443	.51	B.
September	2,570	250	611	.582	.65	C.
October	1,830	370	696	.663	.76	A.
November	2,300	590	1,130	1.08	1.20	C.
December	....	....	543	.517	.60	D.
The year	15,800	250	2,240	2.14	29.01	

NOTE.—Discharge for periods during which ice existed have been estimated by means of five discharge measurements made with ice present, climatologic records, and comparison with records of discharge at other stations.

Mean discharge Jan. 1-20, estimated above 330 second-feet, nearly constant.

The table is a revision of and supersedes that published in the Sixth Annual Report of the New York State Water Supply Commission and the 1910 report of the State engineer and surveyor.

Discharge measurements of Sacandaga River at cable station near Hadley, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Oct. 28	J. J. Phelan	215	453	3.80	948
30	....do	215	499	4.10	1,190
31	....do	215	457	3.90	1,030
Nov. 2	....do	213	446	3.70	806
12	F. J. Shuttleworth	218	592	4.12	1,440
Dec. 1	J. J. Phelan	210	399	3.43	632

Discharge measurements of Sacandaga River at lower bridge at Hadley, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Feb. 17[a]	C. C. Covert	98	563	5.66	765
Mar. 1	....do	130	1,100	9.85	7,290
1	....do	130	1,230	9.9	8,490
Apr. 5	W. G. Hoyt	131	....	10.7	10,200
June 18	C. C. Covert	126	841	7.88	3,040
July 20	....do	97	443	4.50	328
22	J. J. Phelan	103	478	4.48	325
Aug. 6	....do	108	564	5.87	850
10	....do	91	428	4.65	350
Sept. 21	....do	91	422	4.50	252
23	....do	90.5	428	4.46	315
Oct. 1	....do	121	718	6.9	1,920
1	....do	121	687	6.73	1,820
2	....do	120	650	6.4	1,450
2	....do	118	633	6.3	1,390
3	....do	116	604	6.01	1,030
4	....do	116	594	5.8	948
5	....do	114	576	5.6	803
6	....do	113	556	5.49	720
7	....do	111	540	5.34	644
8	....do	101	527	5.23	626
9	....do	104	520	5.20	643
10	....do	101	491	5.12	602
12	....do	101	491	5.11	564
12	....do	101	480	5.02	593
14	....do	101	482	5.00	536
17	....do	92	470	4.92	521
18	....do	91.6	460	4.90	494
19	....do	91.6	455	4.84	452
27	....do	104	518	5.45	717

[a] Only a small amount of shore ice.

Daily gage height, in feet, of Sacandaga River at lower bridge at Hadley, N. Y., for 1910.

[M. J. Smith, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	6.45	9.95	13.75	......	8.85	4.65	4.38	4.28	6.90	5.80	5.22
2	......	6.20	11.50	13.95	8.70	8.55	4.55	4.32	4.30	6.10	5.60	5.20
3	......	6.20	12.15	12.50	8.35	8.15	......	4.32	4.35	5.70	5.52	5.05
4	......	6.10	12.20	11.60	8.40	......	......	4.42	......	5.52	5.72	......
5	......	5.95	15.90	11.40	8.85	......	4.70	4.90	......	5.42	6.18	4.92
6	......	......	......	10.70	8.85	8.45	4.55	5.80	5.08	5.30	......	4.85
7	......	5.50	11.25	10.45	8.60	9.45	4.35	......	5.30	5.30	7.10	5.02
8	......	5.50	10.80	10.30	......	9.95	4.25	4.70	5.38	5.22	6.85	5.35
9	......	5.45	10.50	10.05	8.00	9.95	4.40	4.72	5.25	......	6.58	5.65
10	......	5.65	10.50	......	7.60	9.55	......	4.62	5.15	5.10	6.32	6.32
11	......	5.40	10.20	9.00	7.40	9.25	4.35	4.72	4.82	5.12	6.22	......
12	......	5.20	9.45	8.55	7.20	......	4.30	5.30	4.82	5.02	6.22	6.80
13	......	......	9.10	8.10	7.00	9.00	4.25	4.90	4.75	4.98	......	7.48
14	......	5.35	8.85	7.60	6.80	8.85	4.30	......	5.15	4.92	5.98	7.00
15	......	5.25	8.85	7.45	......	8.35	4.30	4.82	5.08	4.90	5.98	6.90
16	......	5.25	8.50	7.00	6.75	8.05	4.20	4.70	4.98	......	5.85	7.45
17	......	5.25	8.05	......	6.55	7.85	......	4.60	4.78	4.88	5.78	7.42
18	......	5.10	7.50	7.05	6.40	7.70	4.30	4.75	4.70	4.80	5.50	......
19	......	5.10	7.75	8.90	6.85	......	4.30	4.80	4.62	4.75	5.35	7.00
20	......	......	......	9.60	7.00	7.75	4.05	4.80	4.52	4.70	......	6.85
21	......	5.25	7.75	9.40	6.90	7.30	4.05	......	4.52	4.70	5.20	6.65
22	......	5.60	8.25	9.45	......	6.90	4.18	4.75	4.50	4.68	5.22	6.58
23	......	5.85	8.60	9.10	7.40	6.55	4.25	4.62	4.48	......	5.32	......
24	8.25	6.40	9.05	......	7.30	6.25	......	4.55	4.45	5.12	5.30	......
25	8.20	6.30	9.85	8.25	8.15	5.85	4.42	4.50	......	5.02	5.30	......
26	8.10	6.25	11.00	8.60	9.30	......	4.38	4.55	5.00	5.22	5.25	......
27	7.70	......	12.00	9.45	10.05	5.55	4.40	4.40	6.20	5.32	......	......
28	7.45	7.80	12.00	9.70	9.80	5.35	4.42	......	6.92	5.72	5.22	......
29	7.15	......	11.85	9.40	......	5.15	4.55	4.35	8.15	6.30	5.20	......
30	6.95	......	12.20	9.25	8.90	4.95	4.60	4.32	7.55	......	5.30	......
31	6.65	......	13.05	......	8.75	......	4.50	4.30	......	6.02	......	......

NOTE.—Backwater from ice about Jan. 25 to 31, and about Dec. 7 to 31. Also slight backwater during the first few and last few days of February.

Daily discharge, in second-feet, of Sacandaga River at lower bridge at Hadley, N. Y., for 1909 and 1910.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1909.					1909.				
1	......	350	325	605	16	......	255	325	......
2	......	300	325	560	17	......	265	325	......
3	......	312	350	628	18	......	275	338	......
4	......	312	325	605	19	......	300	395	......
5	......	288	325	520	20	......	325	350	......
6	......	275	325	480	21	......	325	325	......
7	......	255	325	445	22	......	350	350	......
8	......	245	325	445	23	......	380	350	......
9	......	245	300	445	24	235	445	410	......
10	......	255	325	......	25	235	445	540	......
11	......	245	325	......	26	235	445	605	......
12	......	235	325	......	27	245	445	650	......
13	......	215	325	......	28	255	410	582	......
14	......	217	325	......	29	350	410	605	......
15	......	245	325	......	30	325	350	700	......
					31	......	350	......	......

Daily discharge, in second-feet, of Sacandaga River at lower bridge at Hadley, N. Y., for 1909 and 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1	......	1,540	8,350	......	......	......	395	325	300	2,000	930	605
2	......	1,250	13,300	......	......	......	365	300	300	1,160	805	605
3	......	1,250	15,800	......	......	......	380	300	313	865	750	540
4	......	1,160	......	......	......	......	395	325	390	750	865	510
5	......	1,080	......	......	......	......	410	480	470	700	1,250	480
6	......	960	......	......	......	......	365	930	560	650	1,760	462
7	......	750	......	......	......	......	313	670	650	650	2,260	......
8	......	750	......	......	......	......	288	410	700	605	1,880	......
9	......	725	......	......	3,650	......	325	410	628	582	1,650	......
10	......	805	......	......	2,990	......	319	380	580	560	1,340	......
11	......	700	......	......	2,690	6,100	313	410	445	560	1,250	......
12	......	665	......	......	2,400	5,900	300	650	445	520	1,250	......
13	......	640	......	......	2,130	5,700	288	480	428	520	1,170	......
14	......	685	5,250	2,990	1,880	5,250	300	462	582	480	1,080	......
15	......	628	5,250	2,690	1,880	4,410	300	445	560	480	1,080	......
16	......	628	4,610	2,130	1,880	4,020	275	410	520	480	930	......
17	......	628	3,650	2,130	1,650	3,310	288	380	445	480	930	......
18	......	560	2,840	2,130	1,440	3,150	300	428	410	445	750	......
19	......	560	3,310	5,470	1,880	3,230	300	445	380	428	675	......
20	......	599	......	......	2,130	3,310	245	445	350	410	640	......
21	......	628	......	......	2,000	2,540	245	436	350	410	605	......
22	......	805	......	......	2,390	2,000	275	428	350	410	605	......
23	......	930	......	......	2,690	1,650	288	380	350	485	650	......
24	4,020	1,440	......	......	2,540	1,340	306	365	338	560	650	......
25	3,200	1,340	......	4,210	4,020	930	325	350	430	520	650	......
26	2,500	1,340	......	......	......	860	325	365	520	605	628	......
27	2,000	1,500	......	......	......	805	325	325	1,250	650	616	......
28	1,800	3,310	......	......	......	675	325	319	2,000	865	605	......
29	1,700	......	......	......	......	582	365	313	4,020	1,340	605	......
30	1,600	......	......	......	......	500	380	300	2,990	1,210	650	......
31	1,500	......	......	......	......	......	350	300	......	1,080	......	......

NOTE.—Daily discharge for 1909 to 1910 determined from a discharge rating curve not very well defined. As the records are only approximate, the gage heights have been reduced to the nearest tenth and half tenth foot before applying the discharge rating table. Discharge for days omitted from the record during periods Sept. 24 to Dec. 31, 1909, and Jan. 24 to Dec. 22, 1910, was affected by backwater from ice, log jams, or high stages in the Hudson. Discharge Jan. 25 to 31, 1910, estimated; no correction made to February, 1910, discharge for possible backwater from ice.

Monthly discharge of Sacandaga River at lower bridge at Hadley, N. Y., for 1909 and 1910.

[Drainage area, 1,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1909.						
October	445	215	315	0.297	0.34	B.
November	700	300	391	.369	.41	B.
1910.						
February	3,310	560	1,020	.962	1.00	C.
July	410	245	322	.304	.35	B.
August	930	300	418	.394	.45	B.
September	4,020	300	735	.693	.77	C.
October	2,000	410	692	.653	.75	A.
November	2,260	605	984	.928	1.04	C.

WEST BRANCH OF SACANDAGA RIVER AT WHITEHOUSE, N. Y.

The West Branch of the Sacandaga is formed by the union of Piseco Lake outlet with a small stream formed in Silver Lake Mountain. It drains a forested area about 188 square miles in extent above Whitehouse, and discharges into the main river about 7 miles east of Whitehouse and about 1 mile south of Wells.

A gaging station was established at Whitehouse August 20, 1910, in cooperation with the New York State Water Supply Commission.

Not enough measurements have been made to determine a rating for this station.

On account of unsatisfactory conditions this station was abandoned March 14, 1911, in favor of a new station at Blackbridge.

Discharge measurements of West Branch of Sacandaga River at Whitehouse, N. Y., in 1910.[a]

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 16	J. J. Phelan	126	132	3.32	76.4
Aug. 20	do	124	156	3.50	125

[a] Made at the wading section.

Daily gage height, in feet, of West Branch of Sacandaga River at Whitehouse, N. Y., for 1910.

[John Seaver, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.30	3.95		3.4	16		3.30	3.4	3.9	3.9
2		3.30	3.8		3.4	17		3.30	3.4	3.85	3.95
3		3.30	3.7		3.35	18		3.30	3.4	3.8	4.0
4		3.38	3.68		3.4	19		3.30	3.4	3.75	4.0
5		3.30	3.7	4.1	3.4	20	3.50	3.30	3.4	3.8	4.0
6		3.70	3.7	4.2	3.4	21	3.50	3.30	3.4	3.8	4.0
7		3.65	3.7	4.1	3.3	22	3.42	3.30	3.4	3.8	4.0
8		3.65	3.7	4.02	3.3	23	3.40	3.30	3.45	3.7	4.0
9		3.70	3.6	3.98	3.4	24	3.40	3.40		3.5	4.3
10		3.65	3.55	4.0	3.5	25	3.40	3.55		3.5	4.3
11		3.45	3.5	4.0	3.8	26	3.42	4.00		3.4	4.3
12		3.40	3.4	4.0	3.8	27	3.38	4.05		3.4	4.3
13		3.40	3.4	4.0	3.8	28	3.38	4.30		3.7	4.32
14		3.40	3.4	3.98	3.85	29	3.34	4.15			4.4
15		3.40	3.4	3.9	3.85	30	3.33	4.00		3.4	5.0
						31	3.33				5.0

NOTE.—Ice conditions probably prevailed at this station from about Dec. 9 to 31.

HOOSIC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Hoosic River rises on the west slope of the Hoosac Mountains in Vermont and Massachusetts. Two head branches, one flowing southward and the other northward along the west slope of this range, unite at North Adams, Mass., and the stream then flows northwestward, entering the Hudson 3 miles north of Mechanicville. Above Buskirk the drainage basin is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the steep rock slopes. The ridges are sparsely wooded. The soil in the valleys is generally firm and tenacious. The general elevation of the valley at the junction of the headwaters is 1,000 feet. Numerous dams, affording power for textile, agricultural implement, and other industries, are scattered throughout the length of the stream from North Adams to Schaghticoke. The drainage basin contains no important lakes and but one storage reservoir, at Farnam, near the head of the South Branch.

South of Hoosic River the State boundary follows the Taconic Ridge, which forms the divide between the Hoosic in Massachusetts and the Little Hoosic in New York.

HOOSIC RIVER NEAR EAGLE BRIDGE, N. Y.

This station, which is located about 1½ miles upstream from Eagle Bridge and half a mile below the mouth of Walloomsac River, was established August 13, 1910, to replace the gaging station at Buskirk.

The gage is of the chain and weight type and is supported by a cantilever arm 14 feet long fastened to two trees a short distance back from the edge of the left bank and about 12 feet above low water.

The left bank is high; the right bank is low and subject to overflow at high stages. About 1,000 feet downstream from the gage the banks are high on both sides and flooded only during periods of extreme high water, which is usually caused by temporary ice jams at the railroad bridge about three-fourths mile downstream.

Discharge measurements during 1910 were made by wading a short distance below the gage. High-water measurements can be made from the highway bridge at Eagle Bridge.

The operation of the dam of Walter A. Wood & Co. at Hoosick Falls, about 2 miles upstream from the gage, has considerable influence on the flow of the stream during low water. Walloomsac River, also slightly controlled by power plants, enters Hoosic River about 1½ miles below the dam at Hoosick Falls.

The relation between gage height and discharge during the winter is affected by ice.

Information in regard to this station is contained in the report of the State engineer and surveyor, State of New York.

Discharge measurements of Hoosic River near Eagle Bridge, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Aug. 2	J. J. Phelan	112	224	[a] 7.25	263
10	C. C. Covert	118	131	7.03	162
Dec. 20[b]	W. G. Hoyt	115	254	8.24	299

[a] Measurement made before new gage was installed. The location of the reference point by means of which the gage height was determined is questionable.
[b] Measurement made under complete ice cover.

Daily gage height, in feet, of Hoosic River near Eagle Bridge, N. Y., for 1910.

[Mrs. Vashti Russell, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	6.9	7.05	6.9	7.5	16	7.0	7.2	6.85	7.75	8.5
2	....	6.88	6.75	6.88	7.32	17	7.0	7.2	6.95	7.68	8.5
3	....	6.95	6.95	7.3	7.45	18	7.05	6.98	6.95	7.55	8.2
4	....	6.95	7.0	8.65	7.25	19	7.15	7.05	6.9	7.58	8.1
5	....	6.95	6.95	8.5	7.4	20	6.85	7.15	6.95	7.5	8.3
6	....	7.4	7.05	8.28	7.4	21	6.7	7.08	6.85	7.52	8.3
7	....	9.15	7.02	7.95	7.4	22	7.0	6.92	6.75	7.45	8.1
8	....	7.95	6.98	7.7	7.45	23	6.95	6.85	6.98	7.65	8.0
9	....	7.5	6.9	7.62	7.45	24	6.85	6.8	6.95	7.28	8.85
10	....	7.38	7.2	7.7	7.45	25	7.05	6.75	7.0	7.45	10.88
11	....	7.2	7.05	7.95	7.45	26	6.85	7.0	7.1	7.5	9.55
12	....	7.3	6.95	7.45	7.5	27	6.8	7.2	7.05	7.2	9.5
13	7.28	7.25	7.12	7.52	7.85	28	6.7	7.25	7.1	7.65	9.15
14	6.8	7.1	6.95	7.8	8.35	29	6.85	7.25	7.35	7.58	9.35
15	7.02	7.25	6.85	7.8	8.2	30	6.78	7.0	7.1	7.28	10.75
						31	6.9	....	7.1	....	9.65

NOTE.—Ice conditions prevailed Dec. 10–31. The gage readings were probably to water surface.

MOHAWK RIVER.

GENERAL FEATURES OF AREA DRAINED.

Mohawk River, the largest tributary of the Hudson, rises in the sandy hills south of Booneville, in western New York, about 40 miles from the east end of Lake Ontario. Its uppermost tributaries are fed by large springs. The river receives also considerable water brought in from the adjacent Black River drainage basin for the supply of Black River and Erie canals. The Mohawk flows southward until it reaches the city of Rome, at which point it turns toward the east, flowing across the State in a course nearly east until it enters the Hudson at Cohoes, a few miles above Troy. Its total length is about 140 miles, and its drainage area comprises 3,470 square miles.

The immediate valley of the Mohawk is broad and open, at many places a mile or two in width, and the flats which border the stream have a rich alluvial soil, finely adapted to the raising of grass, grains, and broom corn. Back from the flats there is a rise, in most places gradual but locally abrupt, to hills which attain altitudes several hundred feet above the stream. The more elevated lands are covered with sandy and gravelly loam. Toward the mouth of the river the valley becomes more contracted and the meadows disappear.

Above Rome the Mohawk flows through a deep gorge in shale rock. From Rome eastward to Little Falls the valley is deeply filled with alluvial deposits, and the flood plains on either side become submerged during freshets, thus acting to some extent as storage reservoirs. At Little Falls the river cuts through a rocky gorge, whose walls rise precipitously 500 or 600 feet.

Below Rome the river has a small and rather uniform fall and is characterized by long, quiet reaches with slight riffles, but at Little Falls this uniformity is broken and the stream descends in a succession of falls about 45 feet in half a mile. The average fall between Rome and the lower aqueduct at Crescent, a distance of 110.7 miles, is 2.43 feet per mile; thence to the level of slack water above Troy dam there is a farther descent of 149.5 feet in 4.4 miles, but of this 105 feet is included within the improved power at Cohoes.

The Erie Canal parallels Mohawk River and derives a part of its water supply from it. The new barge canal, at present under construction by the State of New York, will utilize by canalization the greater portion of the river between Albany and Utica. The water supply for the new canal in the section between Syracuse and Utica will to a large extent come from the Mohawk. A high dam is being constructed across the Mohawk at Delta, 6 miles north of Rome, which will form a large reservoir to supply the summit level of the canal near Rome. This supply will be supplemented by a reservoir on West Canada Creek at Hinckley, discharging by a conduit into Ninemile Creek and thence to the Rome summit level.

Important tributaries of the Mohawk are West and East Canada and Schoharie creeks.

West Canada Creek rises in West Canada Lake, in southwest-central Hamilton County and flows in a southerly direction into the Mohawk at Herkimer. Its drainage area, comprising approximately 583 square miles, contains about 50 small lakes and ponds and a small amount of artificial storage, which, with the numerous swamps and marshes in the region of the headwaters, serve to make the regimen of flow fairly uniform. A considerable part of the basin is timber covered. The underlying rock is granitic gneiss in the upper portion of the basin, with limestone in some places. Heavy accumulations of snow occur during the winter. At Trenton Falls is an important plant of the Utica Gas & Electric Co. There is much undeveloped power on this stream.

East Canada Creek rises in Hamilton County and flows southward between Herkimer and Fulton counties, joining the Mohawk at East Creek. In a general way its drainage basin is similar to that of West Canada Creek, although its flow is less sustained and regular.

Schoharie Creek has its source in the Catskills, about 2 miles east of Tannersville, at an elevation of 1,940 feet. The drainage basin is generally irregular. In places its slopes are almost precipitous, and it is extensively forest covered. The overlying rocks are slaty and allow but a slight depth of percolation. The soil is generally of clay. The total drainage area is 909 square miles.

MOHAWK RIVER AT LITTLE FALLS, N. Y.

At Little Falls are three dams: The upper is the State dam diverting water for the supply of the Erie Canal; the lower two are used for water-power development. Records of discharge have been obtained at the lower (Gilbert's) dam since 1898. These records were originally collected by the United States Geological Survey in cooperation with the State engineer department, and are now maintained wholly by the latter.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 report of the State engineer and surveyor, State of New York.

MOHAWK RIVER AT DUNSBACH FERRY, N. Y.

This station, which is located at the dam of the West Troy Water Co., a short distance above Dunsbach Ferry bridge, 9 miles from the mouth of the river, was established March 12, 1898, in connection with a system of levels by the United States Board of Engineers on Deep Waterways, by D. J. Howell, who has furnished the earlier portion of the record. The station is now maintained by the State of New York.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 report of the State engineer and surveyor, State of New York.

WEST CANADA CREEK AT TWIN ROCK BRIDGE, NEAR GRANT, N. Y.

This station, which is located at the highway bridge about 2 miles above Hinckley and about one-half mile below the outlet of Black Creek, was established September 7, 1900. The station is now maintained by the New York State engineer department. Discharge data are obtained by the current-meter method.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 annual report of the State engineer and surveyor, State of New York.

WEST CANADA CREEK AT KAST BRIDGE, N. Y.

This station, which is located on the highway bridge about 4 miles above the outlet of West Canada Creek and about 3 miles above the village of Herkimer, N. Y., was established May 15, 1905. The station is now maintained by the New York State engineer department. Data on discharge are obtained by the current-meter method.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 annual report of the State engineer and surveyor, State of New York.

EAST CANADA CREEK AT DOLGEVILLE, N. Y.

This station, which is located at the dam of the Herkimer County Light & Power Co., about 7 miles above the outlet of the stream at High Falls, near the village of Dolgeville, N. Y., was established

September 23, 1898. The station is now maintained by the New York State engineer department.

Information in regard to this station and records of discharge for 1910 are contained in the 1910 report of the State engineer and surveyor, State of New York.

SCHOHARIE CREEK AT PRATTSVILLE, N. Y.

This station, which is located at the single-span steel highway bridge at Prattsville, N. Y., was established November 7, 1902, by the United States Geological Survey. On May 7, 1907, it was assumed by the Board of Water Supply of the city of New York, by which the following tables of discharge were supplied.

The gage is attached to the floor of the bridge on the upstream side near the left bank. The chain length is 27.05 feet. The elevation of the datum of the gage is 1,130.03 feet (United States Geological Survey benchmark). The gage datum is referred to a benchmark—a circle of white paint marked on a bowlder at the right end of the downstream side of the bridge; elevation 1,151 feet, or 20.97 feet above the datum of the gage. On May 7, 1907, a new standard board of water-supply chain gage was established in place of the old one, which was dilapidated and unwieldy. The old datum was preserved and the present readings conform to those already obtained. The gage is read each morning and evening by Miss Edna M. Snyder, of Prattsville, N. Y.

The bridge is 187.8 feet between abutments, and all the water passes between the abutments at all but the very highest stages.

High-stage measurements are made from the bridge; low-stage measurements may be made by wading at a point about 500 feet below the bridge.

It is believed that Schoharie Creek is practically unaffected by fluctuation of stage due to storage above Prattsville.

Information in regard to this station is also contained in the reports of the State engineer and surveyor, State of New York.

Daily discharge, in second-feet, of Schoharie Creek at Prattsville, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	43	335	5.020	945	801	275	161	41	31	50	88	205
2	48	310	3,760	721	721	305	153	41	31	48	73	193
3	48	295	2,388	600	649	265	131	48	43	43	66	217
4	43	285	1,610	512	999	217	125	71	61	41	98	217
5	43	265	1,360	488	785	225	118	57	61	41	705	235
6	165	255	1,380	512	635	512	109	52	61	43	572	275
7	500	464	3,115	1,500	551	404	106	50	61	43	512	285
8	324	452	1,400	865	677	320	101	52	59	48	380	255
9	308	422	1,107	635	512	285	98	52	57	48	285	240
10	272	368	930	551	494	315	95	57	48	48	530	240
11	214	295	897	440	434	600	90	75	50	52	999	217
12	178	285	753	1,053	368	705	80	68	39	48	621	197
13	165	310	558	600	335	551	66	57	78	46	446	157
14	160	295	530	530	295	452	61	52	115	39	386	157
15	133	285	476	488	270	368	61	48	80	41	335	140

Daily discharge, in second-feet, of Schoharie Creek at Prattsville, N. Y., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	150	255	446	440	265	628	68	50	63	39	325	140
17	143	494	416	410	225	857	61	48	48	43	330	122
18	133	691	416	1,887	235	1,775	59	39	43	41	285	93
19	410	600	404	2,450	217	1,323	59	61	57	39	235	80
20	365	600	464	2,050	185	1,080	57	52	48	43	193	80
21	640	1,305	990	1,170	205	649	57	52	41	39	193	45
22	12,000	1,450	817	865	185	494	57	43	37	43	185	45
23	2,450	801	850	691	181	428	57	41	35	61	181	25
24	1,450	551	1,014	565	193	380	52	39	57	52	193	1,350
25	1,080	446	1,690	1,323	193	315	50	43	52	52	201	769
26	833	452	2,000	12,860	209	240	52	39	71	50	205	500
27	691	1,850	1,278	2,800	235	250	48	43	61	66	181	440
28	512	8,030	1,017	1,650	193	285	68	41	73	106	177	470
29	446		990	1,215	142	250	61	41	66	98	177	470
30	350		1,251	1,017	165	217	59	39	61	95	177	1,950
31	350		1,341		118		57	39		85		621

Monthly discharge of Schoharie Creek at Prattsville, N. Y., for 1910.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	12,000	43	796	3.32	3.83
February	8,030	255	802	3.34	3.48
March	5,020	404	1,312	5.47	6.31
April	12,860	410	1,394	5.81	6.48
May	999	118	376	1.57	1.81
June	1,775	217	499	2.08	2.32
July	161	48	80	.333	.38
August	75	39	49	.204	.24
September	115	31	56	.233	.26
October	106	39	53	.221	.25
November	999	66	311	1.30	1.45
December	1,950	25	337	1.40	1.61
The year	12,860	25	501	2.09	28.42

[a] Computed by engineers of the U. S. Geological Survey.

KINDERHOOK CREEK AT ROSSMAN, N. Y.

Kinderhook Creek is an interstate stream, with a drainage area of 337 square miles, having its source in the Hancock Mountains in western Massachusetts, at an elevation of nearly 1,500 feet above tide, flowing southwestward through Columbia and Rensselaer counties, N. Y., and joining Claverack Creek, about 2 miles from Hudson River, to form Stockport Creek, through which it discharges into the Hudson, 4 miles north of the village of Hudson. Kinderhook Creek is an important stream for power, with considerable amounts unutilized. and affords also some opportunities for storage.

The gaging station, which is located at the highway bridge near Rossman, N. Y., about 7 miles northeast of Hudson, was established March 17, 1906.

The only important tributary above the station—Valatie Kill—enters at Valatie, about 7 miles distant.

About one-eighth mile above the station, at Chittenden Falls, are two mills, only one of which is at present in use. The river has also been developed at two points above Rossman—at Stuyvesant Falls and Kinderhook, distant, respectively, about 2 and 5 miles.

A box gage of the tape and weight type is located on the highway bridge. The datum of the gage has remained unchanged during the maintenance of the station.

Discharge measurements are made from the bridge or by wading.

During the winter the discharge is affected by the presence of ice.

Conditions for obtaining accurate discharge measurements are good, and a very good discharge rating curve has been developed. The flow, however, is controlled by the mill and power plants above the gaging station, particularly at low stages, and hence the mean daily gage heights which are derived from three daily readings are liable to considerable error.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Discharge measurements of Kinderhook Creek at Rossman, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Jan. 22[a]	W. G. Hoyt	155	1,300	34.56	11,000
Apr. 26	.....do	148	339	28.05	909
Aug. 25[b]	J. J. Phelan	13	9.85	26.36	38.1

[a] Measurement largely estimated for 70 feet near right bank of river was full of floating ice; velocity here determined by timing ice cakes.
[b] Measurement made by wading in tailrace of power plant above, giving total flow under bridge.

ESOPUS CREEK.

GENERAL FEATURES OF AREA DRAINED.

Esopus Creek has its source in northwestern Ulster County and enters Hudson River near Saugerties. The course of the upper portion of the stream is southeastward, but at Binnewater it turns abruptly to the northeast and for a distance of about 20 miles the course of the creek lies parallel to that of Hudson River, though the two streams flow in opposite directions. At Kingston the creek is 2.5 miles from the Hudson and at an elevation of 140 feet above sea level.

The stream is characterized by a number of precipitous falls, which occur chiefly at points where it passes from one geologic formation to another. At Olivebridge it falls 28 feet, at Glen Eyrie 56 feet, and at Saugerties it makes its descent to the tidewater level of the Hudson in an abrupt fall of about 40 feet.

Esopus Creek is to be used as a source of water supply by New York City by placing a masonry dam 210 feet in maximum height near Browns station, where the drainage area is 255 square miles. The Ashokan reservoir, so formed, will have a storage capacity of about 17,000,000,000 cubic feet, and at first about 250,000,000 gallons of water per day will be carried through the Catskill aqueduct to New York City, about 100 miles distant. Eventually portions of Rondout, Catskill, and Schoharie creeks are to be included in the supply, raising this to 500,000,000 gallons daily.

ESOPUS CREEK NEAR OLIVEBRIDGE, N. Y.

During 1906 a weir for the purpose of measuring the flow of Esopus Creek was constructed near Olivebridge, N. Y., by the Board of Water Supply of the City of New York. It is located about 1 mile below the Olivebridge post office. The following description and discharge data have been furnished by the Board of Water Supply of the City of New York.

The weir is constructed of concrete, having a cross section similar to that experimented on in the hydraulic laboratory at Cornell University by the United States Geological Survey, in series 30, described in Water-Supply Papers 150 and 200.

The average height of this weir above the rock on which it is founded, for its entire length, is 7.54 feet; length between abutments, 193.90 feet. In order to form a channel of approach the abutments have been extended upstream at right angles with the axis of the weir for a distance of 16 feet, and the area of the channel of approach below the crest of the weir is 1,462 square feet. The abutments extend 14 feet above the level of the crest, and it is estimated that a flow of 40,000 cubic feet per second can be taken care of.

Measurements of the head on the weir are made in a well 24 inches in diameter, situated 53 feet upstream from the crest of the weir. Water is admitted to this well through a ¾-inch pipe extending 16 feet out into the stream in which, spaced 6 inches apart, are ⅛-inch holes bored vertically through the pipe. The center of this pipe is placed 18 inches above the bed of the stream. A continuous record of the head at this point is kept by means of a Friez automatic water-stage register, geared 1 to 1 and running 24 hours. Observations of the flow were first begun on October 17, 1906, though the automatic gage register was not installed until December 5. Prior to this latter date heads were read three times daily and reduced in the usual manner.

Computations of the discharge over this weir are made from a formula which has been deduced from the results of the experiments made by the United States Geological Survey and referred to above. During the winter the ice which forms between the wing walls which constitute the channel of approach is kept cut away so that there may be no change in the conditions of flow due to this cause.

The use of the automatic gage eliminates from determinations of daily discharge any error that might result from slight fluctuation in daily stage caused by power control above Olivebridge.

The drainage area of Esopus Creek above the weir is 239 square miles, as measured on the topographic maps of the United States Geological Survey.

Information in regard to this station is contained in the reports of the New York State engineer and surveyor.

Daily discharge, in second-feet, of Esopus Creek at weir near Olivebridge, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	220	502	5,157	1,302	1,110	228	182	53	40	57	36	115
2	242	466	4,185	1,047	974	222	172	53	50	57	36	105
3	228	430	3,168	884	928	201	162	58	94	57	58	105
4	185	418	2.337	808	1,048	194	162	60	165	57	158	105
5	248	406	1,974	753	856	182	127	110	130	57	454	90
6	562	394	1,939	738	757	535	127	95	108	53	278	75
7	917	382	2,900	1,269	689	342	113	80	142	57	200	100
8	722	370	2,310	909	625	294	110	67	120	72	166	105
9	588	327	1,720	754	618	256	111	54	122	66	143	75
10	488	284	1,341	662	548	308	94	43	108	58	142	110
11	395	240	1,109	590	501	552	102	80	100	58	187	194
12	338	234	961	684	440	615	111	80	78	53	200	225
13	338	228	931	576	400	546	81	74	72	43	175	225
14	311	222	925	534	358	475	72	68	78	43	162	220
15	280	216	782	498	333	428	64	62	234	43	148	202
16	246	210	690	484	312	470	62	56	144	48	140	175
17	259	210	630	464	278	637	84	50	116	43	138	162
18	315	210	548	4,612	292	891	60	45	110	38	136	130
19	330	210	536	4,538	275	806	62	74	89	38	128	115
20	352	210	705	2,885	249	653	62	70	89	36	119	90
21	3,213	1,465	973	1,976	267	554	67	67	78	36	112	124
22	11,496	1,270	1,006	1,466	246	470	67	64	62	38	114	146
23	3,424	880	1,146	1,171	235	406	72	62	62	48	110	510
24	1,945	690	1,408	969	242	358	86	61	62	48	110	348
25	1,391	578	2,481	2,741	258	316	84	60	118	44	126	228
26	1,007	505	2,730	15,388	282	288	72	61	112	44	130	340
27	861	1,040	1,874	4,392	247	271	67	61	100	44	114	300
28	720	4,372	1,472	2,492	228	281	59	60	94	44	110	355
29	658	......	1,418	1,754	208	232	55	59	94	44	123	565
30	582	......	1,778	1,415	215	210	53	58	72	40	126	350
31	538	......	1,710	......	228	......	53	58	......	40	......	531

NOTE.—On Apr. 26 occurred the maximum flow, 28,100 second-feet; it was maintained for 15 minutes.

Monthly discharge of Esopus Creek at Olivebridge, N. Y., for 1910.

[Drainage area, 239 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	11,496	185	1,077	4.51	5.20
February	4,372	210	606	2.54	2.64
March	5,157	536	1,704	7.13	8.22
April	15,388	464	1,958	8.19	9.14
May	1,110	208	460	1.92	2.21
June	891	182	407	1.70	1.90
July	182	53	92	.385	.44
August	110	43	65	.272	.31
September	234	40	101	.423	.47
October	72	36	48	.201	.23
November	454	36	146	.611	.68
December	565	75	210	.879	1.01
The year	15,388	36	573	2.40	32.46

[a] Computed by engineers of the U. S. Geological Survey.

ESOPUS CREEK AT MOUNT MARION, N. Y.

The Mount Marion station was established April 4, 1907, by the Board of Water Supply of the city of New York. A continuous record of gage heights has been kept by John Sauer, of Saugerties, who reads the gage morning and evening. The description and following records of discharge were supplied by the Board of Water Supply of the city of New York.

