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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

# REPORT

OF

# PROGRESS OF STREAM MEASUREMENTS

FOR

# THE CALENDAR YEAR 1902

BY

F. H. NEWELL

PART I.—NORTHERN ATLANTIC COAST AND ST. LAWRENCE RIVER DRAINAGE

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# LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
DIVISION OF HYDROGRAPHY,
*Washington, D. C., February 18, 1903.*

SIR: I have the honor to transmit herewith the first number of a series of four papers descriptive of the results of the hydrographic measurements made during the year 1902. These papers will contain the data which heretofore have been published in our Water-Supply Papers under the title of Operations at River Stations, and in the Report of Progress of Stream Measurements, which report until 1901 made up Part IV of the Annual Report. The data usually found in Part IV of the Annual Report were in 1901 published in Water-Supply Paper No. 75. These papers present briefly the original data as collected by the various resident hydrographers, together with the computations and results which have been based upon these facts.

This paper contains the data collected at the stations located in that portion of the Atlantic coast drainage north of and including the James River Basin. Part II will contain the data for the remainder of the stations east of the Mississippi, and Parts III and IV the data for the stations located west of the Mississippi.

Very respectfully,

F. H. NEWELL,
*Hydrographer in Charge.*

Hon. CHARLES D. WALCOTT,
*Director United States Geological Survey.*

# PROGRESS REPORT OF STREAM MEASUREMENTS FOR THE CALENDAR YEAR 1902.

## PART I.

By F. H. NEWELL.

### INTRODUCTION.

The determinations of the water supply of various parts of the United States have been continued during the year 1902 by the Division of Hydrography in a manner similar to that of previous years, slight modifications and improvements having been introduced in methods and operations. The work consists in measuring the streams and estimating the water supply, both above and under ground. To give full facts concerning the water supply it is necessary not merely to ascertain the quantity, but also in many cases the quality, and especially the possibilities of water storage or conservation. Water can not be considered as a resource unless it can be had when needed, and therefore the determination of the practicability of holding the floods until time of drought underlies any statement of water supply. In a similar way when considering underground waters it is not enough to know that there is water beneath the surface, but the facts must be ascertained as to the depth to the water, the rate of movement, if any, and the possibility of bringing the water to the surface at reasonable cost.

The principal operation of the hydrographic surveys, as at present conducted, is that of measuring the waters flowing upon the surface, obtaining their fluctuations in quantity, and sometimes in quality, from month to month and from year to year.

During 1902 the number of stations at which stream measurements were made was steadily increased. This is largely the result of the constant demand for the data collected by the Survey. The requests for information have been so great that the supply of publications has become practically exhausted, necessitating the reprinting in condensed form of the data collected in various localities.

The Survey has received the hearty cooperation of various individuals, corporations, and States, as mentioned hereafter. This cooperation has made possible the publication of many valuable records which could not otherwise have been obtained.

A brief historical sketch of the stream measurements made by the Geological Survey is published on pages 11 to 15 of Water-Supply Paper No. 75.

The results of the stream measurements made during previous years by the United States Geological Survey can be found in the following Survey publications, which may be consulted at the public libraries in all the large cities:

1893.
1894. } Bulletin No. 131.

1895. Bulletin No. 140.

1896. Water-Supply Paper No. 11; Eighteenth Annual Report, Part IV.

1897. Water-Supply Papers Nos. 15 and 16; Nineteenth Annual Report, Part IV.

1898. Water-Supply Papers Nos. 27 and 28; Twentieth Annual Report, Part IV.

1899. Water-Supply Papers Nos. 35 to 39, inclusive; Twenty-first Annual Report, Part IV.

1900. Water-Supply Papers Nos. 47 to 52, inclusive; Twenty-second Annual Report, Part IV.

1901. Water-Supply Papers Nos. 65, 66, and 75.

1902. Water-Supply Papers Nos. 82 to 85, inclusive.

## ACKNOWLEDGMENTS.

Most of the measurements presented in this paper have been obtained through local hydrographers. Acknowledgment is due to each of these persons, and thanks are extended to other persons and corporations who have assisted local hydrographers or have cooperated in any way, either by furnishing records of the height of water or by assisting in transportation.