This station is located on the single-span steel highway bridge at a place called Pleasant Valley, on the Saugerties road, 1 mile east of the Mount Marion station of the West Shore Railroad.

The banks of the creek on both sides are high, steep, and rocky. The right bank is about 40 feet above water level; the left is at least 100 feet high. The channel is straight for about 1,000 feet above and about 600 feet below the station. The bed is ledge rock with the strata steeply inclined, giving jagged corners and an irregular but permanent cross section.

A standard Board of Water Supply gage is attached to the downstream side of the bridge. The length of the chain from end of weight to marker is 49.01 feet. The bench mark is a chisel draft on the bridge seat of the left abutment, downstream side, near the lower chord. The elevation of the bench mark is 46.30 feet above the zero of the gage. The initial point of soundings is located on the handrail of the bridge near the left bank of the stream, downstream side, and is marked with black paint.

In May, 1908, the flooring of the bridge was renewed, but provision was made for the continuance of accurate gage heights during this short period.

At very low stages the current at the bridge station is too sluggish for good measurements. A wading station was therefore established about three-fourths of a mile above the bridge and about three-fourths of a mile below Glen Eyrie Falls. The Kingston-Saugerties road parallels the creek on the right bank and the station is 200 feet from the road. The banks on both sides are of the same character as at the bridge. The bed of the stream is gravelly and liable to some change; under certain conditions there may be two channels. This station is used only when the depth of water does not exceed 3 feet. The current is swift and good measurements are obtained at this point; gage heights are referred to the bridge gage.

Such slight fluctuation in daily stage at Marion as may be caused by power control above probably introduces no material error in determinations of daily discharge.

In May, 1902, several measurements were taken at this bridge by the United States Geological Survey. It was then called the Glasco bridge near Glen Eyrie.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Daily discharge, in second-feet, of Esopus Creek at Mount Marion, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	155	900	10,440	1,815	1,995	395	288	80	63	105	68	169
2	130	675	7,660	1,470	1,590	375	273	80	80	94	68	155
3	120	735	5,970	1,245	1,430	345	255	80	108	87	91	146
4	120	715	4,675	1,105	1,887	318	229	115	182	80	138	138
5	135	665	3,730	1,049	1,510	312	210	155	187	74	575	130
6	180	585	3,660	979	1,315	1,245	195	135	187	74	515	122
7	247	222	5,620	1,486	1,140	979	182	111	234	83	347	119
8	640	190	4,675	1,510	1,021	735	173	97	210	94	288	108
9	525	282	3,385	1,210	965	650	164	91	177	87	265	101
10	440	310	2,560	1,070	1,000	575	164	119	159	87	206	91
11	395	222	2,067	930	840	750	155	169	135	80	222	72
12	340	222	1,923	1,105	735	1,210	155	187	111	74	222	66
13	340	210	1,833	951	685	1,374	146	164	105	74	222	78
14	395	200	1,833	840	600	965	138	135	135	74	215	91
15	320	222	1,617	768	550	810	130	115	151	68	210	97
16	318	235	1,430	715	515	840	135	108	146	68	200	104
17	290	246	1,350	715	467	1,140	141	101	138	68	191	72
18	267	270	1,161	4,600	443	1,486	138	94	125	68	182	72
19	510	285	1,161	11,160	467	1,617	130	111	115	68	177	84
20	690	295	1,259	6,600	435	1,231	122	101	108	68	164	78
21	605	455	1,860	3,898	455	1,000	115	101	101	63	151	72
22	18,000	1,370	1,815	2,700	403	810	108	94	101	68	146	72
23	8,060	1,035	1,905	2,040	363	675	108	94	94	87	146	72
24	5,668	790	2,130	1,635	387	565	101	87	91	80	146	91
25	2,676	640	2,916	3,060	415	485	101	87	97	74	151	392
26	1,923	605	4,010	24,700	675	427	97	87	119	68	164	273
27	1,653	700	2,796	10,848	550	395	87	80	155	68	159	189
28	1,390	5,712	2,130	4,870	455	427	80	74	141	63	155	189
29	1,257	......	1,923	3,125	415	387	80	68	125	68	159	234
30	1,105	......	2,130	2,480	395	324	80	63	115	68	169	450
31	965	......	2,260	......	427	......	80	58	......	68	......	410

NOTE.—Ice existed Jan. 1 to 22 and Feb. 7 to 27.

Monthly discharge of Esopus Creek at Mount Marion, N. Y., for 1910.

[Drainage area, 378 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	18,000	120	1,608	4.25	4.90
February	5,712	190	678	1.79	1.86
March	10,440	1,161	3,029	8.01	9.24
April	24,700	715	3,356	8.88	9.91
May	1,995	363	791	2.09	2.41
June	1,617	312	761	2.01	2.24
July	288	80	147	.389	.45
August	187	58	105	.278	.32
September	234	63	133	.352	.39
October	105	63	76	.201	.23
November	575	68	204	.540	.60
December	450	66	146	.386	.44
The year	24,700	58	920	2.43	32.99

[a] Computed by engineers of the United States Geological Survey.

RONDOUT CREEK AT ROSENDALE, N. Y.

Rondout Creek rises in the timber-covered mountain group forming the Wittemberg Chain, flows southeastward to Naponach, where it encounters the foot of the Shawangunk Range, turns abruptly to the northeast, and enters the Hudson at Rondout. On the south its basin is separated from that of Wallkill River only by the narrow Shawangunk Mountain. Notable falls occur at Honk Falls and Naponach, and on Good Beer Kill above Ellenville. On Good Beer Kill there is a fall of 870 feet from the cape, 3 miles above Ellenville, to Ellenville. Of this about 200 feet is concentrated in a series of cascades called Hanging Rock Falls. Above its junction with Sandberg Creek, at Naponach, Rondout Creek is a mountain stream. At Honk Falls a natural declivity affords a fall of 125 feet.

The gaging station, which is located on the highway bridge at Rosendale, was established by the United States Geological Survey on July 6, 1901. It was assumed by the Board of Water Supply of the City of New York on June 1, 1907, at which time a new standard Board of Water Supply chain gage was put in to replace the old one. This description and the following tables of discharge for 1910 were furnished by the Board of Water Supply of the City of New York.

Measurements are taken from the bridge at high and medium stages and by wading at a point about 1,000 feet below the bridge at low stages.

The gage is located on the downstream side of the bridge in the middle panel. The length of the chain from end of weight to marker is 34.53 feet. The bench mark is a circular cut on rock on upstream corner, right abutment. The elevation is 33.56 feet above the datum.

The water is confined to one channel under the single-span steel bridge, which is 135.7 feet between abutments at all stages.

A portion of the water of the creek is diverted by a dam below High Falls and sent through the Delaware & Hudson Canal and is discharged into the creek below the gaging station. At Rock Locks, which is about 1½ miles below Rosendale, there is an overflow weir, from which the approximate discharge of the canal may be obtained. The weir, which has a crest of 3.8 feet, is located at the left end of the lock and is equipped with a standard Board of Water Supply staff gage.

Slight daily fluctuations in the stage of Rondout Creek at Rosendale are caused by storage at Honk Falls, Napanoch, and, to some extent, at High Falls. In determining the daily discharge for this station, proper allowance is made for the water diverted to the Delaware & Hudson Canal.

Information in regard to this station is contained in the report of the State engineer and surveyor, State of New York.

Daily discharge, in second-feet, of Rondout Creek at Rosendale, N. Y. (including Delaware & Hudson Canal), for 1910.

Date.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	165	853	9,000	1,127	1,542	581	244	62	76	100	79	298
2	155	789	6,600	893	1,317	533	208	76	94	108	85	280
3	133	757	5,700	765	1,146	509	178	85	141	82	141	250
4	165	717	4,200	757	1,692	485	154	108	437	85	581	232
5	122	677	3,660	813	1,435	523	138	232	501	108	1,832	220
6	128	677	3,358	757	1,112	1,912	141	186	398	120	933	220
7	621	677	4,800	1,015	988	1,225	116	162	328	120	525	250
8	920	320	4,400	983	932	829	112	135	292	108	509	262
9	672	305	3,078	897	998	798	100	100	256	141	469	268
10	448	294	2,318	762	971	869	108	162	232	147	445	232
11	330	254	1,928	698	861	837	154	1,490	208	116	445	208
12	282	280	1,677	657	772	1,046	147	421	190	100	437	190
13	290	294	2,000	618	700	1,073	135	250	186	88	429	190
14	305	255	1,545	586	556	983	141	178	186	85	405	190
15	350	224	1,391	537	540	901	135	141	186	76	391	186
16	320	224	1,479	538	540	829	154	144	182	85	377	170
17	290	252	1,290	618	548	757	150	123	162	88	370	170
18	348	272	1,145	4,059	539	741	144	116	141	85	352	170
19	560	300	1,046	5,609	516	709	147	108	150	82	304	170
20	290	629	983	3,422	492	661	150	178	150	85	220	170
21	860	901	2,120	2,637	490	581	154	141	150	85	220	170
22	15,525	3,800	1,952	1,771	457	501	147	108	141	88	292	170
23	6,500	2,120	1,892	1,259	443	429	135	129	123	100	310	178
24	3,162	1,271	2,266	1,070	437	377	100	108	116	100	316	1,110
25	2,156	1,028	2,565	1,575	549	310	82	82	100	100	352	685
26	1,490	1,253	3,050	19,510	524	268	66	85	91	100	316	430
27	1,370	1,154	2,144	6,708	509	244	82	88	108	100	304	364
28	1,190	6,600	1,743	3,757	509	244	70	82	116	94	298	377
29	983	......	1,523	3,084	493	238	58	88	120	82	310	493
30	933	......	1,435	1,984	597	244	60	108	116	79	310	813
31	901	......	1,253	......	621	......	62	85	......	79	......	773

NOTE.—Water let into canal Apr. 5. Ice present Jan. 1 to 22 and Feb. 8 to 21.

Monthly discharge of Rondout Creek at Rosendale, N. Y. (including Delaware and Hudson Canal), for 1910.

[Drainage area, 380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).[a]
	Maximum.	Minimum.	Mean.	Per square mile.[a]	
January	15,525	122	1,354	3.56	4.10
February	6,600	224	970	2.55	2.66
March	9,000	983	2,695	7.09	8.17
April	19,510	537	2,315	6.09	6.80
May	1,692	437	768	2.02	2.33
June	1,912	238	674	1.77	1.98
July	244	58	128	.337	.39
August	1,490	62	180	.474	55
September	501	76	189	.497	55
October	147	76	97	.255	.29
November	1,832	79	412	1.08	1.20
December	1,110	170	319	.839	.97
The year	19,510	58	841	2.21	29.99

[a] Computed by engineers of the United States Geological Survey.

PASSAIC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Passaic River rises in Somerset and Morris counties, N. J. Above its confluence with Pompton River, its main tributary, it meanders through a flat country of Triassic red sandstone, to which in large measure must be attributed the turbidity of its waters. In contrast with the sluggish, muddy Passaic, the Pompton is a rapid stream and its waters are clear. It drains parts of Sussex, Passaic, Morris, and other adjoining counties, and traverses for a large part of its course a country of hard crystalline rocks and heavy forests, the general level of which is several hundred feet above that of the Passaic. At their confluence the Pompton enters with a current which carries it well toward the right bank of the Passaic, and at times of flood causes much backwater in the latter.

The highest recorded flood which has occurred in this drainage basin was that of October, 1903. The flood began at 6.30 p. m., October 8, and lasted until midnight, October 18, the maximum height being reached at 9 p. m., October 10. There was a total rainfall of 11.74 inches between October 8 and 11. The estimated maximum discharge at the Dundee dam was 35,800 second-feet. This flood is fully described in Water-Supply Paper 92.

PASSAIC RIVER NEAR CHATHAM, N. J.

This station was established February 10, 1903, and is maintained by the United States Weather Bureau. It is located at the second bridge, about 1½ miles upstream from Chatham.

No important tributaries enter in the immediate vicinity of the station. Canoe Brook enters from the east about 3 miles below the station.

The datum of the chain gage attached to the bridge has remained the same since the station was established.

Discharge measurements are made from the bridge or by wading.

The discharge is affected by ice during the winter months.

Conditions of flow remained permanent at this station from 1903 to 1905–6. Some time during 1905–6 a change took place which was equivalent to a constant change in gage height of about 0.1 foot. Since that time the discharge rating curve has remained constant down to September 5, 1909. On this date a check measurement was made, the gage verified, and everything found correct. Since that date the station has not been visited. Comparisons of gage-height records at other points in the Passaic drainage indicate, however, that the gage datum and the conditions of flow during 1910 were essentially the same as in 1909. The following tables of discharge were accordingly developed from the 1909 discharge rating curve.

Daily gage height, in feet, of Passaic River near Chatham, N. J., for 1910.

[Miss M. A. Butler, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				2.2	3.2	2.3	2.4	2.0	2.2	2.1	2.2	2.2
2				2.2	3.0	2.3	2.4	2.0	2.4	2.1	2.1	2.2
3				2.2	2.8	2.3	2.3	2.2	2.3	2.1	2.1	2.2
4			7.0	2.2	2.7	2.3	2.3	2.4	2.3	2.1	3.5	2.2
5			6.0	2.1	2.5	2.2	2.3	2.4	2.3	2.0	3.9	2.1
6			5.5	2.1	2.4	2.5	2.2	2.3	2.2	2.0	3.6	2.1
7			5.0	2.1	2.3	2.4	2.2	2.3	2.2	2.0	3.2	2.1
8			4.7	2.1	2.3	2.4	2.2	2.2	2.2	2.0	2.8	2.1
9			4.4	2.1	2.3	2.3	2.2	2.2	2.2	2.0	2.6	2.1
10			4.1	2.1	2.3	2.3	2.2	2.2	2.2	2.0	2.5	2.1
11			3.8	2.1	2.3	2.5	2.2	2.4	2.2	2.0	2.4	
12			3.5	2.1	2.2	2.8	2.2	2.4	2.2	2.0	2.4	
13			3.3	2.1	2.2	3.0	2.2	2.3	2.2	2.0	2.3	
14			3.1	2.1	2.2	2.8	2.2	2.3	2.1	2.0	2.3	
15			2.9	2.1	2.2	2.7	2.1	2.3	2.1	2.0	2.2	
16			2.7	2.1	2.2	2.6	2.1	2.3	2.1	2.0	2.2	
17			2.6	2.1	2.2	2.5	2.1	2.3	2.1	2.0	2.2	
18			2.5	2.6	2.2	2.4	2.1	2.2	2.1	2.0	2.2	
19			2.4	3.4	2.2	4.0	2.1	2.2	2.1	2.0	2.2	
20			2.4	3.5	2.2	3.9	2.1	2.2	2.1	2.2	2.2	
21			2.3	3.1	2.3	3.7	2.1	2.2	2.1	2.3	2.2	
22			2.3	2.8	2.8	3.6	2.1	2.2	2.1	2.3	2.2	
23	6.0		2.3	2.6	2.8	3.5	2.1	2.2	2.1	2.3	2.1	
24	5.8		2.2	2.4	2.6	3.3	2.1	2.2	2.1	2.2	2.1	
25	5.5		2.2	3.0	2.4	3.0	2.1	2.1	2.1	2.2	2.1	3.8
26	5.2		2.2	4.0	2.7	2.8	2.1	2.1	2.1	2.2	2.1	3.8
27	4.8		2.2	3.8	2.6	2.7	2.0	2.1	2.1	2.2	2.1	3.5
28	4.5		2.2	3.6	2.5	2.6	2.0	2.1	2.1	2.2	2.1	3.0
29	4.2		2.2	3.5	2.4	2.5	2.0	2.1	2.1	2.2	2.2	2.8
30			2.2	3.4	2.4	2.4	2.0	2.1	2.1	2.2	2.3	2.6
31			2.2		2.4		2.0	2.1		2.2		2.4

NOTE.—Relation between gage height and discharge affected by ice from Jan. 1 to 22, Jan. 30 to Mar. 3, and Dec. 11 to 24.

Daily discharge, in second-feet, of Passaic River near Chatham, N. J., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				20	235	31	45	8	20	12	20	20
2				20	172	31	45	8	45	12	12	20
3				20	119	31	31	20	31	12	12	20
4			2,260	20	97	31	31	45	31	12	350	20
5			1,660	12	60	20	31	45	31	8	525	12
6			1,360	12	45	60	20	31	20	8	390	12
7			1,090	12	31	45	20	31	20	8	235	12
8			925	12	31	45	20	20	20	8	119	12
9			775	12	31	31	20	20	20	8	77	12
10			625	12	31	31	20	20	20	8	60	12
11			480	12	31	60	20	45	20	8	45	
12			350	12	20	119	20	45	20	8	45	
13			271	12	20	172	20	31	20	8	31	
14			202	12	20	119	20	31	12	8	31	
15			144	12	20	97	12	31	12	8	20	
16			97	12	20	77	12	31	12	8	20	
17			77	12	20	60	12	31	12	8	20	
18			60	77	20	45	12	20	12	8	20	
19			45	310	20	575	12	20	12	8	20	
20			45	350	20	525	12	20	12	20	20	
21			31	202	31	435	12	20	12	31	20	
22			31	119	119	390	12	20	12	31	20	
23	1,660		31	77	119	350	12	20	12	31	12	
24	1,540		20	45	77	271	12	20	12	20	12	
25	1,360		20	172	45	172	12	12	12	20	12	480
26	1,200		20	575	97	119	12	12	12	20	12	480
27	980		20	480	77	97	8	12	12	20	12	350
28	825		20	390	60	77	8	12	12	20	12	172
29	675		20	350	45	60	8	12	12	20	20	119
30			20	310	45	45	8	12	12	20	31	77
31			20		45		8	12		20		45

NOTE.—Daily discharge determined from a discharge rating curve well defined below 600 second-feet.

Monthly discharge of Passaic River near Chatham, N. J., for 1910.

[Drainage area, 101 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,660		354	3.50	4.04	D.
February			152	1.50	1.56	D.
March	2,260	20	507	5.02	5.79	A.
April	575	12	123	1.22	1.36	A.
May	235	20	58.8	.582	.67	A.
June	575	20	141	1.40	1.56	A.
July	45	8	17.6	.174	.20	B.
August	45	8	23.1	.229	.26	B.
September	45	12	17.4	.172	.19	B.
October	31	8	14.2	.141	.16	B.
November	525	12	74.5	.738	.82	A.
December	480		67.6	.669	.77	C.
The year	2.260	8	129	1.28	17.38	

NOTE.—The discharge during the periods of obstruction by ice is based on climatologic records.
Mean discharge, Jan. 1 to 22, estimated 84 second-feet.
Mean discharge, Jan. 30 to 31, estimated 450 second-feet.
Mean discharge, Mar. 1 to 3, estimated 1,670 second-feet.
Mean discharge, Dec. 11 to 24, estimated 16 second-feet.

DELAWARE RIVER.

GENERAL FEATURES OF AREA DRAINED.

The headwaters of Delaware River are found in Delaware, Greene, and Schoharie counties, N. Y. The East Branch, which may be considered the main stream, rises at Grand Gorge in northeastern Delaware County; the West Branch [1] has its source in a small lake almost on the line of Schoharie and Delaware counties, at an elevation of 1,886 feet above sea level; the two streams unite at Hancock. From this junction point the river flows southeastward until it reaches Port Jervis, where it turns to the southwest and flows for a distance of about 40 miles along the base of the Shawangunk Range until it passes through the water gap, from which point it flows in an irregular southerly direction to Trenton. Below Trenton its course is in general southwestward to Delaware Bay. Between Hancock and Port Jervis it forms the dividing line between New York and Pennsylvania; south of Port Jervis it separates Pennsylvania from New Jersey and, for a few miles, Delaware from New Jersey.

The drainage area of Delaware River, measured at Philadelphia and including that of Schuylkill River, is about 10,100 square miles, of which about 2,580 square miles lie in New York, 5,720 in Pennsylvania, and 1,800 in New Jersey. The river is tidal to Trenton, which lies also at the head of navigation.

The Delaware receives a number of important tributaries, among which may be mentioned Mongaup and Navesink rivers and Callicoon Creek from New York; Lackawaxen, Lehigh, and Schuylkill rivers and numerous creeks from Pennsylvania; and Rancocas Creek, Musconetcong River, and Maurice River from New Jersey.

EAST BRANCH OF DELAWARE RIVER AT HANCOCK, N. Y.

This station, which is located at the highway bridge half a mile southeast of the Erie Railroad station at Hancock, N. Y., and about 1 mile above the junction of the East and West branches of Delaware River, was established October 14, 1902, and has since been maintained in cooperation with the New York State engineer department, and with the United States Weather Bureau since January 1, 1908. The Erie Railroad bridge is just below the gaging station.

Beaver Kill, which drains a portion of Sullivan and Ulster counties, is the nearest important tributary to East Branch of Delaware River. It enters from the left about 10 miles above the gaging station.

The datum of the chain gage attached to the bridge has remained the same since the establishment of the station.

Discharge measurements are made from the bridge or by wading.

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[1] This branch was formerly described as the main stream, but recent careful measurements show the drainage area of the East Branch to be considerably larger than that of the West Branch.

Conditions for accurate measurements can be considered fairly good. The high-water stage of East Branch is probably affected at times by backwater caused by gorging at its junction with West Branch. Low-water discharge is controlled by a riffle just below the Erie Railroad bridge, but frequent changes in conditions of flow may require many measurements and new ratings each year. During 1910 the channel probably did not change materially and results for this year are considered good. During the winter months the discharge is affected by needle and cake ice jamming on these riffles and causing backwater at the station.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of East Branch of Delaware River at Hancock, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 1[a]	W. G. Hoyt	......	22,300	9.13	16,500
3	....do	342	1,890	7.73	11,400
5	....do	318	1,400	6.15	6,500
8	....do	324	1,500	6.48	7,730
May 10	C. C. Covert	304	738	3.91	1,600
July 28[b]	Hoyt and Carman	152	224	2.70	262

[a] Measurement partly estimated; large cakes of ice running.
[b] Measurement made by wading above bridge.

Daily gage height, in feet, of East Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.6	3.9	9.7	5.2	5.0	3.8	3.1	2.6	2.4	2.7	2.5	3.2
2	3.4	4.0	8.9	4.9	4.7	3.7	3.1	2.6	2.4	2.7	2.5	3.2
3	3.7	3.8	7.8	4.7	4.7	3.7	3.0	2.6	2.4	2.7	2.5	3.2
4	3.6	3.7	6.9	4.4	4.8	3.5	3.0	2.6	3.1	2.6	2.6	3.1
5	3.4	3.8	6.2	4.4	4.5	3.4	2.9	2.8	3.4	2.6	2.7	3.3
6	3.5	3.6	6.1	4.3	4.4	3.6	2.9	2.7	3.3	2.6	2.9	3.4
7	4.1	4.5	7.0	4.3	4.2	4.1	2.9	2.7	3.4	2.6	3.1	3.4
8	5.4	4.6	6.9	4.6	4.1	3.8	2.9	2.6	3.3	2.6	3.1	3.5
9	5.2	4.7	6.0	4.6	4.1	3.6	2.8	2.6	3.1	2.6	3.0	3.4
10	5.1	4.9	5.5	4.3	4.0	3.6	2.8	2.6	3.0	2.6	3.0	3.3
11	5.0	4.6	5.1	4.1	3.8	3.7	2.9	2.8	2.9	2.4	3.3	3.8
12	4.9	4.7	4.9	4.2	3.7	4.1	2.9	2.9	2.8	2.4	3.8	3.8
13	4.8	4.6	4.7	4.4	3.7	4.0	2.8	2.8	2.9	2.5	3.6	3.7
14	4.7	4.7	4.8	4.1	3.6	3.9	2.7	2.7	2.8	2.5	3.5	3.6
15	4.7	4.8	4.6	4.0	3.5	3.8	2.7	2.6	3.0	2.5	3.5	3.6
16	4.7	4.7	4.4	4.1	3.5	3.7	2.7	2.5	2.9	2.5	3.4	3.7
17	4.6	4.7	4.5	3.9	3.4	4.0	2.8	2.5	2.9	2.5	3.3	3.6
18	4.7	4.8	4.2	3.9	3.4	3.9	2.8	2.5	2.7	2.5	3.3	3.6
19	5.0	4.9	4.2	5.8	3.5	4.3	2.7	2.6	2.7	2.5	3.3	3.7
20	5.7	4.9	4.4	5.0	3.4	4.1	2.7	2.8	2.7	2.5	3.2	3.7
21	5.6	5.0	5.2	4.8	3.3	3.8	2.7	2.7	2.6	2.5	3.2	3.7
22	12.9	6.7	5.2	4.6	3.5	3.7	2.7	2.6	2.6	2.6	3.1	3.6
23	8.0	7.0	5.0	4.5	3.4	3.6	2.7	2.6	2.6	2.6	3.1	3.5
24	6.2	6.0	5.5	4.3	3.3	3.5	2.7	2.6	2.6	2.6	3.1	3.6
25	5.4	5.9	6.0	4.3	3.8	3.4	2.7	2.5	2.7	2.5	3.2	5.0
26	4.9	5.6	7.1	6.1	4.8	3.3	2.6	2.5	2.8	2.5	3.3	4.6
27	4.6	5.6	6.3	7.8	4.4	3.3	2.6	2.5	2.8	2.5	3.2	4.4
28	4.4	7.8	5.7	6.2	4.3	3.3	2.7	2.5	2.8	2.5	3.2	4.4
29	4.3	......	5.5	5.6	4.0	3.4	2.7	2.5	2.8	2.5	3.2	4.3
30	4.0	......	5.6	5.4	3.9	3.3	2.7	2.4	2.8	2.5	3.2	4.4
31	4.0	......	5.5	......	3.8	......	2.7	2.4	......	2.5	......	4.6

NOTE.—Ice present at this station from Jan. 1 to about Jan. 21, from about Feb. 5 to 27, and from about Dec. 5 to 31. It is not known whether the gage readings were to water surface or to top of ice.
Gage heights for Jan. 1 to May 9 corrected for error in chain length.

Daily discharge, in second-feet, of East Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	1,570	19,200	4,290	3,800	1,400	525	198	113	248	153	620
2	....	1,750	16,200	3,570	3,120	1,240	525	198	113	248	153	620
3	....	1,400	12,300	3,120	3,120	1,240	440	198	113	248	153	620
4	....	1,240	9,290	2,490	3,340	965	440	198	525	198	198	525
5	....	....	7,040	2,490	2,690	840	367	304	840	198	248	......
6	....	....	6,730	2,300	2,490	1,100	367	248	725	198	367	......
7	....	....	9,620	2,300	2,110	1,930	367	248	840	198	525	......
8	....	....	9,290	2,900	1,930	1,400	367	198	725	198	525	......
9	....	....	6,430	2,900	1,930	1,100	304	198	525	198	440	......
10	....	....	5,050	2,300	1,750	1,100	304	198	440	198	440	......
11	....	....	4,040	1,930	1,400	1,240	367	304	367	113	725	......
12	....	....	3,570	2,110	1,240	1,930	367	367	304	113	1,400	......
13	....	....	3,120	2,490	1,240	1,750	304	304	367	153	1,100	......
14	....	....	3,340	1,930	1,100	1,570	248	248	304	153	965	......
15	....	....	2,900	1,750	965	1,400	248	198	440	153	965	......
16	....	....	2,490	1,930	965	1,240	248	198	367	153	840	......
17	....	....	2,690	1,570	840	1,750	304	153	367	153	725	......
18	....	....	2,110	1,570	840	1,570	304	153	248	153	725	......
19	....	....	2,110	5.860	965	2,300	248	198	248	153	725	......
20	....	....	2,490	3,800	840	1,930	248	304	248	153	620	......
21	....	....	4,290	3,340	725	1,400	248	248	198	153	620	......
22	31,600	....	4,290	2,900	965	1,240	248	198	198	198	525	......
23	13,000	....	3,800	2,690	840	1,100	248	198	198	198	525	......
24	7,040	....	5,050	2,300	725	965	248	198	198	198	525	......
25	4,790	....	6,430	2,300	1,400	840	248	153	248	153	620	......
26	3,570	....	9,950	6,730	3,340	725	198	153	304	153	725	......
27	2,900	....	7,360	12,300	2,490	725	198	153	304	153	620	......
28	2,490	12,300	5,580	7,040	2,300	725	248	153	304	153	620	......
29	2,300	....	5,050	5,310	1,750	840	248	153	304	153	620	......
30	1,750	....	5,310	4,790	1,570	725	248	113	304	153	620	......
31	1,750	....	5,050	....	1,400	....	248	113	....	153	....	......

NOTE.—Daily discharge determined from a discharge rating curve well defined.
Daily discharge Jan. 21, Feb. 21-27, and Dec. 5-10 as published in the New York State report for 1910, has been revised. Daily discharge for missing winter periods not published in Federal report as it is only approximate.

Monthly discharge of East Branch of Delaware River at Hancock, N. Y., for 1910.

[Drainage area, 920 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	31,600	....	2,480	2.70	3.11	C.
February	12,300	....	1,510	1.64	1.71	C.
March	19,200	2,110	6,200	6.74	7.77	A.
April	12,300	1,570	3,440	3.74	4.17	A.
May	3,800	725	1,750	1.91	2.20	A.
June	2,300	725	1,280	1.39	1.55	A.
July	525	198	307	.334	.39	A.
August	367	113	208	.226	.26	A.
September	840	113	359	.390	.44	A.
October	248	113	174	.189	.22	A.
November	1,400	153	600	.652	.73	A.
December	....	....	450	.489	.56	D.
The year	31,600	113	1,560	1.70	23.11	

NOTE.—Discharge for periods during which ice existed estimated from discharge at Port Jervis and Riegelsville.
Mean discharge Jan. 1 to 21 estimated 270 second-feet; nearly constant.
Mean discharge Feb. 5 to 27 estimated 1,050 second-feet; slight variation.
Mean discharge Dec. 5 to 31 estimated 427 second-feet; nearly constant.
Determination of discharge for January, February, and December in the above table is revised and supersedes that published in the New York State report for 1910.

DELAWARE RIVER AT PORT JERVIS, N. Y.

This station, which is located at the toll bridge over Delaware River at Port Jervis, was established for the United States Weather Bureau by Irving Righter, city engineer, Port Jervis, N. Y., October 12, 1904, and is maintained to obtain data for flood predictions.

Mongaup River enters the Delaware from the north about 6 miles above the station, and Neversink River, also from the north, enters about 1 mile below the station.

The chain gage is attached to the bridge. Considerable difficulty has been experienced in maintaining the datum of the gage constant. On September 4, 1908, after a careful investigation, the datum was changed about 2 feet in order to avoid negative readings. The new elevation of the datum of the gage is 414.89 feet above mean sea level. A correction varying from +1.7 to +2.0 feet has been applied to gage heights prior to September 4, 1908, so that all gage heights published by the Survey refer to the same datum.

Discharge measurements are made from the bridge.

The relation between gage height and discharge is affected by ice to a greater or less extent each winter. At times ice gorges form below the bridge.

Conditions of flow at this point are constant, and a good discharge rating curve has been developed.

Comparisons of the records of this station with those obtained at the Riegelsville and the two Hancock stations indicate that the corrections applied to the gage heights were essentially correct and that all discharge data can be fully relied on.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of Delaware River at Port Jervis, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. [a]1	W. G. Hoyt	646	7,850	±11.8	59,300
[b]2	.....do	641	6,760	10.9	48,800
[b]3	.....do	646	6,190	9.82	41,400
[c]4	.....do	646	5,730	8.55	32,200
7	.....do	628	5,490	8.14	28,900
9	.....do	627	4,860	7.25	22,600
10	.....do	626	4,360	6.38	17,300
May 10	C. C. Covert	579	2,880	3.91	5,650
July 30	Hoyt and Carman	460	891	1.37	654

[a] Velocity estimated by timing ice cakes from a measured line on shore.
[b] Large amount of ice flowing, but measurements probably unaffected thereby.
[c] Vertical velocity curves taken every 25 feet and measurement computed, using mean from curves.

Daily gage height, in feet, of Delaware River at Port Jervis, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	3.4	13.0	4.6	5.6	3.6	2.4	1.3	1.0	1.5	1.1	2.2
2	2.1	3.3	11.2	4.2	4.4	3.4	2.3	1.4	1.2	1.4	1.1	2.1
3	2.1	3.3	10.4	4.0	4.1	3.3	2.2	1.3	1.2	1.4	1.1	2.1
4	2.3	3.2	8.7	3.7	4.6	3.2	2.2	1.3	1.3	1.2	1.4	2.0
5	2.3	3.1	7.9	3.5	4.7	3.1	2.0	1.4	1.7	1.1	2.0	2.0
6	2.3	2.9	7.5	3.2	4.6	3.1	2.0	1.2	2.2	1.0	2.2	2.0
7	2.5	2.5	8.1	3.9	4.4	3.8	2.0	1.3	2.2	1.0	2.2	2.4
8	2.8	2.1	9.0	4.1	4.4	3.7	1.9	1.3	2.1	1.0	2.1	2.3
9	3.9	2.5	7.7	4.1	3.7	3.5	1.8	1.4	2.1	0.9	2.2	2.0
10	3.9	2.7	6.6	3.8	3.4	3.3	1.8	1.4	1.8	0.8	2.3	2.0
11	3.7	3.1	5.8	3.4	4.0	3.4	1.7	2.7	1.7	0.8	2.2	2.8
12	3.6	3.1	5.5	3.4	3.8	4.0	1.7	2.4	1.6	0.8	2.1	2.8
13	3.6	3.1	5.3	3.7	3.6	4.2	1.7	1.9	1.5	0.8	3.1	2.7
14	3.6	3.0	5.3	3.5	3.4	4.0	1.7	1.8	1.4	0.7	2.8	2.6
15	3.5	3.0	5.1	3.2	3.2	3.6	1.6	1.6	1.4	0.7	2.7	2.5
16	3.5	2.7	4.8	3.2	3.1	3.5	1.6	1.4	1.4	0.7	2.5	......
17	5.3	2.7	4.6	3.1	3.0	3.5	1.6	1.3	1.4	0.7	2.5	......
18	3.3	2.7	4.3	3.4	2.9	3.9	1.5	1.2	1.4	0.7	2.3	......
19	3.4	2.6	4.0	5.3	2.7	3.9	1.7	1.3	1.3	0.7	2.3	3.1
20	3.5	2.6	4.0	5.6	2.6	3.8	2.0	1.3	1.2	1.1	2.2	2.9
21	4.1	3.1	5.6	5.1	2.9	3.6	2.0	1.4	1.2	1.1	2.1	2.8
22	9.4	3.3	6.0	4.9	2.9	3.3	1.5	1.4	1.2	1.1	2.1	2.6
23	10.9	5.0	5.7	4.7	2.9	3.1	1.5	1.3	1.1	1.2	2.0	2.6
24	7.5	4.7	5.5	4.6	2.8	2.8	1.5	1.3	1.1	1.1	2.0	3.0
25	6.1	4.5	6.3	4.5	3.2	2.6	1.4	1.2	1.0	1.1	2.0	3.2
26	6.1	4.5	7.0	7.2	4.1	2.4	1.4	1.1	1.2	1.3	2.0	3.2
27	4.7	4.1	6.5	9.3	5.1	2.4	1.3	1.1	1.2	1.2	2.2	4.4
28	4.1	4.5	6.3	7.1	4.5	2.5	1.3	1.1	1.6	1.2	2.1	3.9
29	4.1	......	6.0	6.1	4.3	2.7	1.2	1.0	1.5	1.2	2.1	4.0
30	3.9	......	5.2	5.8	3.8	2.6	1.4	1.0	1.5	1.1	2.2	4.1
31	3.4	......	4.8	......	3.6	......	1.3	1.0	......	1.1	......	9.7

NOTE.—Ice present at this station from about Jan. 1 to about Jan. 21, from Feb. 11 to 15, and from about Dec. 7 to 31. Relation between gage height and discharge may also have been slightly affected by ice Feb. 9, 10, and 16 to 20. On Dec. 31 there was backwater of 5 to 6 feet, caused by an ice jam. It is not known whether gage readings during these periods were to water surface or to top of ice.