The following list, arranged geographically by States, gives the names of the resident hydrographers and others who have assisted in furnishing and preparing the data contained in this report:

*Maine.*—Resident hydrographer, N. C. Grover, professor of civil engineering, University of Maine, Orono, Me., assisted by F. E. Pressey. Acknowledgment should also be made to the Bangor and Aroostook Railroad and to the Somerset Railroad, for annual passes issued to N. C. Grover; to the Maine Central Railroad, for a pass between April 1 and October 1; to the Portland and Rumford Falls Railroad, for trip passes issued when desired. Thanks are due the following individuals and corporations for data furnished and assistance rendered: A. C. Mixer, engineer of the Rumford Falls Power Company, for records of flow of the Androscoggin at Rumford Falls; Messrs. S. D. Warren & Co., of Westbrook, Me., for records of the flow of the Presumpscot; Alexander H. Twombley, engineer of the Forest Paper Company, of Yarmouthville, Me., for records of the flow of the Cobbosseecontee; Hollingsworth and Whitney Company, of Winslow, Me., for records from which the flow of the Kennebec at Waterville has been computed; and H. S. Ferguson, engineer of the Great Northern Paper Company, of Millinocket, Me., for records from which the flow of the Penobscot at Millinocket has been computed.

*New Hampshire.*—C. A. Holden, professor of civil engineering, Thayer School, Hanover, N. H., for measurements of the Connecticut River at Orford, N. H.

*Massachusetts.*—Frederic P. Stearns, chief engineer, and C. W. Sherman, division engineer of the Metropolitan Water Board of Boston, for records of the flow

of Sudbury and Nashua rivers and of Lake Cochituate; R. A. Hale, principal assistant engineer, Essex County, for records of the flow of Merrimac River at Lawrence, Mass., and Capt. Harry Taylor, U. S. Army, Boston, Mass.

*Connecticut.*—Edwin D. Graves, chief engineer Connecticut River Bridge and Highway District, for the gage heights of Connecticut River near Hartford, Conn., and Greenwich Water Company of Greenwich, Conn.

*Rhode Island.*—John E. Hill, professor of civil engineering at Brown University, Providence, R. I., for records of the flow of Blackstone River and canal at Berkeley, R. I.

*New York.*—Resident hydrographer, Robt. E. Horton, assisted by C. C. Covert and F. H. Tillinghast. Special acknowledgment is made to Edward A. Bond, State engineer and surveyor, for his hearty cooperation and assistance in the work. Thanks are due the following persons for data furnished and assistance rendered: Wm. S. Bacot, engineer and general manager of the Consolidated Water Company, Utica, N. Y.; Stephen E. Babcock, C. E., Little Falls, N. Y.; City Water Department, Oswego, N. Y.; Frank E. Hinds, C. E., Watertown, N. Y.; Wm. G. Raymond, C. E., Troy, N. Y.; Hannawa Falls Water Power Company, at Hannawa Falls, N. Y.; Utica Gas and Electric Company, Utica, N. Y.; International Paper Company, Fort Edwards, N. Y.; Duncan Company, Mechanicville, N. Y.; Honk Fall Power Company, Ellensville, N. Y.; Fishkill and Matteawan Water Company, Fishkill on the Hudson, N. Y.; Binghamton Railway Company, Binghamton, N. Y.; S. E. Moore, C. E., Binghamton, N. Y.; O. C. Breed, C. E., Fulton, N. Y.; and E. A. Fisher, C. E., Rochester, N. Y.

*New Jersey.*—Resident hydrographers, G. B. Hollister and E. G. Paul.

*Pennsylvania.*—Resident hydrographer, E. G. Paul. Thanks are due to the following persons, who have rendered assistance and furnished data: Mansfield Merriman, professor of civil engineering at Lehigh University, South Bethlehem, Pa.; E. Mather, president of the Harrisburg water commission, Harrisburg, Pa.; John E. Codman, hydrographer for the city water board, Philadelphia, Pa.; and F. A. Snyder, city engineer, Williamsport, Pa.

*Maryland.*—Resident hydrographer, E. G. Paul.

*Virginia and West Virginia.*—Resident hydrographers, E. G. Paul and D. C. Humphreys, professor of civil engineering at Washington and Lee University, Lexington, Va.

Acknowledgments are also due to John C. Hoyt, George L. Warner, and H. G. Stokes for computations on and the arrangement of the data in this report; also to H. A. Pressey for assistance in both field and office.

## WATER POWERS IN MAINE.

The rivers of the State of Maine furnish some of the best water-power sites in the United States. The large rivers have their sources in general at high elevations among the mountains and hills of the central and northern part of the State. Their fall is rapid, with frequent vertical drops over granite ledges. Building stone is abundant in nearly all the drainage basins. The rocky beds furnish excellent foundations for dams and mills, and the excellent harbors along the coast, together with the railroad lines following the lower courses of the streams, give for a large part of the State excellent transportation facilities. The extensive lake areas, aggregating 2,300 square miles, furnish natural reservoirs for the storage of storm

waters that could not be equaled throughout the United States. In addition to the lakes, the extensive forests covering the greater part of the State and the gravelly and porous soil tend to make the flow of the Maine rivers remarkably uniform.

During the summer of 1901 the United States Geological Survey commenced the hydrographic study of the State of Maine. Prior to that time records of flow from a few of the main rivers had been furnished by engineers and manufacturing companies and published in the reports of the Survey. It is hoped that these records may be continued and that the investigations may be extended, so that definite information may be obtained of the flow, fall, and the possibilities of increased storage on all of the larger streams of the State.

In the following pages the records of flow for the year 1902 are published for all stations for which such figures are available. In addition to these, gage heights are given at a number of the new stations established by the Survey, with the results of current-meter measurements made from time to time. As soon as these stations have been continued for a sufficient period to permit of the construction of rating curves for the stations, the records of flow for each day of the year will be published.

Twelve gaging stations are now being maintained by the Geological Survey in the State of Maine. These stations are under the charge of N. C. Grover, professor of civil engineering, University of Maine, assisted by F. E. Pressey. The stations are located as follows: On the Androscoggin River at Dixfield; on the Kennebec River at The Forks and North Anson; on the Carrabassett River near North Anson; on the Dead River near The Forks; on the Moose River near Rockwood; on the Roach River at Roach River; on the East Branch of the Penobscot at Grindstone; on the Penobscot at Montague; on the Mattawamkeag at Mattawamkeag; on the Piscataquis at Low's bridge, between Foxcroft and Guilford; and on the St. Croix at Sprague Falls.

Aside from the records at these stations, records are also received from various engineers, as noted in the following pages.

A full description of the drainage areas of the Maine rivers will be found in Water-Supply and Irrigation Paper No. 69, and records of flow for past years will be found in the same paper.

## ST. CROIX RIVER DRAINAGE BASIN.

St. Croix River is formed by two branches, known as the Upper St. Croix or Chiputneticook River, the outlet of the Schoodic Lakes, and Kennebasis River, the outlet of the western lakes of the area, known as the Kennebasis Lakes. The Upper St. Croix, with its tributary lakes, forms nearly half of the eastern boundary of Maine, separating that State from New Brunswick. The total drainage area of the main stream is about 1,630 square miles, of which 960 square miles are tributary to the great reservoir systems controlled by dams at

Vanceboro and Princeton. The length of the stream from the headwaters to the mouth is 100 miles. The basin is, in general, lower than that of any of the larger streams of the State flowing into the Atlantic, its headwaters having an elevation of about 540 feet. The fall from Chiputneticook Lake (the lower of the Schoodic Lakes) to tide water, a distance of 54 miles, is, however, 382 feet, or 7 feet to the mile, and there are a number of places where falls and rapids occur at which water power has been or can easily be developed.

The lake system of the St. Croix is the largest in the State in proportion to the drainage basin, except that of the Presumpscot, and as the lakes act as a regulator of flow and can easily be improved for greater duty, St. Croix River may be considered one of the best water-power streams on the Atlantic coast. The lake system of the Upper St. Croix comprises approximately 50 square miles of lake surface, and that of the West Branch 70 square miles, considering only the principal lakes and ponds. Indeed, above Vanceboro and Princeton each branch of the river is simply a succession of lakes to almost the extreme headwaters. Wells estimated the total lake surface of the St. Croix as not less than 150 square miles, or nearly one-tenth of the total drainage area. The drainage area at various points on the river is given in the following table:

*Drainage area of St. Croix River.*

| | Sq. miles. |
|---|---|
| Main river: | |
| Vanceboro dam, foot of the Schoodic Lakes | 430 |
| Little Falls | 500 |
| Immediately above mouth of West Branch | 690 |
| Immediately below mouth of West Branch | 1,360 |
| Sprague Falls | 1,390 |
| Calais, lower dam | 1,530 |
| Mouth of river, eastern border of town of Calais | 1,630 |
| West Branch: | |
| Princeton dam | 500 |
| Confluence with main river | 670 |