Daily discharge, in second-feet, of Delaware River at Port Jervis, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	4,100	67,300	8,120	12,500	4,670	1,900	590	390	740	450	1,570
2	......	3,830	52,500	6,620	7,350	4,100	1,730	665	520	665	450	1,420
3	......	3,830	46,000	5,930	6,270	3,830	1,570	590	520	665	450	1,420
4	......	3,570	32,700	4,970	8,120	3,570	1,570	590	590	520	665	1,280
5	......	3,320	26,800	4,380	8,520	3,320	1,280	665	920	450	1,280	1,280
6	......	2,860	23,900	3,570	8,120	3,320	1,280	520	1,570	390	1,570	1,280
7	......	2,080	28,200	5,600	7,350	5,280	1,280	590	1,570	390	1,570	......
8	......	1,420	35,000	6,270	7,350	4,970	1,150	590	1,420	390	1,420	......
9	......	2,080	25,300	6,270	4,970	4,380	1,030	665	1,420	330	1,570	......
10	......	2,450	18,000	5,280	4,100	3,830	1,030	665	1,030	275	1,730	......
11	......	2,500	13,500	4,100	5,930	4,100	920	2,450	920	275	1,570	......
12	......	2,500	12,100	4,100	5,280	5,930	920	1,900	825	275	1,420	......
13	......	2,500	11,100	4,970	4,670	6,620	920	1,150	740	275	3,320	......
14	......	2,500	11,100	4,380	4,100	5,930	920	1,030	665	225	2,650	......
15	......	2,500	10,200	3,570	3,570	4,670	825	825	665	225	2,450	......
16	......	2,450	8,930	3,570	3,320	4,380	825	665	665	225	2,080	......
17	......	2,450	8,120	3,320	3,080	4,380	825	590	665	225	2,080	......
18	......	2,450	6,980	4,100	2,860	5,600	740	520	665	225	1,730	......
19	......	2,260	5,930	11,100	2,450	5,600	920	590	590	225	1,730	......
20	......	2,260	5,930	12,500	2,260	5,280	1,280	590	520	450	1,570	......
21	......	3,320	12,500	10,200	2,860	4,670	1,280	665	520	450	1,420	......
22	38,100	3,830	14,600	9,350	2,860	3,830	740	665	520	450	1,420	......
23	50,100	9,780	13,000	8,520	2,860	3,320	740	590	450	520	1,280	......
24	23,900	8,520	12,100	8,120	2,650	2,650	740	590	450	450	1,280	......
25	15,100	7,730	16,200	7,730	3,570	2,260	665	520	390	450	1,280	......

Daily discharge, in second-feet, of Delaware River at Port Jervis, N. Y., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	15,100	7,730	20,500	21,800	6,270	1,900	665	450	520	590	1,280	......
27	8,520	6,270	17,400	37,300	10,200	1,900	590	450	520	520	1,570	......
28	6,270	7,730	16,200	21,200	7,730	2,080	590	450	825	520	1,420	......
29	6,270	......	14,600	15,100	6,980	2,450	520	390	740	520	1,420	......
30	5,600	......	10,700	13,500	5,280	2,260	665	390	740	450	1,570	......
31	4,100	......	8,930	......	4,670	......	590	390	......	450	......	......

NOTE.—Daily discharge determined from a discharge rating curve well defined below discharge 70,000 second-feet. Discharge Feb. 11 to 15 estimated from discharge at Riegelsville.
All determinations have been revised by means of a new discharge rating curve and supersede those published for this station in the New York State report for 1910.

Monthly discharge of Delaware River at Port Jervis, N. Y., for 1910.

[Drainage area, 3,250 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	50,100	....	6,260	1.93	2.22	B.
February	9,780	1,420	3,890	1.20	1.25	A.
March	67,300	5,930	19,600	6.03	6.95	A.
April	37,300	3,320	8,850	2.72	3.04	A.
May	12,500	2,260	5,420	1.67	1.92	A.
June	6,620	1,900	4,040	1.24	1.38	A.
July	1,900	520	990	.305	.35	A.
August	2,450	390	709	.218	.25	A.
September	1,570	390	752	.231	.26	A.
October	740	225	413	.127	.15	A.
November	3,320	450	1,520	.468	.52	A.
December	....	....	1,500	.462	.53	C.
The year	67,300	225	4,500	1.38	18.82	

NOTE.—Discharge for periods during which ice existed estimated from the discharge at Riegelsville.
Mean discharge Jan. 1 to 21 estimated 1,000 second-feet; practically constant.
Mean discharge Dec. 7 to 31 estimated 1,530 second-feet; nearly constant.
Determinations of discharge made by means of a new discharge rating curve and supersede those published in the New York State report for 1910.

DELAWARE RIVER AT RIEGELSVILLE, N. J.

This station, which is located at the toll suspension bridge between Riegelsville, N. J., and Riegelsville, Pa., was established July 3, 1906, to take the place of the station at Lambertville, N. J., where conditions of flow were unfavorable for obtaining accurate results.

Lehigh River enters the Delaware from the west about 9 miles above Riegelsville, and Musconetcong comes in from the east about 600 feet below the measuring section. The Musconetcong does not, however, materially affect the relation of gage height to discharge, except at rare intervals.

The Delaware division of the Pennsylvania Canal, running from Easton, Pa., to Bristol, Pa., utilizes part of the total flow of the river at Riegelsville. It diverts water from the Lehigh at its mouth, and at low stages takes practically the entire discharge of this tributary. The water is turned out of this canal during the winter period, or from about the middle of December to the last of March, but throughout the remainder of the year the discharge averages about 250 to 300 second-feet.

The datum of the chain gage attached to the bridge has remained the same during the continuance of the station. This gage was checked with a level in January, 1912, and gage heights for July to December have been corrected.

Discharge measurements are made from the bridge. The discharge is affected by ice only during severe winters.

Conditions for obtaining accurate discharge data are very good, and an excellent discharge rating curve has been developed.

No discharge measurement was made during 1910. Comparisons of the records of flow with those at Port Jervis and Hancock, N. Y., show that full reliance can be placed in the estimates of monthly discharge at Riegelsville.

Daily gage height, in feet, of Delaware River at Riegelsville, N. J., for 1910.

[John H. Deemer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.20	5.02	17.85	6.51	9.24	4.95	3.6	2.15	2.2	2.15	1.9	3.0
2	2.62	4.70	18.76	6.06	8.29	4.76	3.4	2.15	2.25	2.2	1.85	2.9
3	2.78	4.69	17.49	5.62	7.51	4.64	3.3	2.25	2.3	2.15	1.95	2.85
4	2.48	4.61	14.91	5.28	7.06	4.64	3.1	2.25	2.65	2.1	2.5	2.7
5	2.50	4.44	13.12	5.15	6.92	4.34	3.1	2.25	2.7	2.0	3.2	2.65
6	2.52	3.95	12.05	5.01	6.61	4.70	3.0	2.3	2.7	1.95	3.4	2.65
7	2.95	3.34	12.45	5.09	6.15	5.01	2.85	2.2	2.9	2.0	3.4	2.65
8	3.30	3.49	14.85	5.50	5.75	5.10	2.95	2.2	3.0	1.95	3.2	2.65
9	3.02	3.69	12.71	5.42	5.68	4.78	3.0	2.45	2.85	1.9	3.1	2.3
10	3.35	3.78	11.10	5.11	5.79	4.54	2.85	2.45	2.8	1.95	3.0	2.4
11	3.69	3.68	9.52	4.84	5.66	4.81	2.95	2.55	2.6	1.95	2.9	2.45
12	3.60	3.54	8.62	4.66	5.51	5.20	2.85	3.4	2.5	1.9	2.85	2.35
13	3.41	3.84	8.15	4.56	5.12	5.79	2.75	3.0	2.45	1.8	3.1	2.2
14	3.39	3.79	8.16	4.60	4.91	5.62	2.65	2.7	2.4	1.85	3.6	2.35
15	3.15	3.82	8.00	4.56	4.61	5.15	2.65	2.6	2.75	1.8	3.4	2.4
16	2.98	3.85	7.36	4.31	4.54	4.86	2.5	2.7	2.45	1.8	3.2	2.35
17	3.01	3.96	6.91	4.22	4.36	5.24	2.5	2.45	2.35	1.8	3.1	2.3
18	3.10	4.75	6.71	6.01	4.26	5.41	2.65	2.4	2.3	1.8	3.0	2.25
19	3.32	4.38	6.29	9.78	4.22	5.99	2.6	2.3	2.3	1.8	2.95	2.5
20	3.68	4.15	6.21	9.84	4.18	5.69	2.55	2.2	2.25	1.85	2.75	2.6
21	3.71	6.65	6.82	9.02	4.49	5.62	2.55	2.25	2.2	1.85	2.75	2.3
22	14.20	8.75	7.98	8.14	4.60	5.00	2.55	2.25	2.2	1.85	2.8	2.35
23	18.90	8.06	7.92	7.35	4.36	4.60	2.55	2.35	2.1	1.8	2.75	2.3
24	12.96	7.19	7.66	6.89	4.35	4.29	2.45	2.2	2.05	2.0	2.7	2.7
25	10.10	6.82	7.94	9.49	5.12	4.02	2.45	2.15	2.05	2.0	2.9	2.55
26	8.26	6.18	8.46	11.92	6.14	3.82	2.4	2.15	1.95	1.95	2.65	3.6
27	7.41	6.25	9.50	15.19	7.02	3.79	2.35	2.05	2.0	1.9	2.7	3.5
28	6.75	8.01	8.11	12.68	6.70	3.69	2.4	1.85	2.15	2.0	2.9	3.7
29	6.30	....	7.29	10.36	6.15	3.58	2.3	1.95	2.15	1.9	3.0	3.8
30	5.56	....	6.82	9.86	5.59	3.70	2.2	2.1	2.15	1.75	2.95	4.0
31	5.35	....	6.58	....	5.18	....	2.05	1.95	....	1.8	....	3.9

NOTE.—River frozen over at gage and gage heights taken to the top of the ice Jan. 1 to 9. The gage heights were also probably affected by ice lodged on the control point below the gage from Jan. 10 to 21. Ice freshet Jan. 23. River partly or wholly frozen over from about Dec. 5 to Dec. 23. Gage heights taken to top of ice Dec. 12 to 14. Except as noted gage readings during the winter were to water surface.

Water restored to canal Mar. 10 and withdrawn from canal Dec. 9.

Daily discharge, in second-feet, of Delaware River at Riegelsville, N. J., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,460	9,570	86,500	15,100	27,900	9,330	5,080	1,740	1,830	1,740	1,350	3,500
2	2,110	8,490	93,500	13,300	23,000	8,690	4,530	1,740	1,920	1,830	1,280	3,260
3	2,390	8,460	83,800	11,700	19,300	8,290	4,260	1,920	2,010	1,740	1,420	3,140
4	1,820	8,190	64,600	10,500	17,400	8,290	3,750	1,920	2,700	1,660	2,400	2,810
5	1,920	7,640	51,900	10,000	16,800	7,320	3,750	1,920	2,810	1,500	4,000	2,700
6	2,020	6,100	44,700	9,530	15,500	8,490	3,500	2,010	2,810	1,420	4,530	2,700
7	2,700	4,370	47,400	9,810	13,700	9,530	3,140	1,830	3,260	1,500	4,530	2,700
8	3,410	4,770	64,200	11,200	12,200	9,840	3,380	1,830	3,500	1,420	4,000	2,700
9	2,840	5,330	49,100	11,000	11,900	8,750	3,500	2,300	3,140	1,350	3,750	2,010
10	2,500	5,590	38,700	9,880	12,300	7,960	3,140	2,300	3,030	1,420	3,500	2,200
11	2,100	5,300	29,400	8,960	11,800	8,850	3,380	2,500	2,600	1,420	3,260	2,300
12	1,800	4,910	24,600	8,360	11,300	10,200	3,140	4,530	2,400	1,350	3,140	2,100
13	1,600	5,770	22,300	8,030	9,910	12,300	2,920	3,500	2,300	1,200	3,750	1,830
14	1,500	5,620	22,400	8,160	9,190	11,700	2,700	2,810	2,200	1,280	5,080	2,100
15	1,500	5,710	21,600	8,030	8,190	10,000	2,700	2,600	2,920	1,200	4,530	2,200
16	1,400	5,800	18,700	7,220	7,960	9,020	2,400	2,810	2,300	1,200	4,000	2,100
17	1,400	6,130	16,700	6,930	7,380	10,300	2,400	2,300	2,100	1,200	3,750	2,010
18	1,500	8,660	15,900	13,100	7,060	10,900	2,700	2,200	2,010	1,200	3,500	1,920
19	1,800	7,450	14,200	30,900	6,930	13,100	2,600	2,010	2,010	1,200	3,380	2,400
20	2,000	6,710	13,900	31,200	6,810	11,900	2,500	1,830	1,920	1,280	2,920	2,600
21	5,000	15,600	16,300	26,700	7,800	11,700	2,500	1,920	1,830	1,280	2,920	2,010
22	59,500	25,300	21,500	22,300	8,160	9,500	2,500	1,920	1,830	1,280	3,030	2,100
23	94,600	21,900	21,200	18,600	7,380	8,160	2,500	2,100	1,660	1,200	2,920	2,010
24	50,800	17,900	20,000	16,600	7,350	7,160	2,300	1,830	1,580	1,500	2,810	2,810
25	32,700	16,300	21,300	29,200	9,910	6,310	2,300	1,740	1,580	1,500	3,260	2,500
26	22,900	13,800	23,800	43,900	13,600	5,710	2,200	1,740	1,420	1,420	2,700	5,080
27	18,900	14,100	29,300	66,700	17,200	5,620	2,100	1,580	1,500	1,350	2,810	4,800
28	16,100	21,600	22,100	48,900	15,800	5,330	2,200	1,280	1,740	1,500	3,260	5,360
29	14,200	....	18,400	34,200	13,700	5,020	2,010	1,420	1,740	1,350	3,500	5,650
30	11,500	....	16,300	31,300	11,600	5,360	1,830	1,660	1,740	1,130	3,380	6,250
31	10,700	....	15,400	....	10,100	....	1,580	1,420	....	1,200	....	5,950

NOTE.—Daily discharge determined from a well-defined discharge rating curve.
Discharge from Jan. 1 to 9 reduced 10 per cent and the discharge from Jan. 10 to 21 estimated by means of climatologic records. Although ice collecting on the control point at the lower end of the pool in which the Riegelsville gage is located may have caused slight backwater from about Feb. 8 to 20, no reduction was made in the computed discharge. Slight backwater caused by ice may have existed from about Dec. 6 to 24, but the general relation of gage height to discharge was probably not changed during December, owing to the fact that the control point below the gage probably remained open, and hence no reduction was made in the computed discharge for this period.

Monthly discharge of Delaware River at Riegelsville, N. J., for 1910.

[Drainage area, 6,430 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	94,600	[a] 1,400	12,200	1.90	2.19	B.
February	25,300	4,370	9,900	1.54	1.60	A.
March	93,500	13,900	33,900	5.30	6.11	A.
April	66,700	6,930	19,400	3.05	3.40	A.
May	27,900	6,810	12,200	1.94	2.24	A.
June	13,100	5,020	8,820	1.41	1.57	A.
July	5,080	1,580	2,890	.491	.57	A.
August	4,530	1,420	2,100	.369	.43	A.
September	3,500	1,420	2,210	.386	.43	A.
October	1,830	1,130	1,380	.257	.30	A.
November	5,080	1,280	3,290	.554	.62	A.
December	6,250	1,830	3,030	.482	.56	B.
The year	94,600	1,130	9,270	1.47	20.02	

[a] Ice effect, estimated.

NOTE.—In order to determine the discharge per square mile and the run-off depth in inches, 270 second-feet were added Mar. 10 to Dec. 8, 1910, before computing the discharge per square mile. Hence the first three columns indicate the actual quantity of water available in the river, and the two remaining columns represent the actual run-off from the drainage area above Riegelsville, including the discharge of the canal See description, p 238.

WEST BRANCH OF DELAWARE RIVER AT HANCOCK, N. Y.

This station, which is located at the toll suspension bridge, half a mile west of the Erie Railroad station at Hancock, N. Y., and about 1 mile above the junction of East and West branches of Delaware River, was established October 15, 1902, and has since been maintained in cooperation with the New York State engineer department and with the United States Weather Bureau since January 1, 1908.

Oquaga Creek, which drains the eastern portion of Broome County, is the nearest important tributary to West Branch of Delaware River. It enters from the right, about 10 miles upstream from the gaging station.

The conditions of the channel are not favorable for accurate ratings.

The datum of the chain gage attached to the toll bridge has remained the same since the establishment of the station. Discharge measurements are made from the suspension bridge or by wading. The high-water stage is at times affected by backwater from East Branch of Delaware River. The low stage is controlled by riffles about 800 feet below the station, but frequent changes in conditions of the channel require many measurements and new ratings each year. During the winter months the discharge is affected considerably by ice conditions. The flood which occurred during the first part of March was accurately measured by means of several discharge measurements. These measurements show a considerable reduction in the discharge as compared with that of previous years, probably partially due to backwater from East Branch of Delaware River.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of West Branch of Delaware River at Hancock, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 2[a]	W. G. Hoyt	400	2,180	9.91	16,700
3	.....do	280	1,480	7.81	9,080
4	.....do	242	1,060	6.36	4,790
9	.....do	230	992	6.06	4,190
May 10	C. C. Covert	222	683	4.60	1,680
July 27	Hoyt and Carman	152	862	2.63	117

[a] Ice floating during the measurement.

Daily gage height, in feet, of West Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.0	3.9	10.6	4.5	4.9	4.8	3.3	2.5	2.4	2.6	2.3	3.1
2	3.2	3.9	9.3	4.2	4.6	4.4	3.1	2.6	2.4	2.6	2.4	3.0
3	3.0	3.8	7.8	4.1	4.7	4.2	3.3	2.6	2.4	2.3	2.3	3.1
4	3.3	3.7	7.0	4.0	4.6	4.0	3.1	2.5	2.8	2.5	2.3	3.1
5	2.9	5.2	6.5	3.9	4.5	3.8	3.1	2.5	3.1	2.5	2.6	3.0
6	3.1	5.0	6.3	3.9	4.2	4.4	2.9	2.5	3.0	2.4	2.9	3.0
7	4.5	5.1	7.8	3.8	4.1	4.5	2.7	2.4	3.2	2.4	3.1	3.2
8	5.1	4.9	6.9	4.1	4.2	4.4	2.9	2.5	2.9	2.4	3.0	3.0
9	4.7	5.0	6.1	3.9	4.1	4.2	2.8	2.6	2.8	2.4	2.8	3.2
10	4.5	5.4	5.6	3.8	4.5	4.1	2.9	2.5	2.7	2.4	2.8	3.4
11	4.1	4.8	5.0	3.8	4.2	4.1	2.7	2.7	2.7	2.4	3.9	3.5
12	4.2	4.7	4.9	3.7	4.2	4.5	2.8	2.6	2.5	2.4	4.0	4.0
13	4.1	4.6	4.8	4.1	4.0	4.5	2.7	2.6	2.5	2.3	3.5	4.0
14	4.1	4.5	4.8	3.9	3.9	4.2	2.6	2.6	2.6	2.4	3.5	4.0
15	4.2	4.6	4.6	3.7	3.8	4.1	2.6	2.5	2.6	2.5	3.4	3.8
16	4.0	4.5	4.3	3.8	3.8	4.0	2.5	2.5	2.5	2.4	3.3	3.9
17	3.9	4.8	4.4	3.6	3.7	4.1	2.7	2.5	2.8	2.3	3.2	4.0
18	4.1	4.9	4.0	3.7	3.6	4.0	2.7	2.4	2.5	2.4	3.1	3.9
19	4.5	4.7	4.1	4.2	3.6	4.8	2.6	2.5	2.4	2.3	3.1	3.8
20	5.4	4.6	4.4	4.3	3.6	4.1	2.5	2.4	2.4	2.4	3.5	3.6
21	5.5	4.7	5.0	4.2	3.5	3.9	2.5	2.4	2.5	2.4	2.8	3.5
22	11.0	7.1	5.2	4.1	3.4	3.7	2.7	2.6	2.5	2.3	3.1	3.5
23	7.7	7.1	5.0	4.1	3.4	3.6	2.7	2.4	2.4	2.4	3.0	3.3
24	6.1	6.1	5.2	4.0	3.3	3.5	2.7	2.4	2.4	2.4	3.0	3.5
25	5.2	5.7	5.6	4.2	4.2	3.3	2.6	2.5	2.5	2.4	3.1	3.7
26	5.8	5.4	5.8	4.8	6.1	3.2	2.7	2.5	2.6	2.4	3.2	4.7
27	4.6	5.5	5.6	6.0	5.4	3.2	2.6	2.4	2.5	2.4	3.2	4.6
28	4.5	11.1	5.1	5.6	5.4	3.2	2.7	2.4	2.7	2.4	3.1	4.5
29	4.2	......	4.8	5.1	4.7	3.3	2.6	2.4	2.6	2.5	3.1	4.5
30	3.5	......	4.8	5.1	4.4	3.2	2.7	2.4	2.7	2.3	3.1	5.4
31	4.0	......	4.5	......	4.5	......	2.6	2.4	......	2.3	......	5.2

NOTE.—Ice present from Jan. 1 to about Jan. 21, from about Feb. 5 to about Feb. 28, and from about Dec. 7 to 31. Relation of gage height to discharge probably affected by backwater from ice jam Feb. 28. It is not known whether gage readings were to water surface or to the top of the ice during these periods. Gage heights Jan. 1 to May 10 corrected for error in chain length.

Daily discharge, in second-feet, of West Branch of Delaware River at Hancock, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	845	19,500	1,470	1,990	1,850	400	83	60	110	41	295
2	......	845	14,400	1,130	1,590	1,350	295	110	60	110	60	250
3	......	755	9,020	1,030	1,720	1,130	400	110	60	41	41	295
4	......	670	6,500	935	1,590	935	295	83	175	83	41	295
5	......	......	5,150	845	1,470	755	295	83	295	83	110	250
6	......	......	4,680	845	1,130	1,350	210	83	250	60	210	250
7	......	......	9,020	755	1,030	1,470	140	60	345	60	295	......
8	......	......	6,210	1,030	1,130	1,350	210	83	210	60	250	......
9	......	......	4,220	845	1,030	1,130	175	110	175	60	175	......
10	......	......	3,150	755	1,470	1,030	210	83	140	60	175	......
11	......	......	2,130	755	1,130	1,030	140	140	140	60	845	......
12	......	......	1,990	670	1,130	1,470	175	110	83	60	935	......
13	......	......	1,850	1,030	935	1,470	140	110	83	41	525	......
14	......	......	1,850	845	845	1,130	110	110	110	60	525	......
15	......	......	1,590	670	755	1,030	110	83	110	83	460	......
16	......	......	1,240	755	755	935	83	83	83	60	400	......
17	......	......	1,350	595	670	1,030	140	83	175	41	345	......
18	......	......	935	670	595	935	140	60	83	60	295	......
19	......	......	1,030	1,130	595	1,850	110	83	60	41	295	......
20	......	......	1,350	1,240	595	1,030	83	60	60	60	525	......
21	......	......	2,130	1,130	525	845	83	60	83	60	175	......
22	21,100	......	2,440	1,030	460	670	140	110	83	41	295	......
23	8,690	......	2,130	1,030	460	595	140	60	60	60	250	......
24	4,220	......	2,440	935	400	525	140	60	60	60	250	......
25	2,440	......	3,150	1,130	1,130	400	110	83	83	60	295	......

Daily discharge, in second-feet, of West Branch of Delaware River at Hancock, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	3,560	....	3,560	1,850	4,220	345	140	83	110	60	345	......
27	1,590	....	3,150	4,000	2,780	345	110	60	83	60	345	......
28	1,470	8,000	2,280	3,150	2,780	345	140	60	140	60	295	......
29	1,130	....	1,850	2,280	1,720	400	110	60	110	83	295	......
30	525	....	1,850	2,280	1,350	345	140	60	140	41	295	......
31	935	....	1,470	....	1,470	....	110	60	....	41	....	......

NOTE.—Daily discharge determined from a discharge rating curve fairly well defined. Assumed unaffected by ice except Feb. 28, for which date the discharge is estimated from the discharge of East Branch of of Delaware River.

All determinations revised on the basis of a new discharge rating curve, superseding those published in the New York State report for 1910.

Monthly discharge of West Branch of Delaware River at Hancock, N. Y., for 1910.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	21,100	....	1,590	2.34	2.70	C.
February	[a] 8,000	....	972	1.43	1.49	D.
March	19,500	935	3,990	5.87	6.77	A.
April	4,000	595	1,230	1.81	2.02	A.
May	4,220	400	1,270	1.87	2.16	A.
June	1,850	345	969	1.43	1.60	A.
July	400	83	169	.249	.29	A.
August	140	60	82.8	.122	.14	B.
September	345	60	124	.182	.20	A.
October	110	41	61.9	.091	.10	B.
November	935	41	313	.460	.51	A.
December	....	....	295	.434	.50	D.
The year	21,100	41	925	1.36	18.48	

[a] Estimated.

NOTE.—Discharge for periods during which ice existed computed from the discharge of Delaware River at Port Jervis and at Riegelsville.

Mean discharge Jan. 1 to 21, estimated, 180 second-feet; practically constant.

Mean discharge Feb. 5 to 27, estimated, 700 second-feet; slight variation.

Mean discharge Dec. 7 to 31, estimated, 300 second-feet; nearly constant.

Determinations for this station published in the New York State report for 1910 revised by means of a new discharge rating curve.

MONGAUP RIVER NEAR RIO, N. Y.

This station, which is located at the steel highway bridge at Partridge ranch, near Rio, about 6 miles above Mongaup village and about 14 miles from Port Jervis, N. Y., was established December 8, 1906. The station is maintained by Charles H. Cooke, civil engineer, of New York City, in cooperation with the United States Geological Survey and the State engineer department of New York. On account of inability to obtain reliable gage readings, earlier observations at this station have not been published.

The bridge, to which the chain gage is attached, has a span of 140 feet. The stream flows in one channel at all stages and measurements are made from the downstream side of the bridge, or by wading.

The channel above the station is straight for about 500 feet and during low and medium stages is divided into two parts by a small island just above the bridge. The channel below the bridge is straight for about 200 feet, when it makes an abrupt turn to the right. The banks on either side are of medium height and overflow only during extreme high stages.

Conditions for measuring at this point are fairly good except in low stages, when the current becomes rather sluggish. Low-water measurements are usually made by wading at the ripples below the bridge. A good discharge rating curve has been developed for stages below 3 feet.

The gage heights are not materially affected by the operation of the small plants above the station.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

The following discharge measurement was made in 1910 by C. C. Covert:

May 12: Width, 138 feet; area, 226 square feet, gage height, 1.63 feet, discharge, 364 second-feet.

Daily gage height, in feet, of Mongaup River near Rio, N. Y., for 1910.

[Mrs. C. S. Rolles, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	1.48	4.70	1.98	2.25	1.26	0.95	0.68	0.76	0.61	0.62	0.98
2	......	1.46	4.95	1.85	2.05	1.25	.94	.70	.80	.59	.60	.92
3	......	1.48	4.70	1.49	2.10	1.22	.88	.70	.86	.58	.72	.92
4	......	1.38	4.40	1.60	2.20	1.16	.86	.72	1.10	.60	1.15	.98
5	......	1.35	3.90	1.55	2.05	1.18	.89	.82	.99	.56	1.62	1.06
6	......	1.32	3.55	1.56	2.02	1.75	.86	.75	.90	.61	1.55	1.12
7	......	1.30	3.95	2.05	1.90	1.62	.82	.72	.86	.62	1.35	1.10
8	......	1.52	3.80	1.98	1.78	1.30	.85	.72	.81	.72	1.15	1.22
9	......	1.58	2.50	1.78	1.71	1.25	.82	.70	.74	.58	1.02	1.12
10	......	1.58	2.25	1.80	1.75	1.40	.76	.66	.75	.59	1.00	1.09
11	......	1.44	2.25	1.62	1.68	1.65	.80	1.25	.74	.64	1.04	......
12	......	1.48	2.21	1.55	1.62	1.70	.78	1.02	.72	.60	1.00	......
13	......	1.52	2.22	1.46	1.59	1.78	.75	.92	.72	.62	1.00	......
14	......	1.60	2.50	1.35	1.50	1.48	.74	.76	.72	.60	.98	......
15	......	1.58	2.28	1.45	1.45	1.42	.75	.75	.76	.62	.95	......
16	......	1.52	2.20	1.45	1.41	1.40	.76	.78	.71	.61	.89	......
17	......	1.55	2.08	1.50	1.40	1.45	.82	.78	.66	.60	.95	......
18	......	1.58	2.05	1.58	1.45	1.38	.91	.94	.70	.60	.91	......
19	......	1.56	2.00	2.82	1.50	1.32	.81	.90	.66	.55	.86	......
20	......	1.55	2.18	2.35	1.49	1.21	.75	.86	.69	.56	.86	......
21	......	1.58	2.68	2.00	1.48	1.12	.79	.80	.69	.59	.88	......
22	6.30	2.42	2.58	1.80	1.50	1.08	.80	.72	.68	.71	.89	......
23	3.35	2.39	2.45	1.68	1.44	1.02	.80	.75	.62	.66	.81	......
24	2.55	2.38	2.55	1.65	1.59	1.00	.78	.75	.62	.64	.84	......
25	2.16	2.22	2.52	2.15	1.60	.98	.70	.76	.61	.61	.90	......
26	1.95	2.21	2.46	4.60	1.60	1.04	.68	.68	.62	.64	1.01	......
27	1.95	2.05	2.18	3.45	1.48	.95	.68	.66	.70	.62	.99	......
28	1.80	2.68	2.22	2.66	1.42	.98	.72	.64	.70	.60	.88	......
29	1.68	......	2.11	2.45	1.38	.98	.68	.65	.68	.61	1.02	......
30	1.60	......	2.00	2.50	1.29	.90	.70	.70	.61	.68	1.00	......
31	1.62	......	2.02	......	1.22	......	.70	.68	......	.61	......	......

NOTE.—Ice present at this station from Jan. 1 to 22, from about Feb. 5 to about Feb. 27, and from about Dec. 4 to 31. Ice jam Jan. 22. Relation of gage height to discharge probably also affected by backwater from ice jam Feb. 28 to Mar. 8. Gage heights were probably read to water surface during the winter.

Daily discharge, in second-feet, of Mongaup River near Rio, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		292	3,040	548	710	206	100	42	56	32	33	109
2		284	2,000	472	590	202	98	45	63	29	30	92
3		292	1,500	296	620	192	81	45	77	28	49	92
4		252	1,000	345	680	171	77	49	150	30	168	
5			1,000	322	590	178	84	68	112	26	355	
6			900	327	572	420	77	54	86	32	322	
7			900	590	500	355	68	49	77	33	240	
8			900	548	435	220	74	49	65	49	168	
9			880	435	400	202	68	45	52	28	122	
10			710	445	420	260	56	39	54	29	115	
11			710	355	385	370	63	202	52	36	129	
12			686	322	355	395	59	122	49	30	115	
13			692	284	340	435	54	92	49	33	115	
14			880	240	300	292	52	56	49	30	109	
15			728	280	280	268	54	54	56	33	100	
16			680	280	264	260	56	59	47	32	84	
17			608	300	260	280	68	59	39	30	100	
18			590	336	280	252	89	98	45	30	89	
19			560	1,120	300	228	65	86	39	25	77	
20			668	775	296	188	54	77	44	26	77	
21			1,010	560	292	157	61	63	44	29	81	
22	2,500		936	445	300	143	63	49	42	47	84	
23	1,580		845	385	276	122	63	54	33	39	65	
24	915		915	370	340	115	59	54	33	36	72	
25	656		894	650	345	109	45	56	32	32	86	
26	530		852	2,910	345	129	42	42	33	36	118	
27	530		668	1,660	292	100	42	39	45	33	112	
28	445	1,010	692	992	268	109	49	36	45	30	81	
29	385		626	845	252	109	42	38	42	32	122	
30	345		560	880	216	86	45	45	32	42	115	
31	355		572		192		45	42		32		

NOTE.—Daily discharge determined from a rating curve well defined below 1,000 second-feet. Discharge Jan. 22 and Mar. 2 to 8 estimated because of probable backwater from ice jams. The relation of gage height to discharge may also have been affected by ice at other times during January and February and the first of March.

Determinations of discharge Feb. 5 to 27, Mar. 2 to 8, and Dec. 4 to 10, as published in the 1910 New York State report, have been revised. Daily discharge Feb. 5 to 27 and Dec. 4 to 10 not published in Federal report, as it is only very approximate.

Monthly discharge of Mongaup River near Rio, N. Y., for 1910.

[Drainage area, 189 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	a 2,500		306	1.62	1.87	C.
February	1,010		240	1.27	1.32	C.
March	3,040	560	910	4.83	5.57	C.
April	2,910	240	611	3.23	3.60	A.
May	710	192	377	1.99	2.29	A.
June	435	86	218	1.15	1.28	A.
July	100	42	63	.333	.38	A.
August	202	36	61.5	.325	.37	A.
September	150	32	54.7	.289	.32	A.
October	49	25	32.5	.172	.20	A.
November	355	30	118	.624	.70	A.
December			150	.794	.92	D.
The year	3,040	25	262	1.39	18.82	

a Estimated.

NOTE.—Discharge for periods during which ice was present estimated by means of climatologic records and the discharge at other stations in the Delaware River basin.

Mean discharge Jan. 1 to 21 estimated 60 second-feet; practically constant.

Mean discharge Feb. 5 to 27 estimated 200 second-feet; slightly variable.

Mean discharge Dec. 3 to 31 estimated 156 second-feet; nearly constant.

Determinations of discharge for January to March and December in the above table are revisions of and supersede those published in the New York State report for 1910.

NEVERSINK RIVER AT GODEFFROY, N. Y.

Neversink River is formed by the confluence of its East and West branches, in the northern part of Sullivan County, and flows southward across Sullivan and Orange counties into Delaware River at Port Jervis.

Its principal tributaries are Sheldrake Creek, which comes in from the west through a chain of lakes and joins the river at Thompsonville, about 25 miles from the mouth; and Bush Kill, a small tributary from the same side, joining at Oakland Valley, some 12 miles farther downstream. From the east Basher Kill, a tributary of considerable importance, formed by Pine Kill and Gamauer Brook, flows into the Neversink near Godeffroy, about 9 miles from Port Jervis, and just above the gaging station which is located at the suspension highway bridge at this point.