A large proportion of the drainage basin is still covered with timber, and above Vanceboro and Princeton the region is for the most part wild and inaccessible, being visited only by lumbermen and sportsmen. The greater part of the timber in this region is controlled by sawmill owners at Calais and St. Stephen. In 1898 the amount of lumber sawed annually had fallen from about 100,000,000 feet to 25,000,000 feet, and since then the number of sawmills has been greatly reduced. In 1901 the lumber sawed amounted to 28,000,000 feet, showing that the rate of cutting has remained nearly constant during the last few years. There are on this stream favorable locations for paper and pulp mills, but arrangements would have to be made with the sawmill owners in order to obtain a supply of timber.

The river is navigable as far as Calais, except during two months of the year, when it is frozen. Calais has railroad connection with

Bangor directly over the Washington County Railroad, and, by way of Vanceboro, over the Canadian Pacific and the Maine Central railroads. There is also a short road connecting Princeton with Calais. Above Princeton the transportation facilities are poor. Calais, Princeton, and Vanceboro, in Maine, and St. Stephen, in New Brunswick, are towns with populations of from 1,000 to 10,000, largely engaged in the manufacture of lumber.

### ST. CROIX RIVER AT SPRAGUES FALLS, NEAR BARING, ME.

This station was established December 4, 1902, by F. E. Pressey. The drainage area at this point is 1,390 square miles. The usual form of wire gage is attached to the lower guard timber of the Washington County Railroad Bridge. It is referenced by a bench mark on the down-stream corner of bridge seat on right abutment; elevation 17.60 feet above zero of gage. The gage is read daily by Simeon Phinney, section foreman on the Washington County Railroad, who resides in Baring, Me. The measurements of flow are made from a car suspended on a steel cable, which is stretched over the river about one-half mile above the bridge. The channel is straight 100 feet above and 1,000 feet below the cable. The banks are high and rocky, and the bed is rocky. The station is best reached by carriage from Calais, Me., because trains run so infrequently on this branch of the Washington County Railroad.

*Daily gage height, in feet, of St. Croix River, at Sprague Falls, near Baring, Me., for December, 1902.*

| Day. | Dec. | Day. | Dec. | Day. | Dec. | Day. | Dec. |
|---|---|---|---|---|---|---|---|
| 4 | 6.9 | 11 | 8.4 | 18 | 9.0 | 25 | 9.0 |
| 5 | 7.1 | 12 | 8.6 | 19 | 9.1 | 26 | 8.9 |
| 6 | 7.2 | 13 | 8.7 | 20 | 8.8 | 27 | 8.8 |
| 7 | 7.4 | 14 | 9.0 | 21 | 8.8 | 28 | 8.5 |
| 8 | 7.8 | 15 | 9.7 | 22 | 8.7 | 29 | 8.2 |
| 9 | 8.0 | 16 | 9.7 | 23 | 8.9 | 30 | 8.0 |
| 10 | 8.3 | 17 | 8.5 | 24 | 9.1 | 31 | 8.0 |

## PENOBSCOT RIVER DRAINAGE BASIN.

The Penobscot has the largest drainage basin of all the rivers in Maine, comprising about 8,500 square miles, or more than one-quarter of the entire State. Its greatest length from north to south is 160 miles, its greatest width 115 miles, all within the State. Eight hundred square miles of the basin discharge their waters into the main river below its lowest water power at Bangor.

The basin is at a lower elevation above the sea than the basins of the Kennebec and the Androscoggin, as would be expected from the general southeasterly slope of the country toward the Atlantic Ocean. The northern portion, however, is rather elevated, having a mean

height of about 1,000 feet. The highest portion of the basin is at the headwaters of the main river, where the elevation is from 1,600 to 2,000 feet.

Taken as a whole, the basin is rather uniform in its topographic features. Hills and low mountains stretch from near the sea to above Bangor; farther north is an undulating plain, while to the west the surface becomes more broken and greatly diversified by hills, detached peaks, lakes, ponds, and swamps. At the south the basin merges into that of the Kennebec, and at the north into that of the Alleguash, terminating on the northwest, at the boundaries of the State, in a highland region intermingled with swamps and lagoons, the latter furnishing water to the Penobscot and the St. John. A large part of the basin is what is known as "wild land," being heavily timbered and known only to the lumberman and the sportsman. Few regions in the country are more delightful to the lover of nature than the forests, the lakes, and the mountains on the headwaters of the Penobscot. From Mount Katahdin, the highest mountain of the State, a view can be obtained in all directions, overlooking the extensive plain and showing vast stretches of forests dotted here and there with lakes.

Over the upper portion of the basin slate is the principal surface rock, being succeeded to the east and south by schists, gneiss, and granite; the soil is mainly gravel, clay, and loam.

The drainage areas of the river and its chief tributaries are given in the following table:

*Drainage areas of Penobscot River and principal tributaries.*[a]

| River. | Locality. | Drainage area. |
|---|---|---|
| | | *Square miles.* |
| Penobscot | Opposite northwest extremity of Moosehead Lake, township of Seboomook, immediately below mouth of Nulhedus Creek. | 510 |
| Do | Entrance into Chesuncook Lake | 850 |
| Do | Outlet of Chesuncook Lake | 1,450 |
| Do | Millinocket, outlet of Twin Lakes | 1,880 |
| Do | Immediately below mouth of east branch of Penobscot.[a] | 3,260 |
| Do | Immediately below mouth of Mattawamkeag.[a] | 4,940 |
| Do | Montague, immediately below mouth of Piscataquis.[a] | 6,630 |
| Do | Sunk Haze Rips[a] | 7,260 |
| Do | Old Town, above mouth of Pushaw River[a] | 7,340 |
| Do | Bangor, above mouth of Kenduskeag River[a] | 7,720 |

[a] Includes Chamberlain Lake Basin (270 square miles).

*Drainage areas of Penobscot River and principal tributaries*—Continued.

| River. | Locality. | Drainage area. |
|---|---|---|
| | | *Square miles.* |
| Penobscot | Mouth [a] | 8,550 |
| Cauquomogomoc | Entrance into Chesuncook Lake | 230 |
| East branch of Penobscot. | Grindstone [a] | 1,130 |
| Do | Mouth [a] | 1,160 |
| Mattawamkeag | Immediately below outlet of Baskahegan Lake. | 190 |
| Do | Mouth | 1,510 |
| Piscataquis | Low's bridge | 280 |
| Do | Dover | 330 |
| Do | Mouth | 1,500 |
| Passadumkeag | do | 400 |

[a] Includes Chamberlain Lake basin (270 square miles).

The river naturally has a comparatively uniform flow throughout the year, which is due to the extent of the tributary area, its extensive system of lakes, the vast breadth of forests upon its drainage surfaces, and the more uniform surface of the basin, in which particular it has decided advantage over the Saco, the Androscoggin, and the Kennebec.

## PENOBSCOT RIVER AT MONTAGUE, ME.

A gaging station was established by N. C. Grover at Montague on November 5, 1901. The station is located at the highway bridge across the Penobscot, about 1,000 feet below the mouth of the Piscataquis River. The drainage area at this point is 6,630 square miles, of which 270 square miles is the area of Chamberlain Lake, which flows into the Penobscot only part of the year. The measurements are made from the bridge. A wire gage of the usual type is fastened to the guard timber on the upper side of the bridge. It is graduated to feet and tenths and is referred to a bench mark, the top of the northwest corner of second course below bridge seat, easterly abutment, the elevation being 25.78 feet above zero of the gage. The initial point of soundings is at the extreme end of the inclined end post on upstream side of bridge. The channel is straight for 1,000 feet above and 3,000 feet below the station, and the current is swift. The banks are high and rocky, and the bed rocky, with some gravel. The gage is read twice daily—7 a. m. and 5 p. m.—by A. H. Hanson, a merchant in Montague.

*Discharge measurements of Penobscot River at Montague, Me.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1901. | | *Feet.* | *Second-feet.* |
| November 5 | F. E. Pressey | 2.00 | 3,034 |
| 1902. | | | |
| March 28 | do | 12.90 | 57,427 |
| April 8 | do | 11.00 | 43,937 |
| July 15 | N. C. Grover | 5.30 | 11,271 |
| August 28 | F. E. Pressey | 4.00 | 7,575 |
| September 15 | do | 4.10 | 7,773 |
| October 11 | R. M. Connor | 3.95 | 7,446 |