The river drains a narrow valley along the southern slope of the Catskill Mountains. There are several reservoirs in the upper watershed, two of which are now in use. The principal power is located at Roses Point, near Cuddybackville, in the vicinity of the old Delaware & Hudson Canal. About half a mile above this point a low concrete dam diverts water through the old feeder ditch to the plant. This plant supplies Port Jervis, Middletown, and other small places in the vicinity with electric light and power.

The gaging station is located at the suspension highway bridge about half a mile east of the town of Godeffroy and 8 miles above the mouth of the river. A staff gage was established at this point August 4, 1903, and was washed out October 9 in the same year. The station was reestablished August 22, 1909, and is maintained in cooperation with the State engineer's department.

An enamel iron staff gage was bolted to the river face, downstream end of the left abutment. This gage was removed by a flood, January 21, 1910, and a chain gage was fastened to the left-hand downstream tower on August 1, 1910, at the same datum. This datum is 0.98 foot lower than that of the gage of 1903. The new gage datum has remained the same during the maintenance of the station. The area of the drainage basin above the station is 314 square miles; area above mouth is 346 square miles.

Measurements are made at the suspension bridge except at low stages, when they are made by wading. Conditions of flow are very unstable at this station, and hence the relation of gage height to discharge is liable to change at each flood stage. The daily gage heights are also affected by the controlling influence of power plants above the station. As a result it is impossible to obtain the correct mean daily gage heights, particularly at low stages, without the use of an automatic gage.

Accurate computation of the diurnal fluctuation of discharge caused by the operation of the mills above the station has been rendered impossible by insufficient funds. It is proposed to install an automatic gage to determine the relation between the daily gage heights heretofore recorded and the true mean gage heights, thus making possible the publication of accurate computations of daily discharge from the inception of the station to date. The gage heights for 1910 are withheld pending this investigation, since no gage heights recorded at this station are true indexes of the daily discharge.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor, State of New York.

Discharge measurements of Neversink River at Godeffroy, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar 6	W. G. Hoyt	160	817	5.15	2,530
10	.....do	157	674	4.85	1,680
July 29[a]	.....do	117	109	2.85	81.8
Aug. 1	.....do	145	183	3.25	211

[a] Wading measurement below bridge.

LEHIGH RIVER AT SOUTH BETHLEHEM, PA.

Lehigh River at South Bethlehem, exclusive of Monocacy Creek, drains 1,235 square miles, and including Monocacy Creek at high stages drains 1,286 square miles of territory in nine counties of Pennsylvania. The river rises in the Pocono Mountains at an elevation of approximately 2,000 feet above sea level and its slope is steep throughout its course, falling in the lower 45 miles from Mauch Chunk to Easton, where it joins Delaware River, about 8 feet to the mile; for the 40 miles above Mauch Chunk the slope is about 24 feet to the mile. It is crossed between Easton and Mauch Chunk by nine dams of the Lehigh Coal & Navigation Co., erected to deflect the water into the Lehigh Canal.

The gaging station, which is located on the New Street Bridge, connecting Bethlehem and South Bethlehem, was established by the United States Geological Survey September 22, 1902, and was until February 13, 1905, under the supervision of Prof. Mansfield Merriam, of Lehigh University. On that date the station was discontinued, but was reestablished by the Water Supply Commission of Pennsylvania at the same point on April 26, 1909.

The present equipment consists of a standard chain-and-weight gage, similar to that previously employed, the new datum being 0.09 foot higher than the old. The elevation of the zero of the present gage is 210.64 feet above sea level.

The channel is straight for one-third mile above station and for several hundred feet below the station. A low rubble dam, built across a portion of the channel a few hundred feet below the bridge late in the fall of 1902, caused an alteration in the rating curve. Changes in this dam caused a further slight change in the rating curve between 1905 and 1909.

The left bank is low and is overflowed at high stages; the right bank is high and does not overflow. The river bed consists of sand, gravel, and bowlders and seems to be fairly permanent, with good velocity at low stages.

The relation between gage height and discharge is little affected by ice.

The Lehigh Canal follows the left bank and passes over Monocacy Creek and under the left span of the bridge; the creek also passes under the bridge, entering the river a short distance below. An ice plant and gristmill take water from the canal and return it to the river above the bridge. The canal is measured at Main Street Bridge, one-third mile above the station, and the discharge, reduced by the amount of tailrace flow of ice plant and gristmill, is added to the river discharge.

At high stages the river overflows into the canal and creek.

Excessive floods are known to have occurred on the Lehigh in 1862 and 1869, when the stage reached about 21.48 feet and 20.5 feet, respectively, as reported to the present datum. The discharges were approximately 66,000 and 62,000 second-feet, respectively, or 53.4 and 50.2 second-feet per square mile. On account of the congestion of industry between Allentown and the mouth, considerable damage has been done by floods on the Lehigh.

The station since its reestablishment has been operated by the Water Supply Commission of Pennsylvania, and many of the measurements have been made by students of Lehigh University, under the direction of the civil engineering department.

Complete data for this station are published in Water-Supply Paper 261.

Daily gage height, in feet, of Lehigh River at South Bethlehem, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.03	3.19	8.45	2.83	4.80	3.39	2.57	1.88	2.09	1.77	1.67	2.28
2	2.08	3.08	8.06	2.75	4.49	3.27	2.50	1.76	1.98	1.68	1.96	2.29
3	2.40	3.08	7.62	2.80	4.25	3.27	2.48	1.75	2.02	1.81	2.08	2.20
4	2.15	3.05	6.58	2.60	4.15	3.34	2.44	1.79	2.38	1.66	1.98	2.02
5	2.51	2.96	5.95	2.68	3.92	3.13	2.43	1.99	2.33	1.69	2.34	2.13
6	2.20	3.85	5.72	2.73	3.59	3.61	2.39	1.93	2.02	1.62	2.26	2.11
7	2.39	2.57	6.10	2.93	3.48	3.38	2.33	1.81	2.08	1.79	2.32	1.98
8	2.80	2.56	6.04	2.88	3.34	3.13	2.52	1.86	2.12	1.75	2.22	1.94
9	2.56	3.84	5.38	2.76	3.62	3.01	2.47	1.97	2.03	1.69	2.15	1.85
10	2.53	3.85	4.91	2.68	3.66	3.07	2.40	2.10	1.92	1.72	2.16	1.80

Daily gage height, in feet, of Lehigh River at South Bethlehem, Pa., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	2.40	2.70	4.91	2.64	3.46	3.27	2.65	2.32	1.83	1.65	2.05	1.79
12	2.31	2.54	4.36	2.60	3.33	3.41	2.46	2.19	1.97	1.63	2.39	1.85
13	2.31	2.50	4.07	2.52	3.20	3.36	2.28	2.02	1.89	1.65	2.27	2.03
14	2.29	2.54	3.84	2.53	3.08	3.13	2.10	1.94	2.45	1.57	2.34	1.93
15	2.15	2.62	3.81	2.48	2.96	2.98	2.15	2.04	2.42	1.41.	2.27	2.02
16	2.05	2.71	3.78	2.41	2.92	3.08	2.08	1.97	2.22	1.60	2.16	1.95
17	2.21	2.80	3.68	2.37	2.83	3.65	2.32	1.90	1.97	1.71	2.25	2.14
18	2.29	3.68	3.57	4.76	2.80	3.60	2.35	1.80	1.88	1.73	2.14	1.92
19	2.65	3.34	3.39	5.98	2.81	3.48	2.22	1.77	1.95	1.54	2.13	2.00
20	2.07	3.10	3.34	5.56	2.77	3.14	2.15	1.90	1.87	1.70	2.01	2.04
21	2.09	5.06	3.48	5.09	3.32	3.84	2.10	1.84	1.70	1.66	2.15	1.94
22	12.28	6.74	3.52	4.70	3.25	3.40	2.02	1.83	1.84	1.69	2.10	1.88
23	7.43	5.71	3.40	4.30	3.14	3.26	2.00	1.84	1.71	1.70	2.11	1.85
24	5.69	4.49	3.33	4.18	3.12	3.35	1.91	1.80	1.66	1.90	1.94	2.58
25	4.96	3.95	3.25	7.48	5.01	2.97	1.97	1.81	1.68	1.77	2.04	3.26
26	4.33	3.70	3.20	7.99	5.26	2.88	1.93	1.76	1.85	1.71	2.07	2.79
27	4.11	3.77	3.12	7.06	4.81	2.88	1.83	1.52	1.86	1.72	2.04	2.81
28	3.85	5.95	3.16	5.88	4.32	2.88	1.90	1.64	1.91	1.74	2.11	2.69
29	3.69	......	3.07	5.17	4.00	2.80	1.86	1.81	1.82	1.62	2.17	2.75
30	3.43	......	2.98	5.52	3.74	2.72	1.76	1.68	1.87	1.54	2.21	2.93
31	3.41	......	2.86	......	3.46	......	1.88	1.63	......	1.72	......	3 12

NOTE.—Relation between gage height and discharge probably affected by ice from about Jan. 1 to 21.
Comparisons of gage heights at this station with those at other stations in the Delaware River basin indicate that the gage heights recorded for Feb. 6, 9, and 10 were 1 foot too high.
Water restored to the canal Mar. 14 and withdrawn Dec. 2.

Daily discharge, in second-feet, of Lehigh River at South Bethlehem, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	1,910	14,500	1,450	5,020	2,260	1,140	486	652	410	347	826
2	......	1,750	13,400	1,350	4,320	2,070	1,060	404	560	353	545	836
3	......	1,750	12,200	1,420	3,820	2,070	1,030	398	592	437	643	705
4	......	1,700	9,370	1,170	3,620	2,180	989	424	925	341	560	547
5	......	1,580	7,760	1,270	3,190	1,860	978	568	875	359	885	642
6	......	1,440	7,180	1,330	2,600	2,630	935	522	592	317	807	624
7	......	1,090	8,130	1,590	2,410	2,250	875	437	643	424	865	515
8	......	1,080	7,980	1,520	2,180	1,860	1,080	472	678	398	769	485
9	......	1,420	6,340	1,360	2,650	1,690	1,020	552	600	359	705	420
10	......	1,440	5,220	1,270	2,720	1,780	945	660	515	378	714	385
11	......	1,240	5,220	1,220	2,380	2,070	1,230	865	451	335	618	378
12	......	1,060	4,000	1,170	2,170	2,300	1,010	741	552	323	935	420
13	......	1,010	3,420	1,080	1,960	2,220	826	592	493	335	818	556
14	......	1,060	3,040	1,090	1,790	1,860	660	530	1,000	288	885	478
15	......	1,150	2,990	1,030	1,630	1,650	705	609	967	205	816	547
16	......	1,270	2,930	956	1,570	1,790	643	552	769	305	714	492
17	......	1,370	2,760	915	1,450	2,700	865	500	552	372	798	651
18	......	2,710	2,560	4,920	1,420	2,620	895	430	486	384	696	470
19	......	2,140	2,260	7,880	1,430	2,410	769	410	538	272	687	530
20	......	1,780	2,180	6,820	1,380	1,880	705	500	479	365	584	564
21	......	5,570	2,410	5,690	2,150	3,040	660	458	365	341	705	485
22	26,800	9,780	2,480	4,780	2,040	2,280	592	451	458	359	660	441
23	11,600	7,160	2,280	3,920	1,880	2,060	575	458	372	365	669	420
24	7,100	4,280	2,170	3,680	1,850	2,200	508	430	341	500	530	1,100
25	5,340	3,200	2,040	11,800	5,500	1,640	552	437	353	410	609	2,010
26	3,940	2,740	1,960	13,200	6,100	1,520	522	404	465	372	634	1,360
27	3,500	2,870	1,850	10,700	5,040	1,520	451	261	472	378	609	1,380
28	3,020	7,760	1,910	7,620	3,970	1,520	500	329	508	391	669	1,230
29	2,730	......	1,780	5,880	3,340	1,420	472	437	444	317	723	1,310
30	2,280	......	1,650	6,720	2,860	1,320	404	353	479	272	760	1,540
31	2,250	......	1,490	......	2,380	......	486	323	......	378	......	1,800

NOTE.—Daily discharge determined from a well-defined discharge rating curve.
Discharge Feb. 6, 9, and 10 applied to the gage heights of the respective days after a reduction of 1 foot in the recorded gage height.
During the period Mar. 14 to Dec. 2, when the canal was in operation, 45 second-feet was added to the daily discharge.

Monthly discharge of Lehigh River at South Bethlehem, Pa., for 1910.

[Drainage area, 1,235 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	26,800	....	2,650	2.15	2.48	B.
February	9,780	1,010	2,620	2.12	2.21	A.
March	14,500	1,490	4,690	3.80	4.38	A.
April	13,200	915	3,830	3.10	3.46	A.
May	6,100	1,380	2,800	2.27	2.62	A.
June	3,040	1,320	2,020	1.64	1.83	A.
July	1,230	404	777	.629	.73	A.
August	865	261	484	.392	.45	A.
September	1,000	341	573	.464	.52	A.
October	500	205	356	.288	.33	A.
November	935	347	699	.566	.63	A.
December	2,010	378	779	.631	.73	A.
The year	26,800	205	1,850	1.50	20.37	

NOTE.—Includes the flow of the canal.
Discharge for periods during which ice was present determined by means of climatologic records.
Mean discharge, Jan. 1 to 21, estimated 650 second-feet.

TOHICKON CREEK AT POINT PLEASANT, PA.

Tohickon Creek rises in the western part of Bucks County, Pa., and flows eastward into the Delaware at Point Pleasant. Its drainage area comprises about 102 square miles, the greater part being farm land under a high degree of cultivation, the original forest cover having been almost entirely cut away. The stream is subject to very sudden freshets, and during heavy rains large quantities of surface soil are eroded.

The gaging station is located about one-eighth mile above the mouth of the creek, and the records show the discharge of practically the entire drainage area. The fall of the stream from its source to the gaging station is about 600 feet in 28 miles. Continuous records of flow have been obtained each year since 1883, with the exception of 1900, by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the following data have been furnished.

An automatic gage is used to obtain a continuous record of gage height. The lower part of the rating curve has been developed from the computed discharge over a weir, and the discharge at high stages is determined from a curve developed from current-meter measurements. The discharge rating curve is well defined.

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.6	95.0	3,064.0	20.1	216.5	20.7	11.6	2.3	204.5	4.3	11.2	37.3
2	9.0	73.6	2,367.0	19.2	103.0	18.1	10.6	1.9	193.0	4.4	7.6	32.6
3	9.0	63.5	1,520.0	19.8	75.5	17.0	7.0	2.1	267.5	3.7	10.5	32.6
4	8.4	63.5	875.0	19.8	85.5	18.8	8.6	2.4	490.5	6.9	967.2	30.6
5	7.3	61.8	354.0	24.8	78.3	16.3	10.3	2.6	317.5	3.9	1,518.5	30.6
6	20.7	60.6	279.0	27.9	57.1	17.8	8.3	2.9	82.5	3.1	374.5	33.0
7	412.0	60.6	392.0	24.6	43.8	25.0	8.2	5.3	226.0	3.4	135.5	33.0
8	866.0	60.6	260.0	23.1	39.5	18.5	8.2	3.4	108.5	6.6	73.8	33.0
9	1,089.5	60.6	145.0	23.1	49.0	20.0	6.5	15.2	53.0	4.1	54.6	33.0
10	1,113.0	60.6	107.5	17.6	55.6	23.7	4.2	33.5	36.8	4.8	42.8	30.6
11	956.5	107.3	87.7	19.5	48.6	115.8	3.6	458.0	26.2	9.3	37.0	23.8
12	788.5	154.0	72.6	21.8	39.7	1,123.5	5.2	125.5	21.0	2.4	30.4	20.0
13	669.0	136.0	65.5	19.8	35.0	531.5	4.3	48.5	20.4	5.4	28.2	21.4
14	643.0	102.5	66.1	17.1	29.2	149.5	4.3	32.1	16.3	2.9	32.7	19.8
15	649.5	73.5	60.5	13.3	22.7	91.0	3.6	27.9	12.6	3.8	32.7	17.6
16	596.5	88.0	52.6	10.6	21.3	79.0	3.6	18.8	29.5	4.3	34.6	14.5
17	571.0	461.5	47.1	10.6	22.0	166.5	3.3	13.7	18.3	3.1	28.4	13.3
18	599.5	685.5	43.0	827.8	23.1	389.0	2.9	23.7	9.4	3.9	21.9	11.3
19	1,441.5	586.5	43.5	687.2	24.5	151.0	3.1	14.5	16.1	10.3	22.3	9.7
20	1,620.0	360.0	44.5	416.0	28.3	79.0	3.4	12.2	14.0	11.1	22.3	9.0
21	1,882.2	1,623.5	49.5	212.0	30.6	48.5	3.3	9.8	15.2	6.3	19.7	8.4
22	3,369.3	2,607.0	50.9	140.0	44.3	31.0	2.9	10.9	12.9	12.8	21.1	7.8
23	1,664.0	1,498.5	43.3	94.7	55.6	26.3	2.3	14.5	8.4	10.2	23.5	7.8
24	594.5	849.0	30.5	1,948.1	46.0	23.7	2.3	10.6	8.5	10.1	19.3	782.0
25	246.5	270.5	25.0	3,549.5	165.5	73.9	2.6	9.5	10.3	13.1	16.1	734.0
26	160.0	201.0	23.9	1,939.0	188.5	126.0	2.4	10.6	4.8	16.9	13.0	294.0
27	140.5	541.0	25.8	515.0	116.6	71.3	3.6	6.3	8.6	14.5	8.9	145.5
28	114.0	2,306.5	26.8	198.5	52.6	18.1	4.0	3.6	8.9	13.3	11.2	90.5
29	107.0	....	26.4	136.5	37.0	15.7	2.8	4.4	4.6	11.7	22.6	74.0
30	107.0	....	25.4	345.0	31.8	14.1	2.6	7.6	3.6	6.4	36.9	302.5
31	107.0	....	21.6	....	25.2	....	2.6	4.0	....	5.3	....	225.0

Monthly discharge of Tohickon Creek at Point Pleasant Pa., for 1910.

[Drainage area, 102 square miles.] T-69451

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	3,369.3	7.3	664	6.51	7.50
February	2,607.0	60.6	475	4.66	4.85
March	3,064.0	21.6	332	3.25	3.75
April	3,549.5	10.6	378	3.71	4.14
May	216.5	21.3	61.0	.598	.69
June	1,123.5	14.1	117	1.15	1.28
July	11.6	2.3	4.91	.048	.05
August	458.0	1.9	30.3	.297	.34
September	490.5	3.6	75.0	.735	.82
October	16.9	2.4	71.7	.703	.81
November	1,518.5	7.6	123	1.21	1.35
December	782.0	9.0	102	1.00	1.15
The year	3,369.3	1.9	195	1.91	26.73

NESHAMINY CREEK BELOW FORKS, PENNSYLVANIA.

Neshaminy Creek rises in the eastern part of Montgomery County, Pa., flows in a southeasterly and southerly course, and enters Delaware River at a point about 12 miles above Philadelphia. The drainage area, measured at the forks of the Big and Little Neshaminy, is 139 square miles, mostly farm land in a high state of cultivation, the original forest growth having been almost entirely cut away. The stream is subject to very sudden freshets, and during heavy rains large quantities of surface soil are eroded.

Continuous records of discharge have been obtained since 1884 by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the records have been furnished. The station is located a short distance below the junction of Big and Little Neshaminy creeks, and the discharge represents about one-half of the total drainage area of the stream. The fall of the stream from its source to the gaging station is about 600 feet in 27 miles.

An automatic gage is used to obtain a continuous record of gage height. The lower part of the rating curve has been developed from the computed discharge over a weir, and the discharge at high stages is determined from a curve developed from current-meter measurements. The discharge rating curve is well defined.

Daily discharge, in second-feet, of Neshaminy Creek below forks, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	93.0	129.5	3,539.0	43.5	415.0	41.0	28.5	7.9	50.0	7.2	8.4	42.0
2	105.0	129.5	883.0	44.0	345.5	33.5	27.0	7.4	167.5	7.7	10.0	37.5
3	105.0	183.5	552.0	44.5	156.0	35.0	38.0	8.2	70.0	7.5	88.2	35.5
4	105.0	213.0	358.0	54.0	151.0	37.5	36.0	25.0	55.0	6.7	1,070.5	40.0
5	105.0	179.5	295.0	64.0	134.5	36.5	28.0	50.5	47.5	6.8	627.0	41.0
6	157.5	126.5	287.0	56.0	119.0	41.5	25.7	55.5	38.0	6.9	185.0	36.0
7	1,039.6	107.0	419.5	45.5	106.5	43.0	13.7	18.5	58.0	8.3	106.5	33.5
8	896.0	97.5	300.5	39.5	110.5	35.0	13.0	32.0	55.0	8.5	80.0	31.0
9	684.0	88.0	188.5	36.5	119.0	35.0	15.5	170.0	28.7	8.5	69.0	31.0
10	455.0	150.5	159.0	34.5	105.5	325.5	13.2	611.5	20.7	8.5	60.0	31.0
11	321.5	213.0	144.0	32.5	91.0	217.5	11.2	823.5	19.0	9.2	54.0	36.0
12	214.0	256.5	134.0	26.0	85.5	1,464.2	11.7	88.5	19.0	9.2	48.5	41.0
13	215.0	290.0	126.5	29.0	77.5	729.5	12.7	39.5	16.5	8.7	40.5	43.5
14	197.5	222.0	121.0	31.0	68.0	417.5	12.0	28.5	14.3	8.7	36.5	43.5
15	197.5	153.0	108.5	31.0	59.0	144.5	12.2	24.0	13.5	8.1	35.5	41.0
16	188.0	375.2	97.5	27.5	52.0	134.5	12.7	21.0	11.3	8.1	39.5	41.0
17	323.0	1,215.2	87.0	40.0	50.0	144.0	12.7	18.5	11.0	7.9	37.0	41.0
18	538.5	499.0	83.5	938.5	56.0	124.5	12.7	19.0	11.2	7.5	33.5	41.0
19	2,519.5	272.5	87.5	488.5	58.0	103.5	17.5	19.0	10.2	23.3	29.5	64.0
20	2,706.5	280.0	83.0	393.5	53.0	90.5	17.0	20.5	9.5	244.5	33.5	85.5
21	3,296.5	2,032.2	83.0	187.5	67.5	71.5	13.2	16.2	9.5	80.0	28.0	85.0
22	1,735.5	2,149.3	82.0	129.5	73.5	58.5	13.5	10.7	10.0	36.0	25.5	88.0
23	474.5	1,392.5	74.5	109.0	56.5	49.5	12.2	16.5	9.2	35.0	26.0	84.5
24	334.0	720.5	72.0	1,901.1	48.5	41.5	11.7	13.0	7.8	29.5	24.0	740.0
25	267.5	199.5	69.0	1,870.0	88.5	36.5	12.5	13.5	7.8	20.5	24.5	705.0
26	227.5	166.0	61.0	2,012.5	301.5	32.0	11.2	13.7	8.5	12.5	24.7	286.5
27	200.5	299.5	53.0	490.5	109.0	33.5	10.0	14.0	7.9	14.5	20.1	193.5
28	191.5	1,673.6	50.0	307.1	58.5	36.0	7.9	12.2	8.1	16.5	22.0	164.0
29	175.0	....	48.0	264.0	44.0	33.5	7.2	11.7	7.7	10.8	38.0	134.5
30	175.0	....	45.0	358.0	42.0	31.0	9.2	12.5	7.3	8.3	48.0	159.0
31	164.5	....	44.0	....	43.0	....	9.2	13.5	....	8.2	....	258.0

Monthly discharge of Neshaminy Creek below forks, Pa., for 1910.

[Drainage area, 139 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	3,296.5	93.0	594	4.27	4.92
February	2,149.3	88.0	493	3.55	3.70
March	3,539.0	44.0	282	2.03	2.34
April	2,012.5	26.0	338	2.43	2.71
May	415.0	42.0	108	.777	.90
June	1,464.2	31.0	155	1.12	1.25
July	38.0	7.2	15.8	.114	.13
August	823.5	7.4	72.1	.519	.60
September	167.5	7.3	27.0	.194	.22
October	244.5	6.7	22.1	.159	.18
November	1,070.5	8.4	99.1	.713	.80
December	740.0	31.0	120	.864	1.00
The year	3,539.0	6.7	1,920	1.38	18.75

SCHUYLKILL RIVER NEAR PHILADELPHIA, PA.

Schuylkill River rises in the central part of Schuylkill County, Pa., flows southeastward, and unites with the Delaware at Philadelphia. Its length is about 100 miles and its drainage area measures about 1,920 square miles. The headwaters of the river lie in a mountainous, coal-bearing region, but 25 or 30 miles below its source it enters a more highly cultivated country and the slope becomes more gentle. There are no lakes in the basin, but there are three artificial reservoirs (Silver Creek and Lower and Upper Tumbling Run reservoirs) constructed for the benefit of navigation. The flow of the river is tolerably constant, but the freshets, notwithstanding the considerable storage, are severe. The Schuylkill is navigable for ocean-going vessels only as far as Fairmount, 8.4 miles from the mouth, where the first dam is built across the river. Above that point it is navigable for river boats as far as Schuylkill Haven.

With the exception of a small amount of water drawn from the Delaware, the entire water supply for the city of Philadelphia comes from the Schuylkill. The river receives a large amount of pollution from various sources, and a filtering plant for the city has been nearly completed.

Records of the height of the river at Fairmount Pool have been kept for many years, but not in such form as to be useful for the computation of daily discharges. Begining with 1898, however, careful estimates have been prepared by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the records have been furnished. The station is located at the Fairmount dam near Philadelphia.

The computed daily discharge represents the total flow of the river as determined from the amount wasted over the flashboards at the Fairmount dam, the pumpage from the river, the leakage, and the quantity used for power at Fairmount.

Daily discharge, in second-feet, of Schuylkill River near Philadelphia, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	266	1,154	23,627	731	2,958	2,193	1,336	215	215	381	202	378
2	235	942	17,112	731	2,268	1,373	1,700	215	1,008	205	202	378
3	250	1,142	11,772	731	1,818	865	1,619	215	1,565	205	221	378
4	250	1,324	9,262	676	1,568	1,351	1,373	282	1,654	205	1,461	378
5	387	1,144	7,477	676	1,424	1,721	1,285	282	1,822	205	7,513	378
6	387	632	6,447	437	1,191	1,381	1,106	282	1,573	205	2,197	378
7	542	434	5,926	437	1,058	1,818	705	282	1,484	205	1,326	378
8	747	373	4,892	676	1,123	1,306	597	330	1,484	205	902	378
9	830	346	4,067	676	1,193	1,217	453	664	1,179	205	615	378
10	645	542	3,261	567	1,348	1,448	488	1,091	796	205	503	378
11	465	542	2,506	507	1,348	1,450	571	2,491	558	205	461	295
12	387	351	2,506	507	1,193	2,710	571	868	558	205	294	295
13	266	351	2,506	487	1,128	4,073	482	474	558	205	202	295
14	266	434	2,101	701	988	2,240	482	282	558	205	294	295
15	235	484	1,741	413	918	1,781	398	282	558	205	331	295
16	240	1,154	1,706	389	673	2,079	398	282	474	205	331	295
17	327	1,949	1,541	511	673	5,184	399	474	390	205	260	378
18	327	5,427	1,456	642	673	5,694	565	390	390	205	294	378
19	646	5,188	1,386	7,662	526	6,834	795	1,484	390	205	294	203
20	1,035	2,994	1,241	4,752	620	6,574	470	857	237	334	288	228
21	4,249	4,948	1,241	6,927	688	4,385	353	410	215	288	294	286
22	36,607	20,670	1,241	4,711	1,263	3,024	353	390	215	349	350	286
23	21,671	17,485	1,471	3,727	1,508	2,380	353	215	215	349	294	286
24	8,099	7,570	1,316	3,491	1,068	2,177	336	215	215	464	294	682
25	4,560	3,986	1,241	12,688	848	1,734	215	215	215	405	329	625
26	3,263	2,619	1,166	11,272	8,559	1,254	215	215	538	320	329	682
27	2,314	2,314	1,166	6,957	6,314	1,094	215	215	840	205	285	1,181
28	1,959	13,420	1,166	4,604	4,098	840	215	215	731	297	285	570
29	1,799	......	1,106	3,291	2,958	840	215	215	558	205	294	514
30	1,454	......	1,106	3,091	2,178	904	215	215	428	205	427	1,047
31	1,314	......	1,054	......	1,658	......	215	215	......	205	......	1,549

NOTE.—Records that show no variation for several consecutive days were computed by periods and the discharge distributed uniformly through the days of each period. The variation during these periods was relatively small.

Monthly discharge of Schuylkill River near Philadelphia, Pa., for 1910

[Drainage area, 1,920 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	36,607	235	3,100	1.62	1.87
February	20,670	346	3,570	1.86	1.94
March	23,627	1,054	4,060	2.11	2.43
April	12,688	389	2,790	1.45	1.62
May	8,559	526	1,800	.938	1.08
June	6,834	840	2,400	1.25	1.40
July	1,700	215	603	.314	.36
August	2,491	215	467	.243	.28
September	1,822	215	721	.376	.42
October	464	205	248	.129	.15
November	7,513	202	712	.371	.41
December	1,549	203	466	.243	.28
The year	36,607	202	1,730	.901	12.24

PERKIOMEN CREEK NEAR FREDERICK, PA.

Perkiomen Creek rises in the western part of Bucks County, Pa., flows southward, and discharges into the Schuylkill about 7 miles above Norristown and 18 miles above Philadelphia. Its drainage area comprises about 345 square miles. The area is mostly in farm land under a high state of cultivation, the original forest growth having been almost entirely cut away. The stream is subject to very sudden freshets, and during heavy rains large quantities of surface soil are eroded.

Continuous records of discharge have been obtained since 1884 by the Philadelphia bureau of water, department of public works, under the personal supervision of John E. Codman, by whom the following records have been furnished. The station is located about 12 miles above the mouth of the creek and above the East Branch, and the discharge represents about one-third of the total area drained by the stream. The fall of the creek from its source to the gaging station is about 800 feet in 24 miles.

An automatic gage is used to obtain a continuous record of gage height. The lower part of the rating curve has been developed from the computed discharge over a weir, and the discharge at high stages is determined from a curve developed from current-meter measurements. The discharge rating curve is well defined.

Daily discharge, in second-feet, of Perkiomen Creek near Frederick, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	56.5	130.5	2,498.6	61.6	248.0	67.5	30.6	18.0	128.0	16.8	25.3	80.0
2	59.0	103.0	1,248.2	50.6	167.0	62.4	45.8	24.6	264.5	15.3	16.8	60.0
3	72.5	107.0	728.2	51.9	146.0	54.3	44.7	18.4	140.5	15.0	33.5	51.1
4	68.2	119.5	615.5	49.4	156.0	48.8	42.7	17.6	152.0	16.5	663.3	44.9
5	55.7	128.0	507.0	64.0	154.0	47.4	41.7	96.0	144.0	18.9	967.3	43.7
6	62.0	128.0	403.0	77.5	124.5	75.3	39.6	109.0	102.0	27.4	379.0	48.2
7	257.5	97.5	454.0	88.0	101.5	91.5	37.0	55.1	203.0	27.4	195.0	48.2
8	419.5	70.5	360.5	92.5	82.0	77.5	36.0	63.6	115.0	17.9	138.0	48.2
9	333.5	103.5	264.0	72.5	135.0	61.6	27.0	294.0	81.0	15.3	107.0	51.9
10	242.5	134.5	216.5	67.5	155.0	62.6	21.5	317.5	59.7	25.1	85.5	49.5
11	184.0	165.0	182.0	51.9	130.0	165.0	38.2	461.6	44.5	30.9	71.0	44.8
12	147.0	231.0	168.0	47.6	97.5	492.0	34.7	285.0	34.3	21.9	67.0	43.7
13	130.0	90.0	155.0	47.1	73.5	453.5	54.8	75.0	23.3	18.8	61.3	48.4
14	140.0	144.0	155.0	50.7	84.5	211.5	40.4	50.8	52.3	23.3	63.8	53.1
15	153.0	67.5	137.0	56.3	90.5	141.0	20.6	42.1	40.1	23.3	69.5	53.1
16	146.0	99.5	114.5	56.6	71.5	303.5	19.0	49.3	35.2	18.8	65.5	53.1
17	139.0	355.5	111.5	45.5	100.0	974.6	26.5	58.1	31.8	21.1	59.1	51.9
18	310.5	1,621.5	118.0	1,667.2	73.5	528.5	25.8	54.9	31.8	24.6	50.5	49.5
19	583.3	643.5	114.5	666.5	74.0	474.5	10.5	48.8	28.6	25.3	43.2	41.9
20	624.0	351.0	108.0	450.5	85.0	229.5	31.7	48.8	29.5	30.9	43.2	55.3
21	1,330.5	2,257.6	129.0	293.5	145.0	163.5	43.2	42.3	34.2	51.4	44.7	70.5
22	4,590.7	3,454.0	129.0	244.5	206.0	129.0	29.1	39.2	30.9	67.0	42.2	61.4
23	1,009.0	1,365.3	111.0	179.5	142.0	101.5	17.6	36.0	30.9	62.5	42.2	57.4
24	476.5	545.5	102.5	366.5	115.5	79.5	16.5	20.8	25.8	58.0	42.7	568.7
25	307.5	357.0	85.5	1,346.5	95.5	69.5	16.9	23.1	16.1	51.9	39.6	647.5
26	226.5	288.5	76.0	688.0	136.0	52.3	25.1	26.4	25.7	45.8	39.1	283.5
27	193.0	540.2	58.8	358.0	106.0	39.3	22.5	22.0	32.7	41.1	40.1	161.0
28	177.0	2,111.6	49.1	233.0	101.5	43.7	17.6	16.8	23.8	42.2	40.1	113.5
29	170.0	....	55.0	198.0	73.0	49.8	17.9	23.6	17.6	37.2	64.8	107.0
30	116.0	....	64.7	379.6	67.0	46.7	9.6	30.9	26.5	24.5	100.7	314.6
31	158.0	....	75.0	....	67.0	....	5.7	26.3	....	28.7	....	264.2

Monthly discharge of Perkiomen Creek near Frederick, Pa., for 1910.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	4,590.7	55.7	417	2.73	3.15
February	3,454.0	67.5	565	3.72	3.87
March	2,498.6	49.1	310	2.04	2.35
April	1,667.2	45.5	270	1.78	1.99
May	248.0	67.0	116	.763	.88
June	974.6	43.7	180	1.18	1.32
July	54.8	5.7	28.7	.189	.22
August	461.6	16.8	80.5	.530	.61
September	264.5	16.1	66.8	.439	.49
October	67.0	15.0	30.5	.201	.23
Novemebr	967.3	16.8	123	.809	.90
December	647.5	41.9	118	.776	.89
The year	4,590.7	5.7	189	1.24	16.90

WISSAHICKON CREEK NEAR PHILADELPHIA, PA.