*Daily gage height, in feet, of Penobscot River at Montague, Me.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 5.30 | 5.15 | (a) | 14.60 | 9.30 | 6.35 | 7.60 | 5.45 | 2.35 | 3.10 | 7.00 | 4.30 |
| 2 | 4.05 | 5.15 | | 14.05 | 10.75 | 6.20 | 7.50 | 5.35 | 2.95 | 3.20 | 6.10 | 4.25 |
| 3 | 4.45 | 5.35 | | 13.45 | 10.30 | 6.25 | 7.55 | 5.15 | 3.10 | 3.05 | 5.40 | 3.90 |
| 4 | 4.60 | 5.20 | | 12.90 | 10.05 | 7.55 | 7.60 | 5.00 | 3.45 | 3.05 | 5.15 | 3.55 |
| 5 | 4.40 | 5.05 | | 12.35 | 9.80 | 9.30 | 7.50 | 5.25 | 3.30 | 2.95 | 5.25 | 3.90 |
| 6 | 4.20 | 5.00 | | 11.50 | 9.60 | 10.15 | 7.15 | 5.20 | 3.20 | 2.75 | 5.00 | 3.80 |
| 7 | 4.15 | 4.90 | | 11.15 | 9.50 | 10.25 | 6.75 | 5.10 | 3.15 | 3.30 | 4.55 | 3.70 |
| 8 | 3.70 | 4.80 | | 10.95 | 9.40 | 10.10 | 6.30 | 5.20 | 2.90 | 3.90 | 4.35 | 5.00 |
| 9 | 3.75 | (a) | | 10.75 | 9.30 | 12.00 | 6.25 | 5.30 | 2.45 | 4.15 | 4.15 | (a) |
| 10 | 3.60 | | | 10.90 | 9.10 | 12.30 | 6.05 | 5.15 | 3.10 | 4.05 | 3.90 | |
| 11 | 3.10 | | | 11.15 | 8.75 | 11.55 | 5.80 | 5.00 | 3.65 | 3.85 | 4.05 | |
| 12 | 3.00 | | | 11.25 | 8.40 | 11.00 | 5.25 | 5.40 | 3.85 | 3.30 | 4.10 | |
| 13 | 2.90 | | | 11.15 | 8.10 | 10.50 | 5.40 | 6.25 | 3.65 | 3.25 | 4.15 | |
| 14 | 2.95 | | | 10.80 | 7.70 | 10.10 | 6.15 | 6.45 | 3.75 | 3.05 | 4.20 | |
| 15 | 2.80 | | | 10.45 | 7.35 | 9.70 | 5.30 | 6.60 | 4.00 | 3.30 | 4.30 | |
| 16 | 2.70 | | | 10.40 | 7.00 | 9.15 | 4.80 | 5.00 | 3.85 | 3.15 | 4.40 | |
| 17 | 2.55 | | | 10.25 | 6.70 | 8.50 | 4.90 | 5.15 | 3.70 | 3.20 | 4.25 | |
| 18 | 2.30 | | | 10.05 | 6.70 | 8.15 | 4.95 | 5.00 | 3.60 | 3.15 | 4.30 | |
| 19 | 2.55 | | | 9.55 | 6.60 | 7.75 | 5.10 | 5.40 | 3.50 | 3.00 | 4.45 | |
| 20 | 2.30 | | | 8.75 | 6.35 | 7.15 | 5.25 | 6.25 | 3.35 | 2.95 | 4.40 | |
| 21 | 2.65 | | | 8.85 | 6.05 | 6.50 | 5.90 | 5.95 | 3.35 | 3.50 | 4.30 | |
| 22 | 2.70 | | | 9.10 | 6.25 | 6.45 | 6.10 | 6.60 | 3.40 | 4.10 | 4.30 | |
| 23 | 3.90 | | | 9.00 | 6.45 | 7.70 | 5.85 | 5.00 | 3.35 | 3.90 | 4.30 | |
| 24 | 6.30 | | | 8.90 | 6.80 | 7.60 | 4.95 | 4.35 | 3.30 | 3.50 | 4.05 | |
| 25 | 6.65 | | | 9.00 | 6.80 | 7.25 | 4.70 | 3.60 | 3.25 | 3.25 | 4.05 | |
| 26 | 5.65 | | | 9.10 | 6.95 | 7.20 | 4.80 | 3.70 | 3.20 | 3.05 | 4.25 | |
| 27 | 5.85 | | | 9.15 | 6.85 | 9.55 | 4.55 | 3.95 | 3.10 | 3.05 | 4.00 | |
| 28 | 6.20 | | 12.80 | 9.35 | 6.80 | 9.85 | 5.05 | 4.00 | 2.95 | 3.90 | 4.05 | |
| 29 | 6.35 | | 12.80 | 9.35 | 7.10 | 8.65 | 5.85 | 3.70 | 2.80 | 7.90 | 4.05 | |
| 30 | 5.65 | | 14.55 | 9.30 | 7.05 | 8.05 | 5.90 | 3.45 | 2.95 | 8.20 | 4.40 | |
| 31 | 5.75 | | 15.10 | | 6.70 | | 5.80 | 2.95 | | 7.60 | | |

a Frozen February 5 to March 27 and December 9 to 31.

*Rating table for Penobscot River at Montague, Me., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 2.0 | 3,034 | 5.4 | 11,715 | 8.8 | 28,206 | 12.2 | 52,325 |
| 2.2 | 3,502 | 5.6 | 12,299 | 9.0 | 29,605 | 12.4 | 53,745 |
| 2.4 | 3,970 | 5.8 | 13,015 | 9.2 | 31,025 | 12.6 | 55,165 |
| 2.6 | 4,438 | 6.0 | 13,763 | 9.4 | 32,445 | 12.8 | 56,585 |
| 2.8 | 4,906 | 6.2 | 14,543 | 9.6 | 33,865 | 13.0 | 58,005 |
| 3.0 | 5,374 | 6.4 | 15,355 | 9.8 | 35,285 | 13.2 | 59,425 |
| 3.2 | 5,842 | 6.6 | 16,199 | 10.0 | 36,705 | 13.4 | 60,845 |
| 3.4 | 6,310 | 6.8 | 17,075 | 10.2 | 38,125 | 13.6 | 62,265 |
| 3.6 | 6,778 | 7.0 | 17,985 | 10.4 | 39,545 | 13.8 | 63,685 |
| 3.8 | 7,246 | 7.2 | 18,925 | 10.6 | 40,965 | 14.0 | 65,105 |
| 4.0 | 7,714 | 7.4 | 19,897 | 10.8 | 42,385 | 14.2 | 66,525 |
| 4.2 | 8,193 | 7.6 | 20,901 | 11.0 | 43,805 | 14.4 | 67,945 |
| 4.4 | 8,701 | 7.8 | 21,940 | 11.2 | 45,225 | 14.6 | 69,365 |
| 4.6 | 9,241 | 8.0 | 23,050 | 11.4 | 46,645 | 14.8 | 70,785 |
| 4.8 | 9,813 | 8.2 | 24,240 | 11.6 | 48,065 | 15.0 | 72,205 |
| 5.0 | 10,417 | 8.4 | 25,510 | 11.8 | 49,485 | | |
| 5.2 | 11,053 | 8.6 | 26,842 | 12.0 | 50,905 | | |

*Estimated monthly discharge of Penobscot River at Montague, Me.*

[Drainage area, 6,630 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1901. | | | | | |
| November 5 to 30 | ---------- | ---------- | [a] 3,466 | [a] 0.52 | [a] 0.50 |
| December | 68,655 | 3,034 | 14,583 | 2.20 | 2.54 |
| 1902. | | | | | |
| January | 16,415 | 3,736 | 8,354 | 1.26 | 1.45 |
| February 1 to 8 [b] | ---------- | ---------- | [a] 10,662 | [a] 1.61 | [a] 0.48 |
| March 28 to 31 [b] | ---------- | ---------- | [a] 63,774 | [a] 9.62 | [a] 1.43 |
| April | 69,365 | 27,862 | 40,862 | 6.16 | 6.87 |
| May | 42,030 | 13,955 | 23,694 | 3.57 | 4.12 |
| June | 53,035 | 14,543 | 29,024 | 4.38 | 4.88 |
| July | 20,901 | 9,103 | 13,737 | 2.07 | 2.39 |
| August | 16,199 | 5,257 | 10,788 | 1.63 | 1.88 |
| September | 7,714 | 3,853 | 6,037 | 0.91 | 1.02 |
| October | 24,240 | 4,789 | 7,787 | 1.17 | 1.35 |
| November | 17,985 | 7,480 | 9,149 | 1.38 | 1.54 |
| December 1 to 8 [b] | ---------- | ---------- | [a] 7,882 | [a] 1.19 | [a] 0.35 |

[a] Partial month. [b] River frozen for remainder of the month.