Wissahickon Creek is the principal stream draining into Schuylkill River from the north below Perkiomen Creek. The following records which were inadvertently omitted from previous reports were furnished by John E. Codman:

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pa., for 1902 and 1903.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1902.			1902.			1902.		
1	82	110	11	68	96	21	31	362
2	73	120	12	66	120	22	31	1,032
3	68	338	13	64	130	23	26	320
4	68	135	14	75	84	24	33	202
5	68	140	15	66	108	25	84	162
6	80	149	16	45	2,495	26	140	150
7	101	111	17	45	675	27	132	177
8	85	103	18	38	253	28	96	166
9	64	96	19	27	206	29	71	133
10	66	87	20	27	186	30	71	133
						31	....	137

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1903.										
1	128	140	340	193	140	73	56	10	20	12
2	140	137	211	168	132	68	46	10	19	14
3	1,241	130	188	158	123	56	92	13	17	14
4	269	510	174	248	132	46	113	28	17	11
5	184	337	168	215	140	54	66	49	28	13
6	198	122	164	157	132	64	35	43	50	....
7	185	150	160	211	123	64	45	44	47	....
8	142	192	214	386	114	75	41	44	24	....
9	137	191	275	590	106	71	19	32	18	....
10	140	136	250	204	106	55	19	32	20	....
11	218	197	209	182	106	59	18	23	19	....
12	233	227	193	193	106	59	18	24	18	....
13	98	159	182	193	106	59	87	24	16	....
14	125	150	166	751	106	64	95	34	15	....
15	111	184	157	833	106	64	54	52	15	....

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pa., for 1902 and 1903—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1903.										
16	115	289	152	434	103	70	19	38	30	....
17	118	258	147	300	99	66	16	20	66	....
18	118	137	147	255	103	45	374	14	66	....
19	108	132	135	230	94	45	296	17	24	....
20	103	135	128	216	84	110	103	17	18	....
21	820	123	166	200	87	140	87	16	15	....
22	214	123	347	182	80	85	105	15	16	....
23	214	123	554	166	73	64	114	13	16	....
24	158	133	340	158	73	75	85	13	15	....
25	114	148	202	158	73	75	54	16	15	....
26	113	164	174	156	73	57	33	16	15	....
27	115	161	168	156	68	49	20	15	27	....
28	716	1,103	162	149	64	47	15	53	22	....
29	303	....	157	140	78	77	12	68	17	....
30	158	....	208	140	87	85	10	35	14	....
31	144	....	425	....	78	....	10	22	....	....

Monthly discharge of Wissahickon Creek near Philadelphia, Pa., for 1902 and 1903.

[Drainage area, 65 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1902.					
November	140	26	66.4	1.02	1.14
December	2,495	84	281	4.32	4.98
1903.					
January	1,241	98	232	3.57	4.12
February	1,103	122	214	3.29	3.43
March	554	128	215	3.31	3.82
April	833	140	257	3.95	4.41
May	140	64	100	1.54	1.78
June	140	45	67.4	1.04	1.16
July	374	10	69.6	1.07	1.23
August	68	10	27.4	.422	.49
September	66	14	24.0	.369	.41

SUSQUEHANNA RIVER.

GENERAL FEATURES OF AREA DRAINED.

Susquehanna River rises in Otsego Lake, in northern Otsego County, N. Y., at an elevation of 1,193 feet above tide, and flows in a general southerly direction into Chesapeake Bay. Its course is in many places extremely tortuous, crossing the State boundary between New York and Pennsylvania three times. The entire length of the river is about 500 miles, and it drains an area of 27,400 square miles, of which 21,060 square miles lie in Pennsylvania, 6,080 in New York, and 260 in Maryland.

The topography of the basin varies widely in character. In New York the stream and its tributaries flow through a rolling and in places rather broken country, bounded on the north by a mountainous area. In this part of its course its bed is of gravel or sand, with rock ledges here and there, and its banks are moderately high and not extensively subject to overflow. In Pennsylvania the river enters a mountain region, its banks are high, and it winds and twists among the parallel ranges in a bed composed generally of drift materials, gravels, sand, and bowlders. In the lower part of its course, from Marietta to Havre de Grace, it occupies a broad, deep valley, ranging in width from a few hundred feet to more than a mile, and is for the most part bounded on either shore by rocky bluffs and table-lands elevated from 100 to 500 feet above its waters.

Above the mouth of the West Branch the fall of the stream is uniform and gradual; below that point the fall becomes more irregular, and there are at many places rapids where the stream flows over a rocky bottom. The elevation of the river at the mouth of the West Branch is 400 feet above mean sea level at Havre de Grace, the distance between the two points being 125 miles. The slope is, however, extremely variable.

The fall in the lower part of the river offers exceptional opportunities for power developments, the value of which is greatly enhanced by their proximity to an unlimited market in the adjacent large cities. The hydrographic investigations of the Geological Survey along Susquehanna River have been of great assistance to engineers in investigating these powers.

In early days a complete system of canals was built along the river from the New York State line to the bay, but these have been abandoned with the establishment of railroads. The head of navigation is at the fall line, near the mouth of the stream, but various stretches are navigable for flatboats.

All available hydrographic data for the Susquehanna River basin prior to 1905 have been collected and published in Water-Supply Papers 108 and 109. No. 108 treats principally of the quality of the water, and No. 109 gives in detail information relative to fluctuations in stage and quantity of water flowing.

SUSQUEHANNA RIVER AT BINGHAMTON, N. Y.

This station, which is located on the Washington Street Bridge at Binghamton, was established July 31, 1901, and has since been maintained in cooperation with the New York State engineer department.

No important tributary enters Susquehanna River between the gaging station and the mouth of Unadilla River, about 50 miles upstream. Chenango River enters about 800 feet downstream, and causes backwater at high stages.

The Binghamton water-power dam, a timber structure affording 6-foot head, is situated 2,800 feet upstream from the bridge. This dam exerts no material control over the flow.

The datum of the chain gage attached to the Washington Street Bridge has remained the same during the maintenance of the station.

On account of the unfavorable conditions at the Washington Street Bridge discharge measurements have usually been made at the Exchange Street Bridge, 1,900 feet upstream.

During the winter months the discharge is usually more or less affected by ice.

The rating curve for low and medium stages is not satisfactory, apparently because of changes in the conditions of flow. Backwater, caused by ice jams which form near Willow Point and also by high water in the Chenango, considerably impairs the accuracy of high-water gage heights.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

Discharge measurements of Susquehanna River at Binghamton, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Mar. 8[a]	W. G. Hoyt	389	4,340	11.55	24,700
May 7[b]	C. C. Covert	421	993	3.32	3,750
July 26[c]	W. G. Hoyt	312	343	1.95	545

[a] Surface float measurement made by timing floating ice and débris from Exchange Street Bridge.
[b] Measurement made from Washington Street Bridge.
[c] Measurement made partly from Washington Street Bridge and partly by wading.

Daily gage height, in feet, of Susquehanna River at Binghamton, N. Y., for 1910.

[Hugh L. Smith, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	3.15	14.95	3.85	3.5	3.55	2.4	1.75	1.8	2.1	1.9	2.5
2	2.1	3.0	17.65	3.6	3.5	3.7	2.35	1.9	1.8	2.1	1.95	2.5
3	2.1	3.0	15.45	3.4	3.6	3.65	2.3	1.8	1.88	2.0	1.9	2.45
4	2.05	3.0	13.4	3.2	4.55	3.3	2.3	1.75	1.8	2.0	1.9	2.4
5	2.45	2.8	10.6	3.15	4.0	3.1	2.2	1.8	1.85	2.0	2.0	2.4
6	2.2	3.0	10.2	3.05	3.7	3.25	2.2	1.8	1.9	1.95	2.0	2.3
7	2.6	2.5	12.25	3.0	3.2	4.4	2.15	1.75	2.2	2.05	2.0	2.15
8	2.75	2.5	11.2	3.0	3.1	4.9	2.15	1.7	2.05	2.05	2.2	2.3
9	2.65	2.5	9.1	3.1	3.1	4.3	2.2	1.75	2.0	1.95	2.2	2.28
10	2.6	2.8	7.22	2.9	3.15	3.8	2.1	1.8	2.0	2.05	2.2	2.1
11	2.45	2.65	6.2	2.9	3.1	3.65	2.1	1.9	1.85	2.0	3.0	2.2
12	2.35	2.6	5.6	2.9	3.0	4.5	2.15	1.85	1.9	1.95	2.85	2.2
13	2.4	2.6	5.6	3.3	2.85	4.5	2.0	1.85	1.95	1.8	2.8	2.2
14	2.4	2.4	5.4	3.1	2.75	4.05	1.95	1.8	1.95	1.8	2.65	......
15	2.3	2.55	4.95	2.9	2.7	3.55	1.95	1.8	1.9	1.9	2.55	......
16	2.3	2.55	4.6	2.7	2.6	3.3	2.0	1.8	1.9	1.7	2.6	......
17	2.35	2.6	4.25	2.6	2.55	3.35	2.0	1.85	1.85	1.9	2.5	2.2
18	2.3	2.75	4.0	2.65	2.5	3.3	2.0	1.85	1.8	1.88	2.45	2.3
19	2.6	2.7	3.8	2.8	2.5	4.3	1.95	1.8	1.95	1.85	2.4	2.2
20	3.2	2.8	4.1	3.35	2.5	3.85	1.95	1.85	1.9	1.9	2.4	2.2
21	3.6	2.8	5.65	3.15	2.5	3.5	1.9	1.75	1.95	1.85	2.4	2.15
22	9.0	3.7	5.8	3.0	2.4	3.05	2.0	1.7	1.85	1.85	2.25	2.22
23	9.1	4.1	5.55	2.9	2.5	2.85	1.9	1.8	1.85	1.7	2.3	2.2
24	7.7	3.9	5.7	2.9	2.4	2.7	1.85	1.8	1.9	1.9	2.35	2.25
25	6.0	3.4	5.9	3.25	2.55	2.65	1.9	1.8	1.7	1.85	2.5	2.6
26	4.95	3.55	6.35	3.25	6.5	2.6	1.9	1.75	1.85	1.9	2.6	2.75
27	4.25	3.2	5.9	4.1	5.7	2.5	1.95	1.8	1.85	1.85	2.55	2.65
28	4.0	9.75	5.1	4.1	4.9	2.55	1.9	1.75	1.95	1.9	2.5	2.55
29	3.75	......	4.5	3.6	4.1	2.5	1.9	1.7	1.75	1.8	2.5	2.75
30	3.1	......	4.3	3.65	3.55	2.5	1.9	1.8	1.9	1.65	2.5	4.4
31	3.15	......	4.0	......	3.5	......	1.85	1.75	......	1.9	......	5.1

NOTE.—Relation of gage height to discharge probably affected by ice from Jan. 1 to 21, Feb. 10 to 27, and Dec. 8 to 31. Gage readings to water surface.

Daily discharge, in second-feet, of Susquehanna River at Binghamton, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3,440	43,400	5,210	4,320	4,440	1,610	272	335	920	500	1,850
2		3,070	54,100	4,570	4,320	4,820	1,500	500	335	920	600	1,850
3		3,070	45,400	4,070	4,570	4,700	1,380	335	467	700	500	1,730
4		3,070	37,400	3,570	7,060	3,820	1,380	272	335	700	500	1,610
5		2,570	27,300	3,440	5,600	3,320	1,150	335	418	700	700	1,610
6		3,070	25,800	3,200	4,820	3,700	1,150	335	500	600	700	1,380
7		1,850	33,200	3,070	3,570	6,650	1,040	272	1,150	810	700	1,040
8		1,850	29,400	3,070	3,320	8,000	1,040	210	810	810	1,150	
9		1,850	21,900	3,320	3,320	6,380	1,150	272	700	600	1,150	
10			15,300	2,820	3,440	5,080	920	335	700	810	1,150	
11			12,000	2,820	3,320	4,700	920	500	418	700	3,070	
12			10,100	2,820	3,070	6,920	1,040	418	500	600	2,700	
13			10,100	3,820	2,700	6,920	700	418	600	335	2,570	
14			9,500	3,320	2,450	5,730	600	335	600	335	2,210	
15			8,140	2,820	2,330	4,440	600	335	500	500	1,970	
16			7,190	2,330	2,090	3,820	700	335	500	210	2,090	
17			6,250	2,090	1,970	3,940	700	418	418	500	1,850	
18			5,600	2,210	1,850	3,820	700	418	335	467	1,730	
19			5,080	2,570	1,850	6,380	600	335	600	418	1,610	
20			5,860	3,940	1,850	5,210	600	418	500	500	1,610	
21			10,300	3,440	1,850	4,320	500	272	600	418	1,610	
22	21,500		10,800	3,070	1,610	3,200	700	210	418	418	1,260	
23	21,900		10,000	2,820	1,850	2,700	500	335	418	210	1,380	
24	16,900		10,400	2,820	1,610	2,330	418	335	500	500	1,500	
25	11,400		11,100	3,700	1,970	2,210	500	335	210	418	1,850	
26	8,140		12,500	3,700	13,000	2,090	500	272	418	500	2,090	
27	6,250		11,100	5,860	10,400	1,850	600	335	418	418	1,970	
28	5,600	24,200	8,580	5,860	8,000	1,970	500	272	600	500	1,850	
29	4,950		6,920	4,570	5,860	1,850	500	210	272	335	1,850	
30	3,320		6,380	4,700	4,440	1,850	500	335	500	162	1,850	
31	3,440		5,600		4,320		418	272		500		

NOTE.—Daily discharge determined from a rating curve somewhat poorly defined.

Monthly discharge of Susquehanna River at Binghamton, N. Y., for 1910.

[Drainage area, 2,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	21,900		3,760	1.57	1.81	D.
February	24,200		2,490	1.04	1.08	D.
March	5,410	5,080	16,700	6.96	8.02	B.
April	5,860	2,090	3,520	1.47	1.64	B.
May	13,000	1,610	3,960	1.65	1.90	B.
June	8,000	1,850	4,240	1.77	1.98	B.
July	1,610	418	810	.338	.39	C.
August	500	210	331	.138	.16	C.
September	1,150	210	502	.209	.23	C.
October	920	162	533	.222	.26	C.
November	3,070	500	1,540	.642	.72	C.
December			899	.375	.43	D.
The year	24,200	162	3,360	1.40	18.62	

NOTE.—Discharge for periods during which ice was present estimated by means of climatologic records and the records of discharge at Wilkes-Barre.

Mean discharge Jan. 1 to 21 estimated about 600 second-feet; no great variation in discharge.

Mean discharge Feb. 10 to 27 estimated 1,200 second-feet, ranging from about 800 second-feet to about 3,000 second-feet.

Mean discharge Dec. 8 to 31 estimated 700 second-feet; no great variation in discharge.

Determinations of discharge for January, February, and December, published in the report of the New York State engineer and surveyor for 1910 have been revised.

SUSQUEHANNA RIVER AT WILKES-BARRE, PA.

This station is located at the Market Street Bridge, Wilkes-Barre. No important tributaries enter Susquehanna River for several miles above or below the station.

The chain gage was established on the bridge by the United States Geological Survey March 30, 1899. The United States Weather Bureau has also maintained gage-height records at this point since 1888, using a gage on the left pier. The datum of the United States Geological Survey gage was placed 4 feet below the datum of the Weather Bureau gage to obviate negative readings, and was soon after adopted by the Weather Bureau. A Mott-type tape gage was installed by the Weather Bureau in the same position and to the same datum as the chain gage July 20, 1910. The records of stage at this station are utilized by the Weather Bureau for the purpose of flood predictions.

The discharge measurements at this station are now being made by the Water Supply Commission of Pennsylvania. No measurement, however, was made during 1910.

The datum adopted by the United States Geological Survey in 1899 has remained constant. Records obtained by the Weather Bureau prior to the adoption of the Geological Survey gage datum should have 4 feet added to reduce them to the present datum. Discharge measurements are made from the bridge.

The discharge at this point is frequently affected by ice during the winter, and water is often backed up many feet by ice gorges. Conditions of flow are subject to change at irregular intervals. A fairly good discharge rating curve has been developed.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Susquehanna River at Wilkes-Barre, Pa., for 1910.

[Obadiah Hemstreet, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	5.4	20.9	6.8	11.0	6.4	3.7	2.3	2.1	2.7	2.1	4.0
2	2.6	4.9	24.2	6.5	9.0	6.1	3.6	2.3	2.1	2.7	2.1	4.0
3	2.7	5.2	25.9	6.1	9.7	6.0	3.5	2.3	2.1	2.7	2.1	4.0
4	2.6	5.4	24.7	5.8	9.6	5.9	3.4	2.3	2.1	2.7	2.1	3.9
5	2.3	4.8	21.4	5.5	11.2	5.6	3.3	2.3	2.2	2.6	2.5	3.9
6	2.4	4.8	18.7	5.3	9.8	5.4	3.1	2.3	2.3	2.5	2.5	3.8
7	2.7	5.7	18.6	5.3	8.3	5.4	3.1	2.2	2.3	2.5	2.5	3.6
8	3.0	4.5	20.7	5.1	7.3	5.6	3.0	2.2	2.3	2.4	2.4	3.3
9	3.0	4.9	18.1	5.0	6.7	6.7	3.0	2.2	2.3	2.4	2.3	3.2
10	3.1	4.9	15.2	5.0	6.6	6.6	3.0	2.3	2.3	2.4	2.6	3.2
11	3.3	4.5	12.7	4.9	6.4	6.6	2.9	2.3	2.4	2.4	3.0	3.2
12	3.4	4.5	10.9	4.8	6.1	6.1	2.9	2.3	2.4	2.3	3.7	3.0
13	3.3	4.4	10.3	4.6	5.8	6.6	2.9	2.3	2.4	2.3	4.7	2.6
14	3.3	4.3	9.8	4.6	5.5	7.0	2.9	2.3	2.4	2.3	4.5	2.6
15	3.1	4.2	9.4	4.8	5.2	6.5	2.8	2.3	2.4	2.3	4.3	2.8

Daily gage height, in feet, of Susquehanna River at Wilkes-Barre, Pa., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	2.9	4.1	8.8	4.7	4.9	5.9	2.8	2.2	2.3	2.2	4.1	2.7
17	2.9	4.2	8.3	4.4	4.6	5.8	2.8	2.2	2.3	2.2	3.9	2.6
18	3.0	5.3	7.8	4.4	4.5	7.7	2.7	2.1	2.2	2.2	3.9	2.6
19	3.2	5.0	7.4	5.2	4.3	7.6	2.7	2.3	2.2	2.2	3.7	2.9
20	3.5	5.2	7.1	5.3	4.2	7.6	2.6	2.2	2.2	2.1	3.6	3.0
21	3.9	5.6	7.8	5.9	4.2	7.1	2.6	2.3	2.2	2.2	3.5	2.9
22	13.9	6.1	9.9	6.9	4.2	6.2	2.6	2.3	2.2	2.2	3.4	2.7
23	18.7	6.3	10.2	6.8	4.2	5.5	2.5	2.2	2.1	2.2	3.4	2.8
24	15.0	6.4	9.9	6.2	4.2	5.0	2.5	2.1	2.1	2.1	3.3	3.0
25	12.2	6.9	10.0	12.5	4.6	4.6	2.5	2.1	2.3	2.1	3.3	3.3
26	10.1	6.9	10.0	19.8	6.8	4.3	2.5	2.1	2.2	2.1	3.3	3.2
27	8.7	6.1	10.0	15.2	10.8	4.0	2.5	2.1	2.2	2.1	3.7	3.0
28	7.6	10.9	9.5	12.1	10.0	4.2	2.4	2.1	2.3	2.1	4.2	3.6
29	6.9	....	8.6	9.8	8.6	4.3	2.3	2.1	2.2	2.1	4.2	4.0
30	6.6	....	7.8	8.9	7.6	3.9	2.3	2.1	2.3	2.1	4.1	4.5
31	5.9	....	7.2	....	6.8	....	2.3	2.1	....	2.1	....	4.9

NOTE.—Ice present at this station from about Jan. 1 to 21, about Feb. 6 to 27, and about Dec. 9 to 31. Jan. 1 to Apr. 22 gage heights are about 0.04 foot higher than those published by the Water Supply Commission of Pennsylvania. The effect on the monthly discharge due to this discrepancy is only about 1 or 2 per cent.

Daily discharge, in second-feet, of Susquehanna River at Wilkes-Barre, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,360	9,000	105,000	14,400	34,600	12,800	3,740	1,090	860	1,660	860	4,520
2	1,510	7,260	136,000	13,200	24,400	11,600	3,500	1,090	860	1,660	860	4,520
3	1,660	8,300	153,000	11,600	27,800	11,200	3,270	1,090	860	1,660	860	4,520
4	1,510	9,000	141,000	10,500	27,300	10,800	3,040	1,090	860	1,660	860	4,250
5	1,090	6,930	110,000	9,360	35,700	9,720	2,820	1,090	970	1,510	1,360	4,250
6	1,220	6,500	86,100	8,650	28,300	9,000	2,390	1,090	1,090	1,360	1,360	3,990
7	1,660	6,000	85,300	8,650	21,000	9,000	2,390	970	1,090	1,360	1,360	3,500
8	2,190	5,500	103,000	7,950	16,500	9,720	2,190	970	1,090	1,220	1,220	2,820
9	2,190	5,200	81,300	7,600	14,000	14,000	2,190	970	1,090	1,220	1,090	2,600
10	2,390	5,000	60,000	7,600	13,600	13,600	2,190	1,090	1,090	1,220	1,510	2,600
11	2,820	4,800	44,300	7,260	12,800	13,600	2,000	1,090	1,220	1,220	2,190	2,600
12	3,040	4,600	34,100	6,930	11,600	11,600	2,000	1,090	1,220	1,090	3,740	2,190
13	2,820	4,500	30,900	6,280	10,500	13,600	2,000	1,090	1,220	1,090	6,600	1,510
14	2,820	4,400	28,300	6,280	9,360	15,200	2,000	1,090	1,220	1,090	5,970	1,510
15	2,390	4,200	26,300	6,930	8,300	13,200	1,820	1,090	1,220	1,090	5,360	1,820
16	2,000	4,000	23,400	6,600	7,260	10,800	1,820	970	1,090	970	4,790	1,660
17	2,000	3,900	21,000	5,660	6,280	10,500	1,820	970	1,090	970	4,250	1,510
18	2,190	3,700	18,700	5,660	5,970	18,200	1,660	860	970	970	4,250	1,510
19	2,600	3,500	16,900	8,300	5,360	17,800	1,660	1,090	970	970	3,740	2,000
20	3,270	3,500	15,600	8,650	5,070	17,800	1,510	970	970	860	3,500	2,190
21	4,250	5,000	18,700	10,800	5,070	15,600	1,510	1,090	970	970	3,270	2,000
22	51,600	8,000	28,800	14,800	5,070	12,000	1,510	1,090	970	970	3,040	1,660
23	86,100	6,000	30,400	14,400	5,070	9,360	1,360	970	860	970	3,040	1,820
24	58,700	5,000	28,800	12,000	5,070	7,600	1,360	860	860	860	2,820	2,190
25	41,400	4,000	29,400	43,100	6,280	6,280	1,360	860	1,090	860	2,820	2,820
26	29,900	3,500	29,400	95,400	14,400	5,360	1,360	860	970	860	2,820	2,600
27	22,900	4,000	29,400	60,000	33,500	4,520	1,360	860	970	860	3,740	2,190
28	17,800	34,100	26,800	40,800	29,400	5,070	1,220	860	1,090	860	5,070	2,300
29	14,800	....	22,400	28,300	22,400	5,360	1,090	860	970	860	5,070	2,400
30	13,600	....	18,700	23,900	17,800	4,250	1,090	860	1,090	860	4,790	2,400
31	10,800	....	16,000	....	14,400	....	1,090	860	....	860	....	2,500

NOTE.—Daily discharge Jan. 1 to 21 and Dec. 9 to 27 so low, by the open channel rating curve, as compared with that at other stations on the Susquehanna, that much backwater from ice seems improbable. The river was frozen over at the gage, but is assumed to have been open at the control point below, in which case there would be no great amount of backwater at the gage. Slight backwater from ice jam may have existed Jan. 22 to 26 and Feb. 28, as the discharge for these days is higher at this station than at Danville. Discharge Feb. 6 to 27 and Dec. 28 to 31, approximate, being deduced from climatologic records and comparisons with determination for other Susquehanna stations. Except for these two periods in February and December, the open channel rating curve has been applied throughout the year, and the daily discharge determined therefrom is considered fairly good.

Monthly discharge of Susquehanna River at Wilkes-Barre, Pa., for 1910.

[Drainage area, 9,810 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	86,100	1,090	12,700	1.29	1.49	B.
February	34,100	3,500	6,410	.653	.68	C.
March	153,000	15,600	51,600	5.26	6.06	A.
April	95,400	5,660	17,100	1.74	1.94	A.
May	35,700	5,070	15,600	1.59	1.83	A.
June	18,200	4,250	11,000	1.12	1.25	A.
July	3,740	1,090	1,950	.199	.23	A.
August	1,090	860	996	.102	.12	B.
September	1,220	860	1,030	.105	.12	B.
October	1,660	860	1,120	.114	.13	B.
November	6,600	860	3,070	.313	.35	A.
December	4,520	1,510	2,610	.266	.31	B.
The year	153,000	860	10,500	1.07	14.51	

SUSQUEHANNA RIVER AT DANVILLE, PA.

This station is located at Mill Street Bridge in Danville. It is 52 miles below Wilkes-Barre and 11 miles above the mouth of West Branch of Susquehanna River. There are no important tributaries within several miles of the station. It was established March 25, 1899, by the United States Geological Survey. It is now being maintained by the Water Supply Commission of Pennsylvania, from whom the table of daily gage heights for 1910 was obtained.

The Susquehanna at this point is paralleled on the north side by the Pennsylvania Canal.

On March 9, 1904, the bridge and chain gage were carried away in an ice freshet, and from that date until March 24, 1905, after the new steel bridge was completed, and when a chain gage was installed on the bridge, observations were made from temporary gages and were constantly liable to error for stages less than 5 feet. With the exception of this period the datum of the chain gage has remained constant during the period of maintenance of the station.

The discharge during the winter is considerably affected by ice.

Discharge measurements are made from the bridge.

The last measurement was made at this station June 25, 1909. It is assumed that the gage was corrected on this date and that a gradual change occurred until March 25, 1911, when the gage was corrected 0.10 foot. The daily gage heights for 1910 have been corrected accordingly. Conditions of flow have heretofore been remarkably permanent at this station and it is therefore believed that the determinations of discharge for 1910 are very good.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Susquehanna River at Danville, Pa., for 1910.

[E. F. Bell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	4.84	16.05	5.49	8.64	5.40	3.35	2.08	1.89	2.12	1.96	3.53
2	....	4.39	19.20	5.23	8.03	5.16	3.25	2.09	1.96	2.27	1.91	3.50
3	....	4.23	20.57	5.05	7.26	5.26	3.14	2.07	1.96	2.55	1.85	3.43
4	....	4.32	20.13	5.69	8.39	5.12	3.09	2.05	1.95	2.50	2.06	3.40
5	....	4.34	17.77	4.60	8.46	4.89	3.03	2.03	1.95	2.42	2.17	3.37
6	....	4.18	15.75	4.41	8.39	4.94	2.88	1.93	1.95	2.40	2.31	3.33
7	....	4.12	14.80	4.31	7.34	4.72	2.81	1.98	1.99	2.36	2.41	3.36
8	....	3.62	16.05	4.23	6.22	4.58	2.84	1.98	2.00	2.30	2.39	3.93
9	....	3.36	14.90	4.11	5.70	4.92	2.77	2.03	2.01	2.23	2.36	4.35
10	....	3.46	12.45	4.08	5.49	5.72	2.81	2.13	2.06	2.16	2.33	4.51
11	....	3.48	10.45	4.05	5.38	5.54	2.68	2.45	2.18	2.09	2.59	4.51
12	3.72	3.60	9.03	3.95	5.16	5.54	2.59	2.30	2.28	2.06	2.83	4.42
13	3.66	3.74	8.20	3.87	4.89	5.54	2.53	2.11	2.24	2.06	3.01	4.23
14	3.69	4.22	7.75	3.74	4.61	5.84	2.53	2.10	2.26	2.04	4.02	4.18
15	3.76	4.46	7.55	3.73	4.44	5.84	2.49	2.06	2.29	2.02	3.73	4.21
16	3.77	4.30	7.30	3.91	4.22	5.82	2.45	2.04	2.18	2.14	3.57	4.03
17	3.86	4.43	6.65	3.75	4.02	6.00	2.58	2.03	2.14	2.02	3.41	3.97
18	4.13	4.64	6.41	4.15	3.80	6.49	2.55	2.02	2.09	2.00	3.37	3.81
19	4.56	4.74	6.00	4.30	3.76	7.14	2.48	2.03	2.04	1.96	3.37	3.76
20	5.06	6.76	5.79	4.80	3.64	7.14	2.40	2.07	2.05	1.95	3.33	3.79
21	6.76	7.51	5.85	5.12	3.68	6.42	2.35	2.09	2.00	1.96	3.17	3.98
22	10.31	9.66	6.95	5.60	3.68	5.74	2.31	2.03	1.95	1.94	3.19	3.93
23	12.51	8.08	7.71	5.80	3.66	5.00	2.31	1.99	1.94	1.97	3.15	3.92
24	10.51	6.31	7.81	5.85	3.71	4.58	2.29	1.97	1.91	1.98	3.10	3.95
25	8.61	5.65	7.87	9.53	4.49	4.16	2.29	1.96	1.89	1.92	3.05	4.31
26	7.54	5.81	7.82	16.51	5.32	3.99	2.31	1.93	2.15	1.94	3.09	4.47
27	6.68	6.58	7.95	13.90	8.24	3.82	2.23	1.88	2.24	1.93	3.07	4.49
28	6.53	8.96	7.64	11.15	8.54	3.64	2.19	1.87	2.12	1.94	3.31	5.35
29	5.91	....	6.95	8.70	7.78	3.62	2.11	1.87	2.22	1.87	3.61	5.79
30	5.41	....	6.33	8.72	6.48	3.59	2.08	1.82	2.15	1.92	3.57	5.81
31	5.18	....	5.85	....	5.86	....	2.06	1.86	....	1.92	....	6.03

NOTE.—Relation of gage height to discharge probably affected by ice Jan. 1 to 21, Feb. 5 to 27, and Dec. 6 to 31.

Daily discharge, in second-feet, of Susquehanna River at Danville, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,600	12,000	109,000	15,300	34,700	14,800	5,410	1,580	1,220	1,660	1,350	6,120
2	1,780	9,870	154,000	14,000	30,300	13,600	5,030	1,600	1,350	1,990	1,260	6,000
3	1,950	9,140	176,000	13,000	25,300	14,100	4,620	1,560	1,350	2,700	1,160	5,720
4	1,780	9,550	169,000	16,300	32,800	13,400	4,440	1,520	1,330	2,560	1,540	5,600
5	1,280	8,160	133,000	10,900	33,300	12,300	4,230	1,480	1,330	2,350	1,770	5,490
6	1,430	7,650	105,000	9,970	32,800	12,500	3,720	1,290	1,330	2,300	2,080	4,700
7	1,950	7,060	94,100	9,510	25,800	11,400	3,490	1,380	1,400	2,200	2,330	4,120
8	2,580	6,470	109,000	9,140	19,200	10,800	3,590	1,380	1,420	2,060	2,280	3,320
9	2,580	6,120	95,300	8,600	16,400	12,400	3,360	1,480	1,440	1,900	2,200	3,060
10	2,810	5,880	68,800	8,440	15,300	16,500	3,490	1,680	1,540	1,750	2,130	3,060
11	3,320	5,650	49,900	8,320	14,700	15,500	3,080	2,430	1,790	1,600	2,810	3,060
12	3,580	5,410	37,700	7,880	13,600	15,500	2,810	2,060	2,010	1,540	3,560	2,580
13	3,320	5,300	31,500	7,530	12,300	15,500	2,640	1,640	1,920	1,540	4,160	1,780
14	3,320	5,180	28,400	6,970	10,900	17,100	2,640	1,620	1,970	1,500	8,190	1,780
15	2,810	4,940	27,100	6,930	10,100	17,100	2,530	1,540	2,040	1,460	6,930	2,140
16	2,350	4,710	25,600	7,700	9,090	17,000	2,430	1,500	1,790	1,700	6,280	1,950
17	2,350	4,590	21,600	7,010	8,190	18,000	2,780	1,480	1,700	1,460	5,640	1,780
18	2,580	4,350	20,300	8,780	7,220	20,700	2,700	1,460	1,600	1,420	5,490	1,780
19	3,060	4,120	18,000	9,460	7,050	24,600	2,510	1,480	1,500	1,350	5,490	2,350
20	3,850	4,120	16,900	11,800	6,560	24,600	2,300	1,560	1,520	1,330	5,330	2,580
21	5,000	5,880	17,200	13,400	6,720	20,300	2,180	1,600	1,420	1,350	4,730	2,350
22	48,600	9,410	23,400	15,900	6,720	16,600	2,080	1,480	1,330	1,310	4,800	1,950
23	69,400	7,060	28,200	16,900	6,640	12,800	2,080	1,400	1,310	1,370	4,660	2,140
24	50,400	5,880	28,800	17,200	6,840	10,800	2,040	1,370	1,260	1,380	4,480	2,580
25	34,500	4,710	29,200	41,900	10,300	8,820	2,040	1,350	1,220	1,280	4,300	3,320
26	27,100	4,120	28,900	115,000	14,400	8,060	2,080	1,290	1,720	1,310	4,440	3,060
27	21,800	4,710	29,800	84,000	31,800	7,310	1,900	1,210	1,920	1,290	4,370	2,580
28	20,900	37,200	27,700	56,200	33,900	6,560	1,810	1,190	1,660	1,310	5,260	2,710
29	17,500	....	23,400	35,100	28,600	6,480	1,640	1,190	1,880	1,190	6,440	2,820
30	14,900	....	19,800	35,300	20,700	6,360	1,580	1,100	1,720	1,280	6,280	2,820
31	13,700	....	17,200	....	17,200	....	1,540	1,170	....	1,280	....	2,940

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge for periods during which ice was present estimated from climatologic records and the discharge at Wilkes-Barre.

Monthly discharge of Susquehanna River at Danville, Pa., for 1910.

[Drainage area, 11,100 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	69,400	1,280	12,100	1.09	1.26	C.
February	37,200	4,120	7,470	.673	.70	C.
March	176,000	16,900	56,900	5.13	5.91	A.
April	115,000	6,930	20,900	1.88	2.10	A.
May	34,700	6,560	17,700	1.60	1.84	A.
June	24,600	6,360	14,000	1.26	1.41	A.
July	5,410	1,540	2,860	.258	.30	B.
August	2,430	1,100	1,490	.134	.15	B.
September	2,040	1,220	1,570	.141	.16	B.
October	2,700	1,190	1,640	.148	.17	B.
November	8,190	1,160	4,060	.366	.41	B.
December	6,120	1,780	3,170	.286	.33	C.
The year	176,000	1,100	12,100	1.09	14.74	

SUSQUEHANNA RIVER AT HARRISBURG, PA.

This station is located at the Walnut Street Bridge at Harrisburg. Daily observations of stage were begun at Harrisburg in 1890 by E. Mather, president of the Harrisburg Water Board. The original gage is located in the pump well at the pump house of the city waterworks, the well being connected with the river by two large mains. On July 18, 1904, a chain gage was installed on the Walnut Street Bridge. The readings are now furnished by the United States Weather Bureau, which has maintained the station since July 15, 1906.

The river is divided into two channels at this point by Foster Island, which is overflowed at times of flood.

Conodoguinet Creek enters Susquehanna River from the west about 2 miles above the gaging station. Paxton Creek enters from the northeast, about 1½ miles below the station. The Pennsylvania Canal parallels the river on the left side.

The datums of both gages have remained constant since their establishment. For full information regarding the two gages, changes in conditions of flow, etc., see Water-Supply Papers 109 and 167.

Discharge measurements are made from the bridge. The discharge at this point is affected by ice.

Conditions of flow here have been relatively permanent during the last few years and a good discharge rating curve has been developed.

No measurement has been made at this station, so far as known, since September 12, 1908. On December 30, 1910, the observer shortened the chain 0.05 foot. No corrections has been made in 1910 gage heights for possible error of gage. Comparisons of the discharge at this station with provisional estimates for the McCall Ferry station indicate that the Harrisburg records published below are very good.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Susquehanna River at Harrisburg, Pa., for 1910.

[E. R. Demain, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	3.3	11.9	3.7	6.5	3.8	2.3	0.7	0.7	1.7	0.6	1.9
2	1.5	2.9	16.2	3.5	6.3	3.5	2.2	.7	.9	1.5	.7	1.9
3	1.5	2.8	17.2	3.3	5.7	3.4	2.1	.7	1.0	1.2	.6	1.9
4	1.4	2.4	16.8	3.1	5.2	4.2	1.9	.6	.9	1.2	.6	1.9
5	1.5	2.6	15.1	3.0	5.4	3.9	1.8	.6	.9	1.2	.7	1.9
6	1.5	2.6	12.8	2.8	5.5	3.7	1.8	.6	1.0	1.1	.7	1.1
7	1.8	2.1	11.5	2.8	5.1	3.8	1.6	.6	1.3	1.0	.7	1.3
8	2.0	3.6	12.4	2.6	4.6	3.6	1.6	.5	1.5	1.0	.9	1.3
9	2.6	4.4	12.2	2.6	4.2	3.4	1.6	.7	1.4	.9	1.0	1.4
10	3.1	5.2	10.1	2.5	4.0	3.5	1.6	.7	1.4	.8	.9	1.3
11	2.8	5.7	8.4	2.4	4.0	4.1	1.5	.8	1.2	.8	.9	1.6
12	2.5	5.2	7.1	2.3	3.7	4.8	1.4	.9	1.2	.8	.8	2.1
13	2.4	5.4	6.3	2.2	3.5	5.4	1.4	.9	1.2	.7	.9	2.8
14	2.3	5.4	5.7	2.2	3.3	5.2	1.4	.9	1.3	.7	1.2	2.9
15	2.2	5.6	5.5	2.1	3.0	4.9	1.3	.8	1.4	.6	1.8	3.0
16	2.5	5.4	5.2	2.0	2.9	4.6	1.4	.7	1.3	.6	1.8	2.0
17	2.4	5.5	4.9	2.0	2.7	5.3	1.4	.7	1.2	.6	1.7	2.1
18	2.3	6.1	4.5	2.4	2.6	6.6	1.3	.6	1.0	.5	1.7	2.2
19	2.2	5.4	4.3	2.9	2.5	6.5	1.4	.6	.9	.5	1.6	2.4
20	2.7	5.0	4.1	4.2	2.4	5.7	1.4	.6	.8	.6	1.5	2.3
21	3.1	4.8	3.9	5.3	2.4	5.2	1.3	.6	.8	.6	1.5	2.0
22	10.7	5.9	4.3	5.4	2.5	4.6	1.2	.7	.7	.6	1.4	1.9
23	12.4	7.0	5.2	5.4	2.5	4.1	1.1	.6	.6	.6	1.4	2.1
24	10.8	6.1	5.5	5.5	2.5	3.6	1.0	.6	.6	.6	1.4	2.2
25	8.5	5.0	5.4	9.6	3.2	3.2	1.0	.6	.6	.6	1.3	2.1
26	6.8	4.6	5.4	14.8	3.9	2.9	.9	.5	.6	.7	1.3	2.2
27	5.7	4.4	5.4	14.9	5.1	2.7	.8	.5	.8	.6	1.2	2.4
28	4.9	6.1	5.3	11.4	5.7	2.6	1.0	.5	1.1	.7	1.3	2.4
29	4.4	......	4.9	8.9	5.4	2.5	.9	.5	1.2	.7	1.5	2.5
30	3.8	......	4.4	7.2	4.7	2.4	.8	.4	1.7	.7	1.9	2.4
31	3.6	......	4.0	......	4.2	......	.7	.4	......	.6	......	2.5

NOTE.—Relation of gage height to discharge probably affected by ice Jan. 1 to 20, Feb. 8 to 27, and Dec. 11 to 31.

Gage heights published by the Water Supply Commission of Pennsylvania vary from about 0.01 foot to 0.05 foot less than those given in the above table. The gage heights by the Survey were not revised because the comparisons of Harrisburg and McCall Ferry discharges appear to indicate that they give better values.

Daily discharge, in second-feet, of Susquehanna River at Harrisburg, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,210	26,900	188,000	32,200	77,400	33,600	15,800	4,830	4,830	10,800	4,380	12,300
2	3,560	22,100	297,000	29,400	73,700	29,400	14,900	4,830	5,820	9,400	4,830	12,300
3	4,010	21,000	325,000	26,900	63,400	28,100	14,000	4,830	6,360	7,490	4,380	12,300
4	3,800	16,800	314,000	24,400	55,100	39,200	12,300	4,380	5,820	7,490	4,380	12,300
5	3,060	18,800	267,000	23,300	58,400	35,000	11,600	4,380	5,820	7,490	4,830	12,300
6	3,120	18,800	209,000	21,000	60,000	32,200	11,600	4,380	6,360	6,910	4,830	6,910
7	4,880	14,000	179,000	21,000	53,500	33,600	10,100	4,380	8,100	6,360	4,830	8,100
8	6,890	14,100	200,000	18,800	45,400	30,800	10,100	3,960	9,400	6,360	5,820	8,100
9	6,150	13,700	195,000	18,800	39,200	28,100	10,100	4,830	8,740	5,820	6,360	8,740
10	5,810	13,200	148,000	17,800	36,400	29,400	10,100	4,830	8,740	5,310	5,820	8,100
11	6,200	12,600	113,000	16,800	36,400	37,800	9,400	5,310	7,490	5,310	5,820	7,700
12	6,270	11,700	88,500	15,800	32,200	48,600	8,740	5,820	7,490	5,310	5,310	7,200
13	5,830	11,200	73,700	14,900	29,400	58,400	8,740	5,820	7,490	4,830	5,820	6,700
14	5,700	10,800	63,400	14,900	26,900	55,100	8,740	5,820	8,100	4,830	7,490	6,500
15	4,950	10,300	60,000	14,000	23,300	50,200	8,100	5,310	8,740	4,380	11,600	6,300
16	4,260	9,770	55,100	13,200	22,100	45,400	8,740	4,830	8,100	4,380	11,600	6,100
17	4,140	11,200	50,200	13,200	19,900	56,800	8,740	4,830	7,490	4,380	10,800	6,000
18	4,420	11,500	43,800	16,800	18,800	79,200	8,100	4,380	6,360	3,960	10,800	6,000
19	4,750	10,400	40,700	22,100	17,800	77,400	8,740	4,380	5,820	3,960	10,100	5,900
20	9,690	11,900	37,800	39,200	16,800	63,400	8,740	4,380	5,310	4,380	9,400	5,800

Daily discharge, in second-feet, of Susquehanna River at Harrisburg, Pa., for 1910—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	24,400	17,200	35,000	56,800	16,800	55,100	8,100	4,380	5,310	4,380	9,400	5,800
22	161,000	27,700	40,700	58,400	17,800	45,400	7,490	4,830	4,830	4,380	8,710	5,800
23	200,000	24,800	55,100	58,400	17,800	37,800	6,910	4,380	4,380	4,380	8,740	5,700
24	163,000	18,400	60,000	60,000	17,800	30,800	6,360	4,380	4,380	4,380	8,740	5,700
25	115,000	13,200	58,400	137,000	25,600	25,600	6,360	4,380	4,380	4,380	8,100	5,700
26	82,900	12,500	58,400	260,000	35,000	22,100	5,820	3,960	4,380	4,830	8,100	6,000
27	63,400	16,900	58,400	262,000	53,500	19,900	5,310	3,960	5,310	4,380	7,490	6,000
28	50,200	70,200	56,800	177,000	63,400	18,800	6,360	3,960	6,910	4,830	8,100	6,000
29	42,200		50,200	123,000	58,400	17,800	5,820	3,960	7,490	4,830	9,400	6,500
30	33,600		42,200	90,400	47,100	16,800	5,310	3,570	10,800	4,830	12,300	6,500
31	30,800		36,400		39,200		4,830	3,570		4,380		7,000

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve. Discharge for periods during which ice was present determined by dividing the total discharge of the Danville, Williamsport, and Newport stations by 0.81.

Monthly discharge of Susquehanna River at Harrisburg, Pa., for 1910.

[Drainage area, 24,000 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	200,000	3,060	34,400	1.43	1.65	B.
February	70,200	9,770	17,900	.746	.78	C.
March	325,000	35,000	113,000	4.71	5.43	A.
April	262,000	13,200	56,600	2.36	2.63	A.
May	77,400	16,800	38,700	1.61	1.86	A.
June	79,200	16,800	39,400	1.64	1.83	A.
July	15,800	4,830	8,900	.371	.43	B.
August	5,820	3,570	4,580	.191	.22	A.
September	10,800	4,380	6,680	.278	.31	A.
October	10,800	3,960	5,460	.228	.26	A.
November	12,300	4,380	7,610	.317	.35	A.
December	12,300	5,700	7,500	.312	.36	B.
The year	325,000	3,060	28,500	1.19	16.11	

SUSQUEHANNA RIVER NEAR McCALL FERRY, PA.

The cable from which discharge measurements were made at this station is located about 1 mile above the village of McCall Ferry in a narrow and rocky part of Susquehanna River, about 20 miles above its mouth. The two principal gages to which the measurements are referred are gage No. 2, about three-fourths of a mile below McCall Ferry, and gage No. 5, about 2 miles below McCall Ferry. This station was established May 17, 1902, by Mr. Boyd Ehle. The station was maintained to determine the discharge of the river for the McCall Ferry power development and to check the accuracy of the records obtained at Harrisburg.

The datum of each gage has remained constant since its establishment. The gage readings give the elevation of the water surface above sea level direct. Gage No. 2, which is located in the tailrace of the power house was used until February 28, 1906, when operations at the dam caused backwater to affect the relation between discharge and gage heights. All readings published since then have been referred to gage No. 5, which is located at the foot of Cullys Falls, entirely out of the direct influence of the dam.

The discharge is affected by ice during severe winters. Discharge measurements made at this station have been referred to gages Nos. 2 and 5. Conditions of flow are permanent, and an excellent discharge rating curve was developed for gages Nos. 2 and 5.

The dam has caused a change in distribution of flow resulting in change in the relation of gage height to discharge as referred to the Cullys Falls gage. On December 1, 1910, a new gage was established on Face Rock about 300 feet below the Cullys Falls gage. In addition there has been maintained for several years a gage at Fites Eddy, about 3 miles below the dam. Data are withheld for the present at this station until a suitable discharge rating curve can be derived for one of the lower gages.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

CHENANGO RIVER AT BINGHAMTON, N. Y.

Chenango River rises in the central part of Madison County, N. Y., and flows southward into the Susquehanna at Binghamton. It is approximately 70 miles long, and its drainage area comprises about 1,580 square miles. Its headwater valleys lie at an elevation of about 1,200 feet above sea level, and its mouth is 864 feet above sea level. Its bed is, as a rule, composed of sand and gravel, and the stream is bordered in many places by bottom lands subject to overflow. A portion of the headwaters are diverted across the Chenango–Mohawk divide through Oriskany Creek to feed the summit level of the Erie Canal.

Considerable power is developed on the Chenango.

The gaging station, which is located at the Court Street Bridge at Binghamton, was established July 31, 1901, and has since been maintained in cooperation with the New York State engineer department.

Tioughnioga River enters Chenango River from the northwest about 14 miles above the gaging station. Chenango River enters Susquehanna River about three-fourths of a mile below the gaging station, but a slight riffle a short distance downstream from the bridge cuts off backwater from the Susquehanna at ordinary stages.

In estimating the run-off of Chenango River the area directly tributary to storage reservoirs, from which water is diverted to the Erie Canal, has been deducted from the total natural drainage area. The diversion area of six reservoirs at the head of Chenango River, whose outflow is turned into Erie Canal through Limestone Creek, is 30 square miles. The diversion area of De Ruyter reservoir, at the head of Tioughnioga River, whose outflow is turned into Erie

Canal through Limestone Creek, is 18 square miles. These two areas have been subtracted from the natural drainage area of 1,580 square miles, giving an effective area of 1,532 square miles. This estimate is approximate, as no allowance for direct inflow to feeder channels from additional areas, nor for waste into the original stream, has been made. The gross area from which more or less run-off is diverted is about 105 square miles.

About 1 mile upstream is the dam of the Binghamton Cold Storage Co. This is a low structure with 5-foot head, built of large blocks of bluestone, laid dry, and allowing a large amount of leakage. Owing to this leakage and to the fact that the water wheels run continuously night and day, the regimen of the stream below is not materially affected, and fluctuations in gage height are due almost entirely to natural causes. The next dam upstream is at Willards, about 16 miles above Binghamton and 2 miles above Chenango Forks.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

Discharge measurements are made from the bridge.

During the winter months the discharge is usually more or less affected by the presence of ice.

The discharge rating curve for low and medium stages is not very well developed. Lack of sufficient discharge measurements and the effects of backwater from Susquehanna River may have caused considerable error in the high-water estimates. Measurements made during 1910 indicate that conditions of flow have remained constant at this station.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

Discharge measurements of Chenango River at Binghamton, N. Y., in 1910.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet.*	*Sec.-ft.*
Mar. 7	W. G. Hoyt	320	4,120	16.82	23,400
May 9	C. C. Covert	310	873	6.50	2,030
July 26[a]	Hoyt and Carman	160	186	4.95	132

[a] Measurement made at wading section below bridge.

Daily gage height, in feet, of Chenango River at Binghamton, N. Y., for 1910.

[H. L. Smith, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.25	6.4	18.25	7.2	6.5	6.95	5.4	5.1	5.2	5.8	5.4	6.4
2	5.25	6.25	21.4	6.95	6.9	....	5.4	5.1	5.1	5.7	5.4	6.3
3	5.3	6.4	19.0	6.7	6.85	6.75	5.3	5.2	5.05	5.6	5.2	6.25
4	5.25	6.3	16.75	6.5	8.75	....	5.35	5.15	5.2	5.6	5.3	6.2
5	5.35	6.1	14.15	6.45	7.75	6.3	5.3	5.15	5.35	5.5	5.5	6.2

Daily gage height, in feet, of Chenango River at Binghamton, N. Y., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
6	5.2	6.1	13.9	6.35	7.2	7.25	5.3	5.15	5.5	5.45	5.45	6.0
7	5.3	5.75	15.75	6.3	6.8	7.75	5.3	5.15	5.6	5.45	5.9	5.9
8	5.3	5.7	14.6	6.4	6.6	7.9	5.3	5.15	5.7	5.45	5.9	5.95
9	5.4	5.95	12.5	6.3	6.5	7.15	5.3	5.15	5.65	5.35	5.85	5.8
10	5.4	6.05	10.45	6.3	6.75	6.75	5.25	5.2	5.4	5.45	6.0	5.65
11	5.4	6.0	9.4	6.15	6.5	6.75	5.2	5.1	5.3	5.45	7.15	5.8
12	5.3	5.85	8.95	6.35	6.45	7.9	5.2	5.2	5.35	5.35	7.1	5.85
13	5.35	5.8	9.0	6.4	6.25	7.6	5.2	5.2	5.3	5.4	6.75	5.9
14	5.3	5.75	8.8	6.15	6.15	7.1	5.15	5.2	5.6	5.4	6.55	5.8
15	5.2	5.85	8.3	6.05	6.1	6.6	5.1	5.2	5.45	5.4	6.48	5.9
16	5.3	5.9	7.8	6.0	6.0	6.5	5.2	5.15	5.3	5.05	6.45	5.75
17	5.3	5.95	7.7	5.9	5.9	6.85	5.25	5.2	5.25	5.4	6.35	5.6
18	5.4	6.0	7.3	5.9	5.9	6.45	5.3	5.2	5.1	5.4	6.25	5.7
19	5.6	5.95	7.25	6.3	6.0	6.9	5.1	5.2	5.1	5.3	6.25	5.85
20	6.3	5.9	7.9	6.35	5.9	6.5	5.1	5.1	5.4	5.35	6.2	5.8
21	6.7	6.1	9.4	6.2	6.05	6.2	5.1	5.2	5.2	5.1	6.1	5.85
22	12.2	6.65	9.3	6.1	6.3	5.95	5.1	5.2	5.2	5.3	6.1	5.7
23	12.5	7.1	9.25	6.0	6.15	5.8	5.1	5.15	5.2	5.0	6.05	5.65
24	10.95	6.75	9.3	5.9	6.1	5.75	5.0	5.15	5.1	5.3	6.1	5.8
25	9.2	6.4	9.55	6.15	6.85	5.65	5.1	5.25	5.05	5.3	6.55	6.1
26	8.1	6.7	9.8	6.7	10.1	5.6	4.95	5.2	5.25	5.2	6.85	6.2
27	7.6	6.1	9.4	7.0	8.85	5.55	5.05	5.15	6.1	5.35	6.7	6.1
28	7.35	12.65	8.35	6.7	8.25	5.5	5.1	5.1	5.9	5.35	6.4	6.05
29	7.1	......	7.9	6.3	7.5	5.55	5.3	5.1	6.5	5.35	6.4	6.15
30	6.5	......	7.6	6.65	7.0	5.45	5.2	5.1	6.0	5.2	6.35	7.7
31	6.4	......	7.4	......	7.05	......	5.2	5.15	......	5.4	......	8.5

NOTE.—Relation of gage height to discharge probably affected by ice from Jan. 1 to 21, Feb. 9 to 27, and Dec. 8 to 31. Gage heights taken to water surface except Jan. 3 to 21 and Dec. 18, which were taken to the top of the ice.

Daily discharge, in second-feet, of Chenango River at Binghamton, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	1,620	26,200	2,760	1,760	2,400	460	235	305	850	460	1,620
2	......	1,410	34,600	2,400	2,320	2,260	460	235	235	745	460	1,480
3	......	1,620	28,200	2,040	2,250	2,110	380	305	202	645	305	1,410
4	......	1,480	22,400	1,760	5,300	1,800	420	270	305	645	380	1,340
5	......	1,210	16,200	1,680	3,620	1,480	380	270	420	550	550	1,340
6	......	1,210	15,600	1,550	2,760	2,840	380	270	550	505	505	1,080
7	......	798	20,000	1,480	2,180	3,620	380	270	645	505	960	960
8	......	745	17,300	1,620	1,900	3,860	380	270	745	505	960	......
9	......	......	12,600	1,480	1,760	2,690	380	270	695	420	905	......
10	......	......	8,420	1,480	2,110	2,110	342	305	460	505	1,080	......
11	......	......	6,460	1,280	1,760	2,110	305	235	380	505	2,690	......
12	......	......	5,650	1,550	1,680	3,860	305	305	420	420	2,620	......
13	......	......	5,740	1,620	1,410	3,380	305	305	380	460	2,110	......
14	......	......	5,390	1,280	1,280	2,620	270	305	645	460	1,820	......
15	......	......	4,520	1,140	1,210	1,900	235	305	505	460	1,730	......
16	......	......	3,700	1,080	1,080	1,760	305	270	380	202	1,680	......
17	......	......	3,540	960	960	2,250	342	305	342	460	1,550	......
18	......	......	2,920	960	960	1,680	380	305	235	460	1,410	......
19	......	......	2,840	1,480	1,080	2,320	235	305	235	380	1,410	......
20	......	......	3,860	1,550	960	1,760	235	235	460	420	1,340	......
21	......	......	6,460	1,340	1,140	1,340	235	305	305	235	1,210	......
22	12,000	......	6,280	1,210	1,480	1,020	235	305	305	380	1,210	......
23	12,600	......	6,190	1,080	1,280	850	235	270	305	170	1,140	......
24	9,400	......	6,280	960	1,210	798	170	270	235	380	1,210	......
25	6,100	......	6,730	1,280	2,250	695	235	342	202	380	1,820	......
26	4,180	......	7,190	2,040	7,760	645	142	305	342	305	2,250	......
27	3,380	......	6,460	2,470	5,480	598	202	270	1,210	420	2,040	......
28	2,990	12,900	4,610	2,040	4,440	550	235	235	960	420	1,620	......
29	2,620	......	3,860	1,480	3,220	598	380	235	1,760	420	1,620	......
30	1,760	......	3,380	1,960	2,470	505	305	235	1,080	305	1,550	......
31	1,620	......	3,060	......	2,540	......	305	270	......	460	......	......

NOTE.—Daily discharge determined from discharge rating curve not very well defined.

Monthly discharge of Chenango River at Binghamton, N. Y., for 1910.

[Drainage area, 1,530 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,600	....	2,060	1.35	1.56	D.
February	12,900	....	1,430	.935	.97	D.
March	34,600	2,840	9,890	6.46	7.45	B.
April	2,760	960	1,570	1.03	1.15	B.
May	7,760	960	2,310	1.51	1.74	B.
June	3,860	505	1,880	1.23	1.37	B.
July	460	142	308	.201	.23	B.
August	342	235	278	.182	.21	B.
September	1,760	202	508	.332	.37	B.
October	850	170	451	.295	.34	B.
November	2,690	305	1,350	.882	.98	B.
December	....	....	646	.422	.49	D.
The year	34,600	142	1,890	1.24	16.86	

NOTE.—Discharge for periods during which ice was present estimated by means of climatologic records and record of discharge at Wilkes-Barre.
Mean discharge Jan. 1 to 21 estimated 350 second-feet; no great variation in discharge.
Mean discharge Feb. 9 to 27 estimated 900 second-feet, ranging from about 500 second-feet to about 2,000 second-feet.
Mean discharge Dec. 8 to 31 estimated 450 second-feet; no great variation in discharge.
Determinations for January, February, and December published in the tenth annual report of thes New York State engineer and surveyor, revised.

CHEMUNG RIVER AT CHEMUNG, N. Y.

Chemung River is formed near Painted Post, in the southeastern part of Steuben County, N. Y., by the confluence of Cohocton and Tioga rivers.

Chemung River proper is about 40 miles long. It flows eastward through the cities of Corning, Elmira, and Chemung and enters the Susquehanna at Athens, Bradford County, Pa. Near Chemung the river crosses the State line into Pennsylvania, and about 2 miles farther east it reenters New York, where it flows for a distance of about 4 miles, when it again crosses into Pennsylvania for the last 5 miles of its course. The drainage area above the mouth measures about 2,520 square miles.

The cities of Corning and Elmira have built extensive dikes to confine the waters at all stages. The stream has a yearly range from about 100 second-feet to about 30,000 second-feet. One of the greatest floods recorded was on June 1, 1889. It was preceded by a phenomenal rainfall, aggregating several inches in a few hours, during the night of May 31. The discharge has been estimated at 67 second-feet per square mile from 2,055 square miles, or 138,000 second-feet.[1]

The gaging station which is located at the suspension highway bridge midway between Willawana, Pa., and Chemung, N. Y., about one-half mile upstream from the State line and 1 mile below the Erie Railroad bridge, was established September 7, 1903, and is maintained in cooperation with the New York State engineer department.

[1] Report of Francis Collingwood, C. E., on the protection of the city of Elmira, N. Y., against floods.

The Chemung was formerly paralleled by a canal taking its supply from dams across the stream. This canal has been abandoned, and the diversion dams are no longer in existence. At present the largest water-power development is at Elmira, N. Y. There are no dams between Elmira, N. Y., and the mouth of Chemung River.

The datum of the chain gage attached to the bridge has remained the same during the maintenance of the station.

Conditions for obtaining accurate discharge measurements during the open period are only fair. At extreme high water the left bank is flooded, and at low stages there is more or less change in conditions of flow from year to year. On account of the numerous small riffs, considerable needle ice forms in this stream during the winter months. This collects under the ice in the smooth section at the gage and causes backwater.

Discharge measurements are made from the bridge and by wading at low stages.

Information in regard to this station is contained in the reports of the State engineer and surveyor, State of New York.

The following discharge measurement was made by W. G. Hoyt in 1910:

July 25: Width, 204 feet; area, 243 square feet; gage height, 1.99 feet; discharge, 233 second-feet.

Daily gage height, in feet, of Chemung River at Chemung, N. Y., for 1910.

[D. L. Orcutt, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		2.94	14.62	3.56	7.00	3.65	2.36	1.78	1.72	2.36	1.78	2.84
2		2.84	14.48	3.38	8.40	3.51	2.31	1.84	1.72	2.13	1.81	2.86
3		3.00	12.90	3.21	8.15	3.38	2.25	1.86	1.76	2.08	1.82	2.60
4		2.76	10.86	3.14	9.24	3.24	2.21	1.86	1.81	2.06	1.84	2.61
5		2.60	9.46	3.24	7.47	3.19	2.22	1.80	1.86	1.92	1.83	2.57
6		3.67	9.83	3.24	6.31	3.13	2.19	1.73	1.88	1.94	1.77	2.40
7			11.92	3.13	5.57	3.15	2.23	1.75	2.04	1.90	1.76	2.62
8			9.46	3.00	5.07	3.15	2.13	1.72	2.01	1.80	1.77	2.57
9			7.38	3.00	4.79	3.08	2.19	1.76	2.04	1.83	1.80	2.50
10			6.26	2.92	4.69	2.91	2.08	1.82	2.05	1.86	1.83	2.40
11			5.68	2.74	4.37	3.03	2.10	1.80	2.38	1.86	1.89	
12			5.36	2.70	4.08	3.35	2.11	1.84	1.85	1.81	1.91	
13			5.16	2.71	3.87	3.33		1.87	1.92	1.76	1.98	
14			5.04	2.66	3.66	3.13		1.86	1.78	1.78	2.12	
15			4.58	2.50	3.51	2.99	2.48	1.74	1.76	1.79	2.14	
16			4.38	2.52	3.41	2.87	2.17	1.82	1.78	1.74	2.04	
17			4.30	2.48	3.29	3.37	2.10	1.80	1.74	1.64	2.20	
18			4.08	2.51	3.19	4.15	2.12	1.75	1.78	1.72	2.18	
19			3.98	4.14	3.09	4.85	2.08	1.76	1.71	1.71	2.20	
20			4.65	4.88	3.04	3.93	2.06	1.74	1.74	1.70	2.13	
21			6.25	5.36	3.13	3.49	2.02	1.74	1.72	1.60	2.10	
22	11.62		5.92	4.04	3.16	3.21	1.94	1.71	1.78	1.66	2.08	
23	8.76		5.87	4.64	3.10	3.01	1.96	1.80	1.67	1.62	2.08	
24	6.01		5.82	8.08	3.43	2.85	1.96	1.78	1.72	1.62	2.05	
25	5.00		5.82	16.56	4.65	2.74	1.98	1.75	1.72	1.72	2.09	
26	4.26		5.66	14.10	6.01	2.47	2.02	1.70	1.85	1.68	2.14	
27	3.97		5.02	10.76	5.07	2.53	1.87	1.74	1.83	1.73	2.38	
28	3.71	11.18	4.61	7.39	4.50	2.47	1.92	1.73	2.58	1.76	2.42	
29	3.46		4.24	6.16	4.05	2.40	1.89	1.68	2.62	1.78	2.50	
30	3.04		4.00	9.00	3.80	2.41	1.87	1.74	2.49	1.78	2.64	
31	3.08		3.80		3.75		1.86	1.72		1.78		

NOTE.—Relation of gage height to discharge probably affected by ice Jan. 1 to 21, Feb. 6 to 27, and Dec. 7 to 31.

Daily discharge, in second-feet, of Chemung River at Chemung, N. Y., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		888	42,400	1,590	9,220	1,710	444	133	112	444	133	799
2		800	41,700	1,360	13,600	1,520	412	156	112	298	144	816
3		945	33,000	1,160	12,800	1,360	372	164	126	269	148	610
4		733	23,400	1,090	16,700	1,200	346	164	144	258	156	618
5		610	17,500	1,200	10,600	1,140	353	140	164	189	152	589
6			19,000	1,200	7,360	1,080	334	116	172	198	130	470
7			28,300	1,080	5,460	1,100	360	122	247	180	126	
8			17,500	945	4,270	1,100	298	112	230	140	130	
9			10,300	945	3,670	1,020	334	126	247	152	140	
10			7,230	869	3,470	860	269	148	252	164	152	
11			5,730	717	2,860	975	280	140	457	164	176	
12			4,940	685	2,360	1,320	286	156	160	144	184	
13			4,480	693	2,030	1,300	286	168	189	126	216	
14			4,210	656	1,720	1,080	526	164	133	133	292	
15			3,250	540	1,520	936	526	119	126	136	304	
16			2,870	554	1,400	825	322	148	133	119	247	
17			2,730	536	1,250	1,350	280	140	119	87	340	
18			2,340	547	1,140	2,480	292	122	133	112	328	
19			2,200	2,460	1,040	3,800	269	126	108	108	340	
20			3,390	3,860	985	2,120	258	119	119	105	298	
21			7,200	4,940	1,080	1,500	236	119	112	75	280	
22	26,900		6,340	2,290	1,110	1,160	198	108	133	93	269	
23	14,900		6,210	3,370	1,040	955	207	140	96	81	269	
24	6,580		6,080	12,600	1,420	808	207	133	112	81	252	
25	4,120		6,080	52,100	3,390	717	216	122	112	112	274	
26	2,660		5,680	39,800	6,580	519	236	105	160	99	304	
27	2,180		4,160	22,900	4,270	561	168	119	152	116	457	
28	1,790	24,800	3,310	10,400	3,100	519	189	116	596	126	484	
29	1,460		2,630	6,970	2,310	470	176	99	625	133	540	
30	985		2,230	15,800	1,920	477	168	119	533	133	640	
31	1,020		1,920		1,850		164	112		133		

NOTE.—Daily discharge determined from a fairly well defined discharge rating curve. Discharge July 13 and 14 estimated.

Monthly discharge of Chemung River at Chemung, N. Y., for 1910.

[Drainage area, 2,440 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	26,900		2,260	0.926	1.07	D.
February	24,800		1,500	.615	.64	D.
March	42,400	1,920	10,600	4.34	5.00	A.
April	52,100	536	6,460	2.65	2.96	A.
May	16,700	985	4,240	1.74	2.01	A.
June	3,800	470	1,200	.492	.55	A.
July	526	164	291	.119	.14	B.
August	168	99	131	.054	.062	B.
September	625	96	204	.084	.094	B.
October	444	75	152	.062	.071	B.
November	640	126	264	.108	.12	B.
December	816		448	.184	.21	D.
The year	26,900	75	2,310	.947	12.92	

NOTE.—Discharge for periods during which ice existed estimated by means of climatologic records, and record of discharge at Wilkes-Barre and at Rochester.

Mean discharge Jan. 1 to 21 estimated 350 second-feet; probably about constant.

Mean discharge Feb. 6 to 27 estimated 600 second-feet, ranging from about 400 second-feet to about 1,500 second-feet.

Mean discharge Dec. 7 to 31 estimated 400 second-feet; probably about constant.

WEST BRANCH OF SUSQUEHANNA RIVER AT WILLIAMSPORT, PA.

The West Branch of Susquehanna River rises in the mountains of Cambria County, at an elevation of not less than 2,000 feet above sea level, flows northeastward, and then southeastward into the Susquehanna above Sunbury. Its length is about 425 miles, and its drainage area, measured at the mouth, comprises approximately 7,030 square miles, all in Pennsylvania.

The river was navigable, by means of the canal along its banks, to Lock Haven and beyond, prior to 1889, there being four canal dams on the stream, the ponds of which were used for navigation. The flood of 1889 so damaged the upper portion of the canal that it was not operated subsequent to that date above Muncy. From Muncy to Northumberland it was operated as late as 1897. No water was flowing in the canal at the Williamsport gaging station in 1895.

The gaging station is located at the Market Street Bridge in Williamsport. Lycoming Creek enters Susquehanna River from the north about 2 miles above the station, and Loyalsock Creek, also from the north, enters about 2 miles below the station. It was established March 1, 1895, by George D. Snyder, who was at that time city engineer of Williamsport.

A standard chain gage was installed on the bridge by the United States Geological Survey August 16, 1901. The gage is now maintained by the United States Weather Bureau, from whom the daily readings are obtained.

The datum of the gage has been unchanged since the establishment of the station.

The discharge is usually affected by ice during the winter period.

There is a dam about one-half mile above the station, but it is believed that it has no effect on the relation of discharge to gage height.

Discharge measurements are made from the bridge or by wading.

No measurement has been made at this station in 1910, and so far as known the chain gage has not been checked since September 8, 1908. Conditions of flow have probably remained constant since that time, although the determined low-water discharge may be somewhat too high because of stretching of the chain.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of West Branch of Susquehanna River at Williamsport, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.4	2.4	16.0	3.4	6.0	3.0	1.3	0.4	0.2	1.4	0.4	1.4
2	.4	2.0	16.0	3.1	5.6	2.8	1.2	.4	.2	.9	.4	1.7
3	.5	2.4	15.4	2.9	5.3	2.7	1.2	.3	.2	.8	.4	1.5
4	.7	2.3	14.3	2.7	5.1	2.7	1.2	.3	.4	.7	.4	1.4
5	.6	2.2	12.7	2.6	4.9	2.6	1.1	.3	1.0	.7	.4	1.2
6	.6	2.2	11.4	2.5	4.6	2.6	1.0	.3	1.3	.6	.4	1.1
7	1.7	2.8	12.8	2.5	4.6	2.5	.9	.3	1.5	.5	.4	1.0
8	2.1	2.4	13.7	2.5	4.5	2.6	.8	.3	1.2	.5	.4	.9
9	1.7	2.4	10.5	2.5	3.7	2.6	.7	.3	1.0	.5	.4	.7
10	1.4	2.3	8.6	2.2	3.6	2.5	.8	.3	.8	.5	.4	.6
11	1.6	2.1	7.3	2.0	3.3	3.1	.8	.3	.7	.4	.4	.7
12	1.7	2.1	5.8	1.9	3.1	4.3	.8	.4	1.1	.4	.4	.7
13	1.7	1.7	6.0	1.8	2.8	4.6	.8	.4	.9	.3	.4	.6
14	1.7	1.5	5.6	1.7	2.6	4.5	1.3	.4	.8	.3	.5	.6
15	1.2	1.7	5.4	1.6	2.4	4.1	1.0	.3	.7	.3	.5	.6
16	1.0	1.7	5.2	1.4	2.3	3.8	.8	.3	.6	.3	.5	.7
17	.9	1.8	4.6	1.3	2.2	4.9	.8	.3	.5	.3	.5	.7
18	1.1	1.5	4.3	1.5	2.0	4.9	1.1	.2	.4	.3	.5	.6
19	1.2	1.5	4.2	4.9	1.9	4.3	1.0	.2	.4	.3	.5	.6
20	2.1	3.1	4.3	6.0	1.9	3.8	1.0	.2	.3	.3	.5	.6
21	6.2	3.8	5.3	6.6	2.0	3.4	.9	.2	.3	.3	.5	.6
22	11.7	4.0	6.4	6.9	2.1	2.9	.8	.2	.3	.3	.5	.6
23	10.8	4.0	6.3	6.4	2.2	2.6	.7	.2	.3	.3	.5	.6
24	8.2	3.5	6.3	6.8	2.1	2.3	.5	.2	.3	.3	.5	.7
25	6.5	5.0	6.4	15.8	2.9	2.1	.5	.2	.3	.3	.5	.6
26	5.2	4.8	6.5	16.9	5.2	1.9	.5	.2	.5	.5	.6	.5
27	4.6	4.3	6.5	14.6	4.8	1.7	.5	.2	1.6	.6	.9	.5
28	4.0	7.8	5.3	10.9	4.3	1.6	.4	.2	2.0	.5	1.2	.5
29	3.5	......	4.6	8.6	3.8	1.4	.4	.2	2.0	.5	1.4	.7
30	3.2	......	4.2	7.4	3.4	1.4	.4	.2	1.8	.5	1.4	.9
31	3.0	......	3.7	......	3.1	......	.4	.2	......	.4	......	2.6

NOTE.—River frozen over above and below the dam from Jan. 1 to 20, Feb. 7 to 20, and Dec. 13 to 31. Backwater caused by ice also probable Jan. 21 and Feb. 6. River partly open below the dam Feb. 21 to 27, and frozen above the dam at the gage Dec. 7 to 12.

Daily discharge, in second-feet, of West Branch of Susquehanna River at Williamsport, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	500	4,970	88,400	7,780	18,100	6,580	2,410	775	495	2,620	775	2,620
2	550	3,980	88,400	6,870	16,200	6,020	2,210	775	495	1,630	775	3,270
3	700	4,970	82,400	6,300	14,900	5,750	2,210	630	495	1,440	775	2,830
4	700	4,720	71,800	5,750	14,000	5,750	2,210	630	775	1,260	775	2,620
5	600	4,470	57,800	5,490	13,200	5,490	2,010	630	1,820	1,260	775	2,210
6	600	4,000	48,000	5,230	11,900	5,490	1,820	630	2,410	1,090	775	2,010
7	1,000	3,500	58,600	5,230	11,900	5,230	1,630	630	2,830	930	775	1,820
8	1,500	3,200	66,400	5,230	11,500	5,490	1,440	630	2,210	930	775	1,630
9	1,200	3,000	42,200	5,230	8,710	5,490	1,260	630	1,820	930	775	1,260
10	900	2,800	31,200	4,470	8,400	5,230	1,440	630	1,440	930	775	1,090
11	800	2,600	24,400	3,980	7,470	6,870	1,440	630	1,260	775	775	1,260
12	700	2,400	17,200	3,740	6,870	10,800	1,440	775	2,010	775	775	1,260
13	700	2,300	18,100	3,500	6,020	11,900	1,440	775	1,630	630	775	1,090
14	600	2,200	16,200	3,270	5,490	11,500	2,410	775	1,440	630	930	1,090
15	600	2,100	15,400	3,050	4,970	10,000	1,820	630	1,260	630	930	1,090
16	500	2,000	14,500	2,620	4,720	9,030	1,440	630	1,090	630	930	1,260
17	500	2,000	11,900	2,410	4,470	13,200	1,440	630	930	630	930	1,260
18	500	2,000	10,800	2,830	3,980	13,200	2,010	495	775	630	930	1,090
19	1,000	1,800	10,400	13,200	3,740	10,800	1,820	495	775	630	930	1,090
20	3,000	3,000	10,800	18,100	3,740	9,030	1,820	495	630	630	930	1,090
21	19,000	5,000	14,900	20,900	3,980	7,780	1,630	495	630	630	930	1,090
22	50,200	8,000	19,900	22,400	4,220	6,300	1,440	495	630	630	930	1,090
23	44,100	5,000	19,500	19,900	4,470	5,490	1,260	495	630	630	930	1,090
24	29,100	4,000	19,500	21,900	4,220	4,720	930	495	630	630	930	1,260
25	20,400	3,000	19,900	86,400	6,300	4,220	930	495	630	630	930	1,090

Daily discharge, in second-feet, of West Branch of Susquehanna River at Williamsport, Pa., for 1910—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	14,500	3,000	20,400	97,600	14,500	3,740	930	495	930	930	1,090	930
27	11,900	5,000	20,400	74,600	12,800	3,270	930	495	3,050	1,090	1,630	930
28	9,690	27,000	14,900	44,800	10,800	3,050	775	495	3,980	930	2,210	930
29	8,090	....	11,900	31,200	9,030	2,620	775	495	3,980	930	2,620	1,260
30	7,170	....	10,400	24,900	7,780	2,620	775	495	3,500	930	2,620	1,630
31	6,580	....	8,710	....	6,870	....	775	495	....	775	....	5,490

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge Jan. 1 to 20 and Feb. 6 to 27 estimated from climatologic records and the discharge at other Susquehanna River stations. No correction made in discharge Jan. 21 or Dec. 7 to 31. Discharge probably not greatly affected by backwater during December, although above figures are probably somewhat excessive.

Monthly discharge of West Branch of Susquehanna River at Williamsport, Pa., for 1910.

[Drainage area, 5,640 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	50,200	a 500	7,670	1.36	1.57	C.
February	27,000	a 1,800	4,360	.773	.80	C.
March	88,400	8,710	31,100	5.51	6.35	A.
April	97,600	2,410	18,600	3.30	3.68	A.
May	18,100	3,740	8,560	1.52	1.75	A.
June	13,200	2,620	6,890	1.22	1.36	A.
July	2,410	775	1,510	.268	.31	A.
August	775	495	592	.105	.12	A.
September	3,980	495	1,510	.268	.30	A.
October	2,620	630	914	.162	.19	A.
November	2,620	775	1,050	.186	.21	A.
December	5,490	930	1,600	.284	.33	B.
The year	97,600	495	7,060	1.25	16.97	

a Estimated.

JUNIATA RIVER AT NEWPORT, PA.

Juniata River rises in the mountains of Bedford, Blair, and Somerset counties, Pa., at a general elevation of about 2,000 feet above the sea, though the divide between its waters and those of the Ohio attains in places an elevation of 2,800 feet. The river has two chief upper divisions, the Frankstown and Raystown branches; from their union, a few miles southeast of Huntingdon, the main river winds eastward to the point where it enters the Susquehanna at Duncans Island. The length of the river below the branches is about 75 miles, and the total drainage area, measured at the mouth, comprises 3,530 square miles.

The gaging station, which is located at the steel highway bridge about 800 feet east of the public square at Newport, about 1 mile below the mouth of Buffalo Creek and about 12 miles above the mouth of the Juniata, was established March 21, 1899, by the United States Geological Survey, and was discontinued from July 15, 1906, to January 6, 1907. It is now being maintained by the Pennsylvania

State Water Supply Commission, from whom the tables of daily gage heights and discharge measurements made by engineers of the commission are obtained.

The datum of the chain gage attached to the bridge has remained constant during the maintenance of the station.

Discharge measurements are made from the bridge.

Conditions of flow are liable to change from year to year. A good discharge rating curve has been developed for high and medium stages, and at low stages it is fairly good.

The gage was checked with a level December 28, 1910, and found correct. No measurement has been made since May 13, 1909. This measurement did not plat well, but determinations of discharge for 1909, derived from the 1908 curve and disregarding the 1909 measurement, compared favorably with the discharge at other stations in the Susquehanna River basin. The discharge for 1910 here published is also obtained from the 1908 curve.

Discharge data for this station prior to 1905 have been revised and republished in Water-Supply Paper 109.

Daily gage height, in feet, of Juniata River at Newport, Pa., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.38	3.70	13.05	3.56	5.90	3.70	3.78	2.84	3.02	3.55	2.91	3.15
2	3.30	3.60	13.45	3.56	5.45	3.70	3.62	2.84	3.10	3.28	2.78	3.12
3	3.28	3.52	13.30	3.55	5.05	4.10	3.50	2.78	3.12	3.15	2.98	3.10
4	3.30	3.60	11.20	3.45	4.85	4.35	3.48	2.80	3.25	3.10	2.80	3.00
5	3.30	3.60	9.40	3.45	4.60	4.05	3.40	2.79	3.50	3.00	2.82	3.08
6	3.88	3.75	8.40	3.50	4.40	4.60	3.35	2.82	3.85	2.90	2.88	3.05
7	4.00	3.00	8.20	3.60	4.22	4.85	3.36	2.82	3.85	2.80	2.84	3.02
8	5.05	3.45	8.00	3.50	4.20	4.60	3.41	2.85	3.72	2.80	2.85	3.30
9	5.78	3.59	7.00	3.40	4.15	4.45	3.32	2.88	3.50	3.00	2.76	3.30
10	5.40	3.66	6.10	3.40	4.55	4.40	3.31	2.88	3.40	3.00	2.84	3.30
11	4.65	3.91	5.55	3.35	4.40	5.45	3.28	3.02	3.28	3.00	2.85	3.20
12	4.35	3.82	5.15	3.24	4.15	7.65	3.20	3.05	3.45	2.80	2.90	3.30
13	4.05	3.66	4.88	3.22	4.02	7.95	3.15	3.02	3.50	2.80	2.90	3.35
14	3.92	3.54	4.70	3.21	3.95	6.85	3.10	2.92	3.50	2.80	2.82	3.15
15	4.20	3.45	4.60	3.14	3.90	5.95	3.10	2.90	3.68	2.80	2.78	3.20
16	4.10	3.40	4.40	3.10	3.82	5.60	3.00	2.91	3.70	2.82	2.75	3.12
17	3.95	4.02	4.40	3.20	3.60	7.50	3.15	2.78	3.40	2.72	2.98	3.15
18	3.95	7.59	4.20	4.00	3.66	7.25	3.20	2.88	3.22	2.85	2.80	3.15
19	4.00	6.00	4.12	6.30	3.55	6.50	3.08	2.89	3.12	2.78	2.79	3.15
20	3.95	5.04	4.10	6.95	3.50	5.60	3.16	2.99	3.09	2.90	2.78	3.22
21	6.60	4.80	3.98	7.00	3.52	5.40	3.10	3.50	3.10	2.82	2.76	3.08
22	13.57	5.98	4.05	6.42	3.70	4.95	3.05	3.05	2.99	2.88	2.76	3.02
23	10.20	8.48	4.02	5.78	3.65	4.65	3.02	3.02	3.02	3.02	2.82	3.20
24	6.45	7.78	3.98	7.00	3.80	4.55	3.00	2.95	3.01	3.18	2.85	3.32
25	5.25	5.74	3.95	11.85	4.42	4.30	3.00	2.95	3.00	3.15	2.78	3.30
26	4.58	5.17	3.90	13.05	4.75	4.05	3.00	2.80	3.09	3.02	2.75	3.40
27	4.42	5.18	3.78	10.55	4.55	3.92	2.92	2.80	3.58	3.02	2.82	3.32
28	4.05	9.30	3.79	8.55	4.25	3.90	3.08	2.75	3.55	2.92	2.90	3.22
29	3.98	....	3.72	7.10	4.30	4.00	3.00	2.75	3.68	2.98	3.02	3.30
30	4.00	....	3.68	6.40	4.00	3.85	2.88	2.82	3.70	2.98	2.82	3.50
31	3.89	....	3.62	....	3.70	....	2.95	2.75	....	2.90	....	3.60

NOTE.—Relation of gage height to discharge probably affected by ice from Jan. 1 to 20, about Feb. 10 to 27, and about Dec. 8 to 31.

Daily discharge, in second-feet, of Juniata River at Newport, Pa., for 1910.

[Drainage area, 3,480 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	500	2,240	38,300	1,940	8,570	2,240	2,420	773	1,000	1,920	858	1,190
2	550	2,020	40,400	1,940	7,160	2,240	2,060	773	1,120	1,410	702	1,150
3	600	1,850	39,600	1,920	5,930	3,230	1,810	702	1,150	1,190	949	1,120
4	600	2,020	29,400	1,720	5,340	3,910	1,770	725	1,360	1,120	725	975
5	600	2,020	21,600	1,720	4,610	3,100	1,620	714	1,810	975	749	1,090
6	500	2,360	17,500	1,810	4,050	4,610	1,530	749	2,590	845	821	1,040
7	1,000	975	16,700	2,020	3,550	5,340	1,550	749	2,590	725	773	1,000
8	1,500	1,720	16,000	1,810	3,500	4,610	1,640	785	2,290	725	785	900
9	1,200	2,000	12,300	1,620	3,360	4,190	1,480	821	1,810	975	679	900
10	1,000	2,000	9,210	1,620	4,470	4,050	1,460	821	1,620	975	773	900
11	900	1,800	7,460	1,530	4,050	7,160	1,410	1,000	1,410	975	785	900
12	800	1,700	6,230	1,340	3,360	14,600	1,270	1,040	1,720	725	845	800
13	700	1,500	5,420	1,300	3,020	15,800	1,190	1,000	1,810	725	845	800
14	700	1,400	4,900	1,290	2,840	11,700	1,120	871	1,810	725	749	900
15	600	1,300	4,610	1,180	2,710	8,730	1,120	845	2,200	725	702	900
16	600	1,200	4,050	1,120	2,520	7,620	975	858	2,240	749	668	900
17	500	2,500	4,050	1,270	2,020	14,100	1,190	702	1,620	633	949	800
18	500	3,000	3,500	2,970	2,150	13,200	1,270	821	1,300	785	725	800
19	600	2,500	3,280	9,870	1,920	10,500	1,090	833	1,150	702	714	800
20	1,000	2,500	3,230	12,100	1,810	7,620	1,210	962	1,100	845	702	800
21	10,900	3,000	2,920	12,300	1,850	7,000	1,120	1,810	1,120	749	679	800
22	41,000	5,000	3,100	10,300	2,240	5,630	1,040	1,040	962	821	679	800
23	25,000	8,000	3,020	8,190	2,130	4,760	1,000	1,000	1,000	1,000	749	900
24	10,400	5,000	2,920	12,300	2,470	4,470	975	910	989	1,240	785	1,000
25	6,540	3,000	2,840	32,400	4,110	3,770	975	910	975	1,190	702	1,000
26	4,550	3,000	2,710	38,300	5,040	3,100	975	725	1,100	1,000	668	1,200
27	4,110	4,000	2,420	26,600	4,470	2,760	871	725	1,980	1,000	749	1,000
28	3,100	21,200	2,450	18,100	3,640	2,710	1,090	668	1,920	871	845	1,000
29	2,920	....	2,290	12,600	3,770	2,970	975	668	2,200	949	1,000	1,000
30	2,970	....	2,200	10,200	2,970	2,590	821	749	2,240	949	749	1,200
31	2,690	....	2,060	....	2,240	....	910	668	....	845	....	1,500

NOTE.—Daily discharge determined from a rating curve well defined above 3,000 second-feet and fairly well defined below. Discharge for periods during which ice was present estimated by means of climatologic records and comparison with records of other Susquehanna River stations.

Monthly discharge of Juniata River at Newport, Pa., for 1910.

[Drainage area, 3,480 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	41,000	a 500	4,170	1.20	1.38	A.
February	21,200	975	3,240	.931	.97	A.
March	40,400	2,060	10,200	2.93	3.38	A.
April	38,300	1,120	7,780	2.24	2.50	A.
May	8,570	1,810	3,610	1.04	1.20	A.
June	15,800	2,240	6,280	1.80	2.01	A.
July	2,420	821	1,290	.371	.43	C.
August	1,810	668	852	.245	.28	C.
September	2,590	962	1,610	.463	.52	C.
October	1,920	633	938	.270	.31	C.
November	1,000	668	770	.221	.25	D.
December	a 1,500	a 800	970	.279	.32	C.
The year	41,000	a 500	3,470	.997	13.55	

a Estimated.

NOTE.—Low accuracy July to December due to probable backwater from fish-trap dams.

POTOMAC RIVER.

GENERAL FEATURES OF AREA DRAINED.

Potomac River is formed by the junction of its North and South branches, about 15 miles below Cumberland, Md., from which it flows in a southeasterly direction into Chesapeake Bay. For its entire length it forms the southern boundary of the State of Maryland and the northern boundary of the States of West Virginia and Virginia. It drains a total area of about 14,500 square miles.

North Branch of Potomac River rises in the Allegheny Mountains near the west corner of Maryland, and South Branch in the Alleghenies in Virginia and West Virginia. These branches with their tributaries and the tributaries of the main stream as far down as the Shenandoah drain a series of narrow and generally fertile valleys lying between the parallel ranges which make up the system of the Alleghenies in this region. Their slopes are not, as a rule, very great, and their beds are of gravel and sand. The slopes of their drainage basins, however, are usually very steep, and after a rain the water collects quickly in the rivers. There are few lowlands to be overflowed and no lakes whatever in the region; consequently these streams, and with them Potomac River, are subject to sudden and very heavy freshets in wet seasons, and in dry seasons their discharge becomes small.

The slopes of the tributary basin of Shenandoah River are in many places steep, but the valley through which the Shenandoah flows is in general broader and more lands are subject to overflow. The slope of the river itself is, as a rule, greater than the slope of the tributaries above mentioned.

From the junction of its North and South branches below Cumberland, Md., the Potomac cuts through the mountains at nearly right angles. Its valley is narrow, its slope in many places great. The bed is generally gravel and bowlders, with ledge rock at little depth, or in places appearing at the surface. The banks are usually high and are not subject to overflow. It crosses the fall line a few miles above Washington and reaches tidewater at Georgetown.

The Baltimore & Ohio Railroad follows the river for most of its length above Washington, and the Norfolk & Western and Cumberland Valley railroads cross the stream. The Chesapeake & Ohio Canal follows it from Cumberland to Georgetown.

As a water-power stream the principal disadvantage of the Potomac is the great variability of its flow. Good rock foundations for dams can generally be found at small depth; the banks are, as a rule, favorable; and there are several sites where large falls could be rendered available. A very insignificant amount of power has been developed.

The Great Falls of the Potomac, located about 15 miles above Washington, offers one of the best undeveloped power sites along Potomac River.

The surface water resources of the Potomac River basin have been discussed in detail in Water-Supply Paper 192.

POTOMAC RIVER AT POINT OF ROCKS, MD.

This station, which is located at the steel highway bridge at Point of Rocks, Md., was established February 17, 1895.

Catoctin Creek enters Potomac River about one-third mile above the station from the Virginia side. Monocacy River enters from the Maryland side about 6 miles below the station. The Chesapeake & Ohio Canal parallels the Potomac on the Maryland side. The average discharge of the canal approximates from 75 to 100 second-feet and is not included in the discharge given in the following tables. The records obtained at Point of Rocks, in conjunction with those derived from stations on Monocacy River near Frederick, Md., and on Goose Creek near Leesburg, Va., are of particular value in determining the discharge available for the development of power at Great Falls, where the Potomac descends about 90 feet in crossing the fall line. The drainage area above these three stations is about 93 per cent of the drainage area at Great Falls. The discharge at Great Falls can be determined without appreciable error by estimating the run-off from the remaining 7 per cent, adding to it the determined discharge at Point of Rocks, at Frederick, and at Leesburg, and then deducting about 101 second-feet per day, the latter amount representing the water taken out by the Washington Aqueduct immediately above the head of Great Falls on the Maryland side.

The conditions of flow at this station are practically permanent. The discharge is controlled by a rock ledge that extends completely across the river (except in one relatively unimportant channel) a few hundred feet below the station.

The discharge is rarely affected by ice.

The datum of the chain gage, which is attached to the bridge from which measurements are made, has been maintained at a constant elevation since September 2, 1902. Prior to this date the datum was 0.45 foot higher than at present.

The present rating curve is considered very accurate and should require relatively little change in the future.[1]

[1] Discharge data prior to 1907 have been revised and republished in Water-Supply Paper 192.

Daily gage height, in feet, of Potomac River at Point of Rocks, Md., for 1910.

[Geo. H. Hickman, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.65	2.5	5.4	1.5	3.6	1.65	2.3	1.2	0.80	0.81	0.80	0.85
2	1.6	2.4	7.1	1.5	3.3	1.6	2.4	1.2	.80	.80	.85	.80
3	1.55	2.2	7.0	1.55	3.0	1.65	2.1	1.25	.81	.80	.81	.75
4	1.35	2.1	6.4	1.6	2.7	1.65	2.0	1.3	1.0	.81	.80	.80
5	1.35	2.2	5.1	1.65	2.4	1.6	2.0	1.4	1.35	.76	.80	.85
6	3.8	2.0	4.6	1.6	2.2	1.8	2.4	1.25	1.3	.80	.82	1.05
7	3.5	2.1	4.0	1.6	2.1	1.75	2.4	1.2	1.2	.76	.77	1.05
8	3.0	2.4	3.7	1.55	2.0	1.7	2.3	1.1	1.15	.85	.76	.95
9	3.3	2.2	3.4	1.55	2.0	1.7	2.6	1.05	1.05	.86	.70	.95
10	3.2	2.1	3.2	1.5	1.95	1.9	2.4	1.0	.96	.80	.81	1.05
11	3.2	2.2	3.0	1.45	1.95	2.1	2.2	.95	.92	.85	.80	1.0
12	3.0	1.8	2.7	1.4	1.95	4.2	2.2	.92	.90	.91	.80	1.0
13	2.6	1.85	2.3	1.4	1.9	6.3	2.3	.91	.90	.85	.75	1.05
14	2.5	1.95	2.3	1.35	1.85	6.8	2.4	.91	.91	.90	.72	1.0
15	2.3	2.0	2.2	1.3	1.8	6.1	2.6	.95	.91	.85	.75	1.0
16	2.4	2.2	2.2	1.3	1.75	5.9	2.4	1.0	.90	.80	.76	1.0
17	2.4	3.3	2.2	1.4	1.7	15.3	2.4	1.05	.90	.81	.80	1.05
18	2.4	8.2	2.2	1.65	1.7	22.0	2.2	.95	.90	.76	.81	1.0
19	4.0	8.6	2.1	4.3	1.65	13.5	2.2	.91	.85	.75	.72	.95
20	4.0	7.0	2.0	4.8	1.65	13.2	3.0	.90	.75	.80	.70	1.0
21	8.0	5.6	1.95	4.5	1.65	10.4	2.3	.91	.80	.80	.75	1.5
22	13.5	4.1	1.9	4.1	1.85	6.9	2.2	.92	.80	.85	.75	1.35
23	10.5	7.8	1.85	3.8	1.75	6.4	2.0	.91	.75	.80	.72	1.15
24	7.2	7.0	1.8	3.5	1.7	4.9	1.75	.91	.76	.75	.70	1.1
25	4.7	5.2	1.75	3.8	1.85	4.0	1.6	.90	.75	.85	.80	1.1
26	3.7	4.0	1.65	7.6	2.2	3.6	1.55	.90	.55	1.05	.95	1.2
27	3.1	3.6	1.6	7.4	2.9	3.4	1.55	.90	.80	.95	.85	1.1
28	3.0	3.65	1.5	6.8	2.4	2.8	1.55	.85	.85	.90	.80	1.05
29	3.0	......	1.5	4.9	2.1	2.6	1.6	.80	.80	.85	.81	1.05
30	3.0	......	1.5	4.1	1.9	2.5	1.25	.80	.80	.80	.81	1.1
31	2.8	......	1.5	......	1.75	......	1.25	.81	......	.81	......	1.2

NOTE.—The river above and below the gage was covered with heavy ice from Jan. 1 to 20. Probably no effect from ice during the remainder of January or February. Slight backwater from ice occasionally during December. All gage readings are probably to water surface.

Daily discharge, in second-feet, of Potomac River at Point of Rocks, Md., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,200	6,920	22,300	3,390	12,000	3,860	6,130	2,520	1,480	1,510	1,480	1,610
2	2,200	6,520	33,500	3,390	10,500	3,700	6,520	2,520	1,480	1,480	1,610	1,480
3	2,200	5,750	32,800	3,540	9,070	3,860	5,380	2,660	1,510	1,480	1,510	1,360
4	2,200	5,380	28,800	3,700	7,750	3,860	5,020	2,800	1,990	1,510	1,480	1,480
5	2,200	5,750	20,400	3,860	6,520	3,700	5,020	3,090	2,940	1,390	1,480	1,610
6	5,000	5,020	17,400	3,700	5,750	4,330	6,520	2,660	2.800	1,480	1,540	2,120
7	6,000	5,380	14,100	3,700	5,380	4,170	6,520	2,520	2,520	1,390	1,410	2,120
8	5,000	6,520	12,500	3,540	5,020	4,010	6,130	2,250	2,380	1,610	1,390	1,860
9	10,000	5,750	11,000	3,540	5,020	4,010	7,330	2,120	2,120	1,640	1,240	1,860
10	3,000	5,380	10,000	3,390	4,840	4,670	6,520	1,990	1,890	1,480	1,510	2,120
11	3,000	5,750	9,070	3,240	4,840	5,380	5,750	1,860	1,790	1,610	1,480	1,990
12	2,500	4,330	7,750	3,090	4,840	15,200	5,750	1,790	1,740	1,760	1,480	1,990
13	2,500	4,500	6,130	3,090	4,670	28,100	6,130	1,760	1,740	1,610	1,360	2,120
14	2,500	4,840	6,130	2,940	4,500	31,500	6,520	1,760	1,760	1,740	1,290	1,990
15	2,500	5,020	5,750	2,800	4,330	26,800	7,330	1,860	1,760	1,610	1,360	1,990
16	2,300	5,750	5,750	2,800	4,170	25.500	6,520	1,990	1,740	1,480	1,390	1,990
17	2.300	10,500	5,750	3,090	4,010	99,600	6,520	2,120	1,740	1,510	1,480	2,120
18	2,300	41,500	5,750	3.860	4,010	155,000	5,750	1,860	1,740	1,390	1,510	1,990
19	3,000	44.500	5,380	15,700	3,860	84,600	5,750	1,760	1,610	1,300	1,290	1,860
20	5,000	32,800	5,020	18,600	3,860	82,200	9,070	1,740	1,360	1,480	1,240	1,990
21	40,000	23,600	4,840	16,800	3,860	58,900	6,130	1,760	1,480	1,480	1,360	3,390
22	84,600	14,600	4,670	14,600	4,500	32,100	5,750	1,790	1,480	1,610	1,360	2,940
23	59,800	38,500	4,500	13,000	4.170	28,800	5,020	1,760	1,360	1,480	1,290	2,380
24	34,200	32,800	4,330	11,500	4,010	19,200	4,170	1,760	1,390	1,360	1,240	2,250
25	18,000	21,100	4,170	13,000	4,500	14,100	3,700	1,740	1,360	1,610	1,480	2,250

Daily discharge, in second-feet, of Potomac River at Point of Rocks, Md., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	12,500	14,100	3,860	37,100	5,750	12,000	3,540	1,740	900	2,120	1,860	2,520
27	9,530	12,000	3,700	35,600	8,620	11,000	3,540	1,740	1,480	1,860	1,610	2,250
28	9,070	12,200	3,390	31,500	6,520	8,180	3,540	1,610	1,610	1,740	1,480	2,120
29	9,070	....	3,390	19,200	5,380	7,330	3,700	1,480	1,480	1,610	1,510	2,120
30	9,070	....	3,390	14,600	4,670	6,920	2,660	1,480	1,480	1,480	1,510	2,250
31	8,180	....	3,390	....	4,170	....	2,660	1,510	....	1,510	....	2,520

NOTE.—Daily discharge determined from a well-defined discharge rating curve. Discharge for Jan. 1 to 20 estimated from climatological records. No correction has been made to the discharge for December.

Monthly discharge of Potomac River at Point of Rocks, Md., for 1910.

[Drainage area, 9,650 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	84,600	a 2,200	11,700	1.21	1.40	B.
February	44,500	4,330	12,200	1.26	1.31	B.
March	33,500	3,390	9,960	1.03	1.19	A.
April	37,100	2,800	10,100	1.05	1.17	A.
May	12,000	3,860	5,520	.572	.66	A.
June	155,000	3,700	26,400	2.74	3.06	A.
July	9,070	2,660	5,500	.570	.66	A.
August	3,090	1,480	2,000	.207	.24	A.
September	2,940	900	1,740	.180	.20	A.
October	2,120	1,360	1,560	.162	.19	A.
November	1,860	1,240	1,440	.149	.17	A.
December	3,390	1,360	2,090	.217	.25	B.
The year	155,000	900	7,450	.772	10.50	

a Estimated.

MONOCACY RIVER NEAR FREDERICK, MD.

This station, which is located at the county bridge on the toll road leading from Frederick to Mount Pleasant, Md., was established August 4, 1896. It is about 3½ miles northeast of Frederick, 3,000 feet below Tuscarora Creek, which enters on the right, and 2,000 feet above Israel Creek, which enters on the left. Monocacy River is the principal stream entering the Potomac between the Point of Rocks station and Great Falls. (See Potomac River at Point of Rocks.)

The datum of the chain gage attached to the bridge has been maintained unchanged since the establishment of the station.

Discharge measurements are made from the bridge or by wading. The discharge is liable to be more or less affected by ice during the winter months.

Conditions of flow at this station change somewhat from year to year, and changes in the rating curves are therefore necessary.[1]

No measurement was made during 1910.

[1] Discharge data prior to 1907 have been revised and republished in Water-Supply Paper No. 192.

Daily gage height, in feet, of Monocacy River near Frederick, Md., for 1910.

[E. L. Derr, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.3	4.9	12.9	4.3	6.1	4.4	4.6	3.9	3.7	3.7	3.8	4.0
2	4.3	4.5	9.1	4.4	5.7	4.3	4.5	4.0	3.8	3.6	3.9	4.0
3	4.3	4.6	8.5	4.4	5.4	4.4	4.6	3.9	4.4	3.6	3.8	4.0
4	4.3	4.6	7.0	4.5	5.4	5.0	4.5	3.9	4.2	3.54	4.0	4.1
5	4.3	4.6	6.5	4.7	5.2	4.9	4.6	3.8	4.0	3.6	3.9	4.0
6	4.5	5.4	6.1	4.6	5.1	4.8	4.5	3.9	4.1	3.54	4.0	4.3
7	5.25	5.1	6.1	4.4	4.9	4.7	4.4	3.8	3.9	3.54	4.1	4.2
8	7.8	5.2	5.7	4.5	5.0	4.7	4.4	3.9	4.0	3.6	3.9	4.3
9	5.5	5.4	5.4	4.4	5.1	4.8	4.3	3.8	3.9	3.54	4.0	4.1
10	5.3	5.4	5.3	4.3	5.0	5.6	4.4	3.9	3.9	3.6	3.9	4.1
11	5.2	5.4	5.3	4.3	4.8	7.85	4.4	3.8	3.6	3.8	3.9	4.0
12	4.9	5.3	5.3	4.3	4.9	7.45	4.3	3.9	3.7	3.7	4.0	4.1
13	4.9	5.4	5.1	4.1	4.7	7.5	5.7	3.8	3.6	3.8	3.9	4.0
14	4.8	5.2	5.1	4.2	4.8	6.8	5.5	3.9	3.7	3.7	4.0	4.0
15	4.8	4.8	5.0	4.2	4.7	5.9	5.2	5.5	3.7	3.7	3.8	4.0
16	4.9	4.9	4.8	4.1	4.6	6.2	4.3	6.8	3.8	3.6	3.8	4.0
17	4.8	13.4	4.8	4.5	4.7	13.2	4.2	5.8	3.7	3.6	3.8	3.9
18	5.8	15.55	4.7	8.0	4.7	8.7	4.8	4.1	3.8	3.7	3.9	4.0
19	13.65	7.6	4.6	6.95	4.6	6.8	4.5	4.0	3.8	3.7	3.7	3.9
20	9.3	8.6	4.7	6.2	4.6	6.8	4.5	4.1	3.8	3.8	3.7	3.9
21	15.5	11.6	4.7	6.0	4.6	6.4	4.3	4.0	3.6	3.7	3.8	3.9
22	17.8	13.1	4.7	5.9	4.6	6.0	4.2	4.0	3.7	3.9	3.7	4.1
23	8.2	12.1	4.7	6.0	4.6	6.0	4.2	3.9	3.6	4.0	3.9	4.0
24	7.05	8.5	4.6	8.7	4.6	5.3	4.1	4.0	3.7	4.0	3.8	4.1
25	6.4	6.8	4.6	15.3	4.5	5.0	4.1	3.9	3.6	4.0	3.8	4.0
26	5.4	6.3	4.6	9.9	4.7	4.9	4.0	3.9	3.7	3.9	3.9	4.0
27	5.3	5.9	4.5	8.2	4.7	4.8	3.9	3.7	3.6	3.9	3.8	4.1
28	5.2	8.9	4.5	7.0	4.4	4.9	4.0	3.8	3.7	4.0	3.9	4.2
29	5.2	......	4.4	6.5	4.5	4.8	3.9	3.7	3.6	3.9	4.2	4.1
30	5.0	......	4.5	6.4	4.4	4.7	4.0	3.8	3.7	4.0	4.1	4.5
31	5.0	......	4.45	......	4.3	......	4.0	3.8	......	3.8	......	4.8

NOTE.—Relation of gage height to discharge more or less affected by ice from Jan. 1 to 18. Probably no appreciable backwater from ice during the remainder of the year. All gage readings probably to water surface.

Daily discharge, in second-feet, of Monocacy River near Frederick, Md., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	150	402	7,440	183	1,030	214	282	79	38	38	57	102
2	150	247	3,620	214	789	183	247	102	57	22	79	102
3	150	282	3,050	214	632	214	282	79	214	22	57	102
4	150	282	1,700	247	632	446	247	79	154	15	102	127
5	150	282	1,320	320	537	402	282	57	102	22	79	102
6	200	632	1,030	282	491	360	247	79	127	15	102	183
7	560	491	1,030	214	402	320	214	57	79	15	127	154
8	2,400	537	789	247	446	320	214	79	102	22	79	183
9	682	632	632	214	491	360	183	57	79	15	102	127
10	584	632	584	183	446	734	214	79	79	22	79	127
11	537	632	584	183	360	2,440	214	57	22	57	79	102
12	402	584	584	183	402	2,090	183	79	38	38	102	127
13	402	632	491	127	320	2,130	789	57	22	57	79	102
14	360	537	491	154	360	1,540	682	79	38	38	102	102
15	360	360	446	154	320	906	537	682	38	38	57	102
16	402	402	360	127	282	1,100	183	1,540	57	22	57	102
17	360	7,970	360	247	320	7,760	154	846	38	22	57	79
18	846	10,200	320	2,580	320	3,240	360	127	57	38	79	102
19	8,230	2,220	282	1,660	282	1,540	247	102	57	38	38	79
20	3,810	3,140	320	1,100	282	1,540	247	127	57	57	38	79
21	10,200	6,100	320	969	282	1,240	183	102	22	38	57	79
22	12,600	7,660	320	906	282	969	154	102	38	79	38	127
23	2,760	6,600	320	969	282	969	154	79	22	102	79	102
24	1,750	3,050	282	3,240	282	584	127	102	38	102	57	127
25	1,240	1,540	282	9,960	247	446	127	79	22	102	57	102

Daily discharge, in second-feet, of Monocacy River near Frederick, Md., for 1910—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	632	1,170	282	4,400	320	402	102	79	38	79	79	102
27	584	906	247	2,760	320	360	79	38	22	79	57	127
28	537	3,430	247	1,700	214	402	102	57	38	102	79	154
29	537	....	214	1,320	247	360	79	38	22	79	154	127
30	446	....	247	1,240	214	320	102	57	38	102	127	247
31	446	....	230	....	183	....	102	57	....	57	....	360

NOTE.—Daily discharge determined from a fairly well-defined discharge rating curve. Discharge Jan. 1 to 6 slightly reduced on account of effect of ice. No further corrections made to the daily discharge.

Monthly discharge of Monocacy River near Frederick, Md., for 1910.

[Drainage area, 660 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,600	a 150	1,700	2.58	2.97	B.
February	10,200	247	2,200	3.33	3.47	B.
March	7,440	214	917	1.39	1.60	A.
April	9,960	127	1,210	1.83	2.04	A.
May	1,030	183	388	.588	.68	A.
June	7,760	183	1,130	1.71	1.91	A.
July	789	79	236	.358	.41	A.
August	1,540	38	169	.256	.30	A.
September	214	22	58.5	.089	.10	B.
October	102	15	49.5	.075	.09	B.
November	154	38	77.8	.118	.13	B.
December	360	79	127	.192	.22	B.
The year	12,600	15	676	1.02	13.92	

a Estimated; affected by ice.

GOOSE CREEK NEAR LEESBURG, VA.

Goose Creek, the largest and most important tributary of the Potomac between the mouth of the Monocacy and Great Falls, rises on the eastern slope of the Blue Ridge in Loudoun and Fauquier counties, Va., flows eastward, and discharges into the Potomac near Edwards Ferry, Md., about 18 miles above Great Falls. The drainage area comprises about 384 square miles and lies chiefly in Loudoun County.

The gaging station, which is located at Evergreen Mills, about 7 miles directly south of Leesburg, Va., the most convenient railroad station, and about 10 miles above the mouth of the stream, was established July 12, 1909. Little River enters Goose Creek about 1 mile above the station, and Sycoline and Tuscarora creeks enter below.

A vertical staff gage is spiked to a tree on the left bank immediately below the tailrace of the grist and lumber mill.

Measurements are made between the mill and dam, either by wading or from the highway bridge.

The dam is constructed of timber and rock, and at low stages most of the water passes through it. The mill race carries water at all times—three or four times more when the mill is running than when it is idle. This variation in flow causes variation in the gage heights, ranging from a few hundredths to about 0.15 foot, but as the mill is run only four or five hours a day, the fluctuation has a relatively small effect on the accuracy of the estimates.

Discharge measurements of Goose Creek near Leesburg, Va., in 1910.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 22	G. C. Stevens	4.42	a 1,330
25	do	2.23	b 451
25	do	2.16	b 447

a Includes 40 second-feet; estimated quantity flowing in the canal.
b Includes 28.0 second-feet flowing in mill race.

NOTE.—Measurements made from the bridge.

Daily gage height, in feet, of Goose Creek near Leesburg, Va., for 1910.

[J. O. Daniel, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.08	1.60	4.60	1.10	1.54	1.06	1.28	0.70	0.42	0.10	0.70	0.95
2	1.10	1.58	3.10	1.00	1.40	1.04	1.30	.65	.48	.12	.65	.95
3	1.10	1.50	2.85	1.05	1.38	1.10	1.24	.60	.50	.10	.70	.94
4	1.08	1.95	2.36	1.10	1.55	1.20	1.48	.65	.60	.08	.68	.95
5	1.10	1.85	2.25	1.30	1.35	1.30	1.50	.62	.70	.06	.70	1.00
6	1.10	1.90	2.20	1.30	1.30	1.40	1.28	.64	.66	.10	.65	1.10
7	3.30	1.98	2.05	1.20	1.28	1.38	1.15	.66	.65	.12	.70	1.10
8	2.00	1.52	2.02	1.20	1.10	1.36	1.22	.68	.62	.14	.68	1.05
9	1.80	1.50	1.95	1.20	1.02	1.30	1.35	.55	.60	.20	.70	1.05
10	1.30	1.50	1.90	1.15	.95	2.00	1.34	.60	.61	.40	.75	1.05
11	1.25	1.45	1.85	1.15	.94	2.40	1.30	.65	.62	.50	.77	1.05
12	1.10	1.50	1.88	1.10	1.30	3.00	1.88	.68	.65	.45	.75	1.05
13	1.10	1.30	1.82	1.08	1.32	2.65	2.06	.70	.66	.40	.72	1.05
14	1.08	1.32	1.73	1.05	1.28	2.10	1.38	.65	.60	.45	.75	1.05
15	1.10	3.30	1.64	1.05	1.15	1.80	1.12	.64	.50	.40	.70	1.10
16	1.15	4.50	1.55	1.08	1.12	6.00	1.10	.80	.40	.40	.75	1.10
17	1.20	4.51	1.50	2.00	1.10	3.08	1.05	.92	.30	.45	.85	1.10
18	1.25	6.51	1.40	2.70	1.08	3.02	1.04	.95	.25	.40	.86	1.10
19	7.00	3.40	1.38	2.50	1.04	3.00	1.06	.96	.20	.38	.90	1.10
20	3.00	3.35	1.39	2.00	1.02	2.30	1.10	.94	.20	.40	.88	1.10
21	6.00	3.25	1.38	1.90	1.04	2.10	1.05	.82	.22	.50	.85	1.10
22	4.70	3.87	1.38	1.80	1.06	2.04	.98	.75	.20	.70	.90	1.00
23	3.75	3.52	1.37	1.54	1.20	1.85	1.00	.70	.18	1.00	.92	1.05
24	3.05	2.90	1.32	2.36	1.12	1.74	.98	.65	.15	1.50	.95	1.05
25	2.20	2.71	1.32	3.00	1.44	1.50	.94	.62	.14	1.10	1.10	1.10
26	1.80	2.67	1.33	2.50	1.30	1.45	.90	.64	.12	.95	.98	1.10
27	1.70	3.70	1.33	2.20	1.22	1.38	.92	.55	.13	.75	1.00	1.15
28	1.70	4.10	1.32	1.90	1.10	2.15	.90	.50	.15	.70	1.05	1.25
29	1.68		1.30	1.60	1.12	1.85	.88	.48	.10	.65	1.08	1.25
30	1.75		1.24	1.55	1.10	1.48	.80	.40	.12	.70	1.00	1.90
31	1.70		1.20		1.08		.75	.38		.60		1.90

NOTE.—Relation of gage height to discharge probably affected by ice from about Jan. 1 to 6 and 12 to 18, for short periods during the first half of February, and from about Dec. 5 to 24.

Daily discharge, in second-feet, of Goose Creek near Leesburg, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	240	1,410	106	222	97	150	36	12	2.0	36	74
2	......	234	783	84	182	93	155	30	16	2.4	30	74
3	......	210	684	95	177	106	140	25	17	2.0	36	73
4	......	353	499	106	225	130	204	30	25	1.8	34	74
5	......	320	459	155	168	155	210	27	36	1.6	36	......
6	......	336	441	155	155	182	150	29	32	2.0	30	......
7	863	363	388	130	150	177	118	32	30	2.4	36	......
8	370	216	377	130	106	171	135	34	27	2.8	34	......
9	303	210	353	130	88	155	168	21	25	4.0	36	......
10	155	210	336	118	74	370	166	25	26	11	42	......
11	142	196	320	118	73	513	155	30	27	17	45	......
12	106	210	329	106	155	743	329	34	30	14	42	......
13	106	155	310	102	160	607	391	36	32	11	39	......
14	102	160	281	95	150	405	177	30	25	14	42	......
15	106	863	252	95	118	303	111	29	17	11	36	......
16	118	1,370	225	102	111	2,040	106	49	11	11	42	......
17	130	1,370	210	370	106	775	95	69	7.0	14	57	......
18	142	2,270	182	626	102	751	93	74	5.5	11	59	......
19	2,490	903	177	550	93	743	97	76	4.0	10	65	......
20	743	883	179	370	88	477	106	73	4.0	11	62	......
21	2,040	843	177	336	93	405	95	52	4.6	17	57	......
22	1,460	1,100	177	303	97	384	80	42	4.0	36	65	......
23	1,050	952	174	222	130	320	84	36	3.6	84	69	......
24	763	704	160	499	111	284	80	30	3.0	210	74	......
25	441	630	160	743	193	210	73	27	2.8	106	106	106
26	303	615	163	550	155	196	65	29	2.4	74	80	106
27	271	1,030	163	441	135	177	69	21	2.6	42	84	118
28	271	1,200	160	336	106	423	65	17	3.0	36	95	142
29	265	......	155	240	111	320	62	16	2.0	30	102	142
30	287	......	140	225	106	204	49	11	2.4	36	84	336
31	271	......	130	......	102	......	42	10	......	25	......	336

NOTE.—Daily discharge determined from a rating curve well defined between 50 and 1,370 second-feet. Discharge Jan. 1 to 6 and Dec. 5 to 24 estimated from climatologic data. No correction was made to determinations of discharge for the remainder of the year.

Monthly discharge of Goose Creek near Leesburg, Va., for 1910.

[Drainage area, 338 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,490	....	439	1.30	1.50	B.
February	2,270	155	648	1.92	2.00	B.
March	1,410	130	321	.950	1.10	B.
April	743	84	255	.754	.84	B.
May	225	73	130	.385	.44	B.
June	2,040	93	397	.117	.13	B.
July	391	42	130	.385	.44	B.
August	76	10	34.8	.103	.12	C.
September	36	2.0	14.6	.043	.05	C.
October	210	1.6	27.5	.081	.09	C.
November	106	30	55.2	.164	.18	B.
December	336	....	89.7	.265	.30	D.
The year	2,490	1.6	208	.615	7.19	

NOTE.—Mean discharge Jan. 1–6 estimated 50 second-feet.
Mean discharge Dec. 5–24 estimated 60 second-feet.

RAPPAHANNOCK RIVER.

RAPPAHANNOCK RIVER NEAR FREDERICKSBURG, VA.

Rappahannock River rises on the eastern slope of the Blue Ridge, in Rappahannock and Fauquier counties, Va., and takes a general southeasterly course to Chesapeake Bay, into which it discharges at a point about 36 miles from Cape Charles. The length of its course in a straight line is about 132 miles, and its drainage area comprises approximately 2,700 square miles. It crosses the fall line, with considerable fall, at the city of Fredericksburg; below that point it is a sluggish, tidal, navigable stream, spreading out in places to a width of several miles. There are no lakes in the basin, and the flow of the river is exceedingly variable. The bed is generally of rock overlain with gravel and sand, and the banks are in most places high enough to confine the stream except at high freshets. The slope of the stream is not uniform but is broken by falls at several places. At Fredericksburg the elevation of the river above sea level is zero; 35½ miles above it is 252 feet, showing a fall of 7.1 feet per mile. The average annual rainfall in this basin is about 42 inches. The principal tributary is the Rapidan, which enters from the right 10 or 12 miles above Fredericksburg and drains about 745 square miles. No important tributary enters between the mouth of the Rapidan and Fredericksburg.

The gaging station, which was established September 19, 1907, in cooperation with the Fredericksburg Power Co., by which the cable and equipment were furnished, is located about 3½ miles above the city. The records of discharge are important in determining the amount of power available between the station and Fredericksburg. The station is located at a pool a few hundred feet above a rocky control and is about 1½ miles above the dam of the power company. The discharge is probably not affected by backwater, as there is considerable fall between the station and the dam.

The original staff gage was destroyed February 14, 1908, and was replaced on February 20, 1908, by a chain gage under the cable. The datum, which is the same for both gages, has been maintained at a constant elevation.

The discharge is likely to be affected by ice during the winter period.

Conditions of flow at the station are probably permanent. At extreme low water the current is very sluggish and accurate discharge measurements are difficult. A good low-water rating curve has been developed.

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

September 8, 1910: Width, 447 feet; area of section, 1,580 square feet; gage height, 0.95 foot; discharge, 291 second-feet.

Daily gage height, in feet, of Rappahannock River near Fredericksburg, Va., for 1910.

[J. W. Franklin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.16	1.76	4.38	1.47	2.14	1.40	1.73	1.27	0.97	0.60	1.08	1.33
2	1.12	1.68	3.85	1.45	2.10	1.36	1.59	1.23	1.07	.62	1.08	1.17
3	1.18	1.78	3.15	1.60	2.02	1.36	1.46	1.63	1.47	.57	1.11	1.10
4	1.64	2.21	2.86	1.85	1.84	1.38	6.49	1.49	1.43	.50	1.18	.98
5	2.04	2.58	2.58	1.96	1.80	1.47	5.15	1.27	1.24	.48	1.16	.98
6	1.46	2.46	2.43	1.76	1.77	2.01	2.90	1.21	1.15	.48	1.08	1.02
7	1.93	1.80	2.33	1.69	1.64	1.93	2.25	1.14	1.06	.62	1.06	1.03
8	3.30	1.86	2.17	1.63	1.69	1.56	2.05	1.63	.97	1.31	1.06	1.18
9	3.69	1.96	2.07	1.52	1.74	1.48	2.05	1.35	.92	2.16	1.03	1.24
10	3.07	1.80	1.97	1.43	1.62	2.40	1.94	1.23	.83	1.94	1.02	1.17
11	2.48	1.74	2.01	1.39	1.60	3.72	2.15	1.13	.80	1.42	.99	1.16
12	2.52	1.53	2.13	1.39	1.61	5.76	2.69	1.27	.78	1.12	1.00	1.15
13	2.38	1.48	2.17	1.41	2.04	5.83	4.25	1.21	.76	1.01	1.00	1.12
14	2.27	1.62	2.01	1.50	2.04	4.48	3.59	1.14	1.04	.96	1.00	1.15
15	2.17	1.72	1.91	1.46	1.78	3.66	2.55	1.12	1.31	.92	1.00	1.18
16	2.30	1.93	1.81	1.41	1.64	3.18	2.13	1.21	1.06	.87	1.02	1.20
17	1.88	2.93	1.77	3.38	1.60	5.50	2.15	1.17	.87	.82	1.03	1.32
18	1.78	6.35	1.75	4.51	1.58	3.90	2.95	1.13	.82	.80	1.00	1.18
19	2.30	3.85	1.69	3.51	1.52	3.34	4.29	1.11	.77	.80	.99	1.22
20	2.32	3.09	1.66	2.95	1.48	3.15	3.08	1.09	.73	.77	.98	1.32
21	2.12	2.70	1.63	2.57	1.68	3.14	2.29	1.07	.72	1.98	.98	1.26
22	5.65	3.42	1.61	2.37	1.65	2.42	2.04	1.19	.72	1.74	1.00	1.18
23	3.65	3.20	1.57	2.17	2.20	2.34	1.84	1.21	.73	3.14	1.00	1.16
24	3.00	2.71	1.57	3.01	1.81	2.14	1.73	1.19	.71	2.16	1.00	1.34
25	2.48	2.42	1.56	2.67	1.80	2.04	1.61	1.17	.70	1.67	1.02	2.34
26	2.38	2.21	1.55	3.11	2.32	1.86	1.57	1.11	.67	1.47	1.02	2.11
27	2.19	2.07	1.49	2.70	1.82	1.80	1.53	1.17	.65	1.37	1.02	1.90
28	2.30	2.20	1.49	2.53	1.68	1.82	1.49	1.15	.64	1.28	1.06	1.86
29	2.50	......	1.45	2.33	1.58	2.22	1.39	1.11	.62	1.22	1.13	1.84
30	2.15	......	1.49	2.19	1.42	1.82	1.37	1.03	.62	1.17	1.27	2.74
31	1.92	......	1.49	......	1.40	......	1.32	.99	......	1.11	......	2.68

NOTE.—River more or less frozen from about Jan. 1 to 21, Feb. 7 to 15, and Dec. 5 to 29. All gage readings probably to water surface.

Daily discharge, in second-feet, of Rappahannock River near Fredericksburg, Va., for 1910.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	442	1,060	6,040	718	1,570	645	1,020	526	325	186	388	578
2	414	961	4,760	698	1,520	607	854	494	382	192	388	449
3	456	1,080	3,290	865	1,400	607	708	901	718	178	407	400
4	913	1,680	2,740	1,180	1,160	626	12,300	740	676	160	456	330
5	1,430	2,260	2,260	1,320	1,110	718	8,160	526	502	156	442	330
6	708	2,060	2,010	1,060	1,070	1,390	2,820	478	435	156	388	352
7	1,280	1,110	1,860	973	913	1,280	1,740	428	376	192	376	358
8	3,580	1,190	1,620	901	973	819	1,440	901	325	560	376	456
9	4,400	1,320	1,470	773	1,040	729	1,440	598	300	1,600	358	502
10	3,130	1,110	1,330	676	889	1,960	1,290	494	262	1,290	352	449
11	2,090	1,040	1,390	634	865	4,470	1,590	421	250	666	335	442
12	2,160	784	1,560	634	877	10,000	2,440	526	243	414	340	435
13	1,930	729	1,620	656	1,430	10,200	5,700	478	236	346	340	414
14	1,760	889	1,390	750	1,430	6,300	4,190	428	364	320	340	435
15	1,620	1,010	1,250	708	1,080	4,340	2,210	414	560	300	340	456
16	1,810	1,280	1,120	656	913	3,350	1,560	478	376	278	352	470
17	1,210	2,870	1,070	3,750	865	9,200	1,590	449	278	258	358	569
18	1,080	11,900	1,050	6,380	842	4,870	2,910	421	258	250	340	456
19	1,810	4,760	973	4,020	773	3,670	5,800	407	240	250	335	486
20	1,840	3,170	937	2,910	729	3,290	3,150	394	226	240	330	569
21	1,540	2,460	901	2,240	961	3,270	1,800	382	223	1,350	330	518
22	9,660	3,830	877	1,920	925	2,000	1,430	463	223	1,040	340	456
23	4,320	3,380	830	1,620	1,660	1,870	1,160	478	226	3,270	340	442
24	3,000	2,480	830	3,020	1,120	1,570	1,020	463	219	1,600	340	588
25	2,090	2,000	819	2,410	1,110	1,430	877	449	216	949	352	1,870
26	1,930	1,680	808	3,210	1,840	1,190	830	407	207	718	352	1,530
27	1,650	1,470	740	2,460	1,140	1,110	784	449	201	616	352	1,240
28	1,810	1,660	740	2,170	961	1,140	740	435	198	534	376	1,190
29	2,120	......	698	1,860	842	1,690	634	407	192	486	421	1,160
30	1,590	......	740	1,650	666	1,140	616	358	192	449	526	2,530
31	1,270	......	740	......	645	......	569	335	......	407	......	2,430

NOTE.—Daily discharge determined from a discharge curve well defined below 6,000 second-feet. No correction has been made for effect of ice, as the gage heights for the periods during which ice existed indicate a relatively small amount of backwater.

Monthly discharge of Rappahannock River near Fredericksburg, Va., for 1910.

[Drainage area, 1,590 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	9,660	414	2,100	1.32	1.52	B.
February	11,900	729	2,190	1.38	1.44	B.
March	6,040	698	1,560	.981	1.13	A.
April	6,380	634	1,760	1.11	1.24	A.
May	1,840	645	1,070	.673	.78	A.
June	10,200	607	2,850	1.79	2.00	B.
July	12,300	569	2,370	1.49	1.72	B.
August	901	335	488	.307	.35	A.
September	718	192	314	.197	.22	A.
October	3,270	156	626	.394	.45	A.
November	526	330	369	.232	.26	A.
December	2,530	330	738	.464	.53	B.
The year	12,300	156	1,360	.862	11.64	

MISCELLANEOUS MEASUREMENTS.

Measurements of stream discharge in north Atlantic coast drainage basins, made at points other than regular gaging stations, are recorded in the following table:

Miscellaneous measurements in north Atlantic coast drainage basins in 1910.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Apr. 21	Baboosic stream	Souhegan River	At mouth, near Merrimac, N. H.	[a]14.16	110
July 22	Ware River	Chicopee River	Barre Station, Mass	([b])	102
22	do	do	do	([c])	368
Sept. 13	do	do	do	([d])	7.34
Oct. 15	West Branch of Westfield River.	Westfield River	Highway bridge, Chester, Mass.		33.2
Sept. 8	do	do	Huntington, Mass		69.1
July 20	The Branch, Niagara Brook.	Schroon River	Farm crossing near White House Hotel, 1 mile west of Blue Ridge, N. Y.	[a]5.62	12.5
Jan. 10	West Branch of Sacandaga River.	Sacandaga River	Highway bridge above mouth of Devorse Creek, about 2½ miles southwest of Wells, N. Y.		[e]76.9
Aug. 23	West Stony Creek	do	Near highway bridge on road to Benson Center, N. Y.	[a]15.69	7.4
23	East Stony Creek	do	300 yards above highway bridge on road to Wells, N. Y.	[a]12.2	16.1
Aug. 12	Batten Kill	Hudson River	Battenville, N. Y	[f]6.35	241
Oct. 23	do	do	do	[f]5.66	85.6
June 2	Schuyler Creek	do	Highway Bridge at Stillwater, N. Y.	7.9	39
Aug. 1	Hoosic River	do	Highway bridge, Buskirk, N. Y.	[g]2.27	262
1	do	do	At Eagle Bridge, N. Y	1.11	233
Oct. 11	do	do	do	.93	153

[a] Reference point to water surface.
[b] Pond gage, 101.62 feet; forebay gage, 101.62 feet; tailrace gage, 86.66 feet.
[c] Pond gage, 101.10 feet; forebay gage, 100.04 feet; tailrace gage, 87.95 feet.
[d] Pond gage, 98.60 feet; tailrace gage, 85.64 feet; reference point on bridge, 18.15 feet.
[e] Measurement made under complete ice cover; average thickness of ice, 0.8 foot.
[f] Gage height referred to chain gage on bridge.
[g] Old chain gage datum; affected by backwater.

SUMMARY OF DISCHARGE PER SQUARE MILE.

The following summary of discharge per square mile is given to allow ready comparison of relative rates of run-off from different areas in the north Atlantic coast drainage basins. It shows in a general way the seasonal distribution of run-off and the effect of snow, ground, surface, and artificial storage; but the most important fact worth noting is the almost entire lack of uniformity or agreement between any two streams. This indicates that the discharge of each stream is a law unto itself, and that all projects dependent upon stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible.

Summary of discharge, in second-feet per square mile, for stations in north Atlantic coast drainage basins for 1910.

Station.	Drainage area.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
NEW ENGLAND STATES.	*Sq. m.*													
St. John River near Dickey, Maine	2,820	....	....	....	....	....	....	....	0.55	0.37	0.50	....	....	....
St. John River at Fort Kent, Maine	4,880	0.30	0.25	0.66	6.74	3.36	1.77	.38	.54	.49	.43	1.00	0.29	1.35
St. John River at Van Buren Maine	8,270	....	....	....	....	....	2.24	.59	.57	.43	.42	.85	.22	....
Allagash River near Allagash, Maine	1,240	....	....	....	....	....	....	.35	.34	.74	.29	.39	....	....
St. Francis River near St. Francis, Maine	560	....	....	....	....	....	2.20	.61	.56	.29	.34	.85	....	....
Madawaska River at Ste. Rose du Degele, Quebec	958	....	....	....	....	....	2.89	1.10	.75	.43	.48	.93	.91	....
Aroostook River at Fort Fairfield, Maine	2,230	.94	.54	.81	7.40	4.22	2.35	1.32	.30	.22	.19	.59	.16	1.58
St. Croix River near Woodland, Maine	1,420	1.63	1.59	1.89	1.88	1.71	1.86	1.61	1.38	1.40	1.34	.89	.95	1.51
Machias River at Whitneyville, Maine	465	2.60	2.39	3.27	3.81	4.62	2.26	1.54	.61	.52	.37	.31	.63	1.91
Green Lake Stream at Lakewood, Maine	47	2.21	3.23	4.30	3.53	3.19	1.43	1.16	1.20	2.60	1.45	1.00	1.87	2.26
Branch Lake Stream near Ellsworth, Maine	31	1.46	1.80	3.84	3.29	3.61	2.63	1.86	2.42	1.88	1.74	2.01	1.36	2.33
West Branch of Penobscot River at Millinocket, Maine	1,880	1.14	2.16	2.16	1.34	3.03	2.86	1.52	1.23	1.25	1.18	1.14	1.14	1.68
Penobscot River at West Enfield, Maine	6,600	1.12	1.30	1.79	4.21	3.00	2.55	1.27	.93	.64	.51	.62	.61	1.[illegible]
East Branch of Penobscot River at Grindstone, Maine	1,100	.97	.54	.60	5.01	3.62	4.43	1.46	.46	.24	.19	.36	.25	1.51
Mattawamkeag River at Mattawamkeag, Maine	1,500	1.20	1.10	1.50	5.38	3.12	2.05	.73	.36	.18	.10	.47	.43	1.38
Piscataquis River near Foxcroft, Maine	286	1.05	1.05	2.82	7.97	2.08	2.41	.46	.51	.28	.14	.14	.43	1.60
Kenduskeag Stream near Bangor, Maine	191	2.82	2.13	5.20	3.10	1.43	.69	.24	.25	.09	.08	.15	.59	1.39
Moose River near Rockwood, Maine	680	....	....	....	....	....	3.37	1.28	.41	.35	.35	.64	.29	....
Kennebec River at The Forks, Maine	1,570	1.27	1.11	.96	2.59	3.81	3.03	2.04	1.55	.89	1.01	.76	.80	1.66
Kennebec River at Bingham, Maine	2,660	1.22	1.09	1.28	3.84	3.75	2.79	....	....	....	....	....	....	....
Kennebec River at Waterville, Maine	4,270	1.30	1.11	2.44	5.22	3.37	2.74	1.26	.99	.59	.60	.59	.45	1.72
Dead River near The Forks, Maine	878	1.14	1.03	1.67	7.18	4.69	2.08	.57	.50	.42	.20	.50	.23	1.67
Sandy River near Farmington, Maine	270	....	....	....	....	....	....	....	.40	.24	.23	.32	.23	....
Sebasticook River at Pittsfield, Maine	320	1.48	1.63	2.48	3.59	1.87	1.08	.83	.85	.64	.41	.38	.31	1.30
Cobbosseecontee Stream at Gardiner, Maine	240	.77	.86	1.15	1.22	1.58	1.01	.86	.94	.94	.81	.70	.46	.94
Androscoggin River at Errol Dam, N. H.	1,095	1.02	1.08	1.05	3.10	2.56	2.52	1.11	1.02	1.08	.90	.94	1.09	1.46
Androscoggin River at Rumford Falls, Maine	2,090	1.28	.94	1.88	4.03	2.11	1.76	.80	.85	.80	.69	.79	.69	1.38
Presumpscot River at outlet of Sebago Lake, Maine	436	1.43	1.47	1.18	1.17	1.17	1.21	1.17	1.19	1.19	1.13	1.09	.82	1.18
Saco River at West Buxton, Maine	1,550	.76	.75	3.65	5.28	3.22	2.00	.67	.76	.60	.46	.66	.51	1.61
Pemigewasset River at Plymouth, N. H.	615	1.93	.86	5.27	6.85	2.70	2.42	.62	1.33	1.12	.69	1.13	.82	2.15
Merrimac River at Franklin Junction, N. H.	1,460	1.40	1.15	3.72	3.98	2.36	1.97	.90	1.01	.80	.76	1.05	.62	1.64
Merrimac River at Garvins Falls, N. H.	2,340	1.23	1.00	3.51	3.26	1.75	1.35	.58	.70	.60	.50	.70	.50	1.31
Merrimac River at Lawrence, Mass.	4,452	1.04	.97	3.61	2.44	1.51	1.08	.40	.46	.40	.30	.46	.34	1.08

Summary of discharge, in second-feet per square mile, for stations in north Atlantic coast drainage basins for 1910—Continued.

Station.	Drainage area.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
NEW ENGLAND STATES—continued.	*Sq. m.*													
Souhegan River at Merrimac, N. H.	168	1.64	1.23	8.33	2.97	1.57	1.35	.25	.24	.21	.24	.37	.35	1.57
South Branch of Nashua River at Clinton, Mass.	118.2	2.86	2.85	4.08	1.60	.94	1.27	.10	.29	.22	.11	.55	.60	1.28
Sudbury River at Framingham, Mass.[a]	75.2	2.30	2.86	3.02	1.03	.43	.80	.16	.11	.01	.08	.27	.34	.88
Lake Cochituate at Cochituate, Mass.[a]	17.8	2.42	2.81	2.41	1.15	.60	1.02	.25	.01	.10	.04	.38	.51	.96
Connecticut River at Orford, N. H.	3,300	.95	.61	3.88	4.39	2.75	1.83	.49	.74	.53	.62	.76	.46	1.50
Connecticut River at Sunderland, Mass.	7,700	1.69	1.08	5.40	3.90	2.27	1.90	.42	.54	.40	.44	.64	.36	1.59
Passumpsic River near St. Johnsbury, Vt.	237	1.91	1.16	4.19	3.89	2.68	1.81	.65	.68	.70	.73	.84	.59	1.66
White River near Sharon, Vt.	686	.79	1.02	4.61	2.64	1.81	2.07	.48	.82	.82	.77	.96	.81	1.47
Deerfield River at Shelburne Falls, Mass.	501	2.99	1.94	7.25	3.69	1.70	2.24	.33	.22	.33	.26	.61	.34	1.82
Westfield River at Knightville, Mass.	162	3.44	1.51	6.91	3.59	1.70	2.31	.28	.23	.59	.15	.91	.53	1.85
Westfield River (Middle Branch), Goss Heights, Mass.	53	....	....	....	....	....	....	....	.25	.59	.14	1.23	.57	....
HUDSON RIVER.														
Hudson River at North Creek, N. Y.	804	.74	.84	4.53	4.43	2.96	2.29	.63	1.19	1.23	1.41	1.13	.71	1.84
Hudson River at Thurman, N. Y.	1,550	.58	.77	4.19	4.39	2.55	2.45	.53	.79	.92	1.03	.96	.56	1.65
Hudson River at Mechanicsville, N. Y.	4,500	1.15	1.22	4.76	3.91	2.05	2.27	.36	.44	.50	.56	.73	.45	1.53
Schroon River at Riverbank, N. Y.	534	.35	.68	3.58	5.21	3.18	2.62	.49	.35	.65	.69	.75	.41	1.58
Sacandaga River at Wells, N. Y.	263	1.40	1.14	6.84	5.40	3.61	3.14	.24	.61	1.17	1.00	1.22	.46	2.19
Sacandaga River at Northville, N. Y.	740	1.22	1.01	7.16	6.22	3.55	3.03	.33	.50	.70	.81	1.15	.47	2.19
Sacandaga River near Hadley, N. Y. (upper bridge station)	1,050	1.07	.97	7.34	5.78	3.37	3.47	.34	.44	.58	.66	1.08	.52	2.14
Sacandaga River at Hadley, N. Y. (lower bridge station)	1,060	....	.96	....	....	....	....	.30	.39	.69	.65	.93	....	....
Schoharie Creek at Prattsville, N. Y.	240	3.32	3.34	5.47	5.81	1.57	2.08	.33	.20	.23	.22	1.30	1.40	2.09
Esopus Creek (weir station) near Olivebridge, N. Y.	239	4.51	2.54	7.13	8.19	1.92	1.70	.38	.27	.42	.20	.61	.88	2.40
Esopus Creek at Mount Marion, N. Y.	378	4.25	1.79	8.01	8.88	2.09	2.01	.39	.28	.35	.20	.54	.39	2.43
Rondout Creek at Rosendale, N. Y.	380	3.56	2.55	7.09	6.09	2.02	1.77	.34	.47	.50	.26	1.08	.84	2.21
MIDDLE ATLANTIC STATES.														
Passaic River near Chatham, N. J.	101	3.50	1.50	5.02	1.22	.58	1.40	.17	.23	.17	.14	.74	.67	1.28
East Branch Delaware River at Hancock, N. Y.	920	2.70	2.04	6.74	3.74	1.91	1.39	.33	.23	.39	.19	.65	.49	1.73
Delaware River at Port Jervis, N. Y.	3,250	1.93	1.20	6.03	2.72	1.67	1.24	.30	.22	.23	.13	.47	.46	1.38
Delaware River at Riegelsville, N. J.	6,430	1.90	1.54	5.30	3.05	1.94	1.41	.49	.37	.39	.26	.55	.48	1.47
West Branch Delaware River at Hancock, N. Y.	680	2.34	1.43	5.87	1.81	1.87	1.43	.25	.12	.18	.09	.46	.43	1.36
Mongaup River near Rio, N. Y.	189	1.62	1.27	4.83	3.23	1.99	1.15	.33	.32	.29	.17	.62	.79	1.39
Lehigh River at South Bethlehem, Pa.	1,235	2.15	2.12	3.80	3.10	2.27	1.64	.63	.39	.46	.29	.57	.63	1.50
Tohickon Creek at Point Pleasant, Pa.	102	6.51	4.66	3.25	3.71	.60	1.15	.05	.30	.74	.70	1.21	1.00	1.91
Neshaminy Creek below forks, Pa.	139	4.27	3.55	2.03	2.43	.78	1.12	.11	.52	.19	.16	.71	.86	1.38
Schuylkill River near Philadelphia, Pa.	1,920	1.62	1.86	2.11	1.45	.94	1.25	.31	.24	.38	.13	.37	.24	.90
Perkiomen Creek near Frederick, Pa.	152	2.73	3.72	2.04	1.78	.76	1.18	.19	.53	.44	.20	.81	.78	1.24
Susquehanna River at Binghamton, N. Y.	2,400	1.57	1.04	6.96	1.47	1.65	1.77	.34	.14	.21	.22	.64	.38	1.40
Susquehanna River at Wilkes-Barre, Pa.	9,810	1.29	.65	5.26	1.74	1.59	1.12	.20	.10	.10	.11	.31	.27	1.07
Susquehanna River at Danville, Pa.	11,100	1.09	.67	5.13	1.88	1.60	1.26	.26	.13	.14	.15	.37	.29	1.09
Susquehanna River at Harrisburg, Pa.	24,000	1.43	.75	4.71	2.36	1.61	1.64	.37	.19	.28	.23	.32	.31	1.19
Chenango River at Binghamton, N. Y.	1,530	1.35	.94	6.46	1.03	1.51	1.23	.20	.18	.33	.30	.88	.42	1.24
Chemung River at Chemung, N. Y.	2,440	.93	.62	4.34	2.65	1.74	.49	.12	.05	.08	.06	.11	.18	.95
West Branch of Susquehanna River at Williamsport, Pa.	5,640	1.36	.77	5.51	3.30	1.52	1.22	.27	.10	.27	.16	.19	.28	1.25
Juniata River at Newport, Pa.	3,480	1.20	.93	2.93	2.24	1.04	1.80	.37	.24	.46	.27	.22	.28	1.00
Potomac River at Point of Rocks, Md.	9,650	1.21	1.26	1.03	1.05	.57	2.74	.57	.21	.18	.16	.15	.22	.77
Monocacy River near Frederick, Md.	660	2.58	3.33	1.39	1.83	.59	1.71	.36	.26	.09	.08	.12	.19	1.02
Goose Creek near Leesburg, Va.	338	1.30	1.92	.95	.75	.38	.12	.38	.10	.04	.08	.16	.26	.62
Rappahannock River near Fredericksburg, Va.	1,590	1.32	1.38	.98	1.11	.67	1.79	1.49	.31	.20	.39	.23	.46	.86

[a] Attention is called to the fact that the Sudbury River records do not give the actual run-off of the river (which would include the effect of storage in the wet season and draft from storage in the dry season from the tributary reservoirs and streams as well as the loss by evaporation from them), but the natural flow of the basin without storage, as nearly as this flow can be measured and adjusted for the change in volume of stored water, without, however, taking into account the actual loss of water by evaporation from the water surfaces of the existing reservoirs and streams in this drainage basin. It may be said that this method of figuring the yield is common for waterworks or public supplies and is used also in the Nashua and Croton records, but for streams utilized chiefly for production of power the effect of storage as well as the loss by evaporation is included in the yield or run-off measurements and records.

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