## PENOBSCOT RIVER AT MILLINOCKET, ME.

The discharge of the Penobscot at Millinocket since January 11, 1901, has been computed from data furnished by H. S. Ferguson, engineer for the Great Northern Paper Company. These results were obtained by adding to the flow through the wheels the flow over the dam. 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, several tube float measurements of the flow in the canal leading to the mill have been made by Mr. Ferguson in order to determine just how much water the mill uses under different conditions of gate openings. By means of these measurements it is believed that a very good estimate has been made of the flow through the wheels. The dam is of concrete, resting on ledge, and does not leak. The flow over it was computed by use of the formula $Q=c\ b\ H^{\frac{3}{2}}$, in which $c$ is a variable coefficient obtained from a study of the results of experiments made by George W. Rafter at the Cornell testing flume.

The area of the drainage basin at Millinocket is 1,880 square miles. The following tables give the record of flow for the years 1901 and 1902:

*Mean daily flow, in second-feet, of Penobscot River at Millinocket, Me.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | ------- | 1,580 | 1,740 | 1,710 | 20,220 | 2,580 | 2,580 | 1,800 | 2,310 | 2,000 | 760 | 410 |
| 2 | ------- | 1,670 | 1,510 | 1,370 | 19,360 | 2,680 | 2,490 | 1,980 | 3,600 | 1,960 | 690 | 470 |
| 3 | ------- | 2,250 | 1,450 | 1,680 | 18,030 | 2,760 | 2,680 | 1,690 | 3,280 | 1,960 | 570 | 470 |
| 4 | ------- | 1,410 | 1,680 | 2,000 | 17,240 | 2,440 | 3,310 | 2,830 | 2,130 | 1,950 | 710 | 460 |
| 5 | ------- | 1,840 | 1,930 | 1,920 | 16,280 | 2,550 | 1,540 | 1,760 | 1,940 | 1,540 | 760 | 450 |
| 6 | ------- | 1,630 | 1,510 | 2,180 | 15,030 | 2,430 | 1,930 | 2,000 | 1,930 | 1,740 | 700 | 440 |
| 7 | ------- | 1,210 | 1,410 | 2,800 | 14,000 | 2,550 | 2,420 | 1,910 | 1,810 | 1,990 | 510 | 430 |
| 8 | ------- | 1,660 | 1,300 | 3,210 | 9,240 | 2,680 | 2,710 | 2,850 | 3,750 | 1,940 | 490 | 420 |
| 9 | ------- | 1,910 | 1,160 | 4,890 | 6,130 | 2,540 | 2,390 | 3,960 | 3,110 | 1,960 | 330 | 860 |
| 10 | ------- | 1,480 | 1,470 | 4,420 | 5,280 | 2,770 | 2,600 | 3,930 | 1,940 | 1,950 | 1,090 | 840 |
| 11 | 1,310 | 1,050 | 1,930 | 5,430 | 3,410 | 2,770 | 2,450 | 6,500 | 1,880 | 1,600 | 1,020 | 850 |
| 12 | 960 | 1,740 | 1,510 | 6,030 | 2,740 | 2,480 | 2,630 | 6,440 | 1,970 | 1,240 | 760 | 450 |
| 13 | 1,200 | 2,360 | 1,510 | 5,920 | 2,790 | 2,780 | 3,450 | 2,030 | 1,940 | 980 | 630 | 450 |
| 14 | 1,500 | 1,890 | 1,720 | 6,400 | 2,930 | 2,960 | 2,830 | 1,940 | 1,820 | 1,530 | 1,230 | 470 |
| 15 | 1,460 | 1,860 | 1,510 | 8,610 | 3,130 | 3,200 | 6,790 | 2,060 | 3,860 | 1,320 | 760 | 780 |
| 16 | 1,310 | 2,000 | 2,030 | 8,880 | 3,320 | 3,370 | 3,820 | 2,200 | 3,880 | 1,250 | 750 | 1,760 |
| 17 | 1,260 | 1,230 | 1,450 | 9,860 | 4,130 | 3,370 | 4,010 | 1,980 | 1,950 | 1,130 | 380 | 1,520 |
| 18 | 1,430 | 1,650 | 1,610 | 12,390 | 3,830 | 2,350 | 3,520 | 2,910 | 3,010 | 1,470 | 790 | 1,530 |
| 19 | 1,450 | 1,440 | 1,770 | 12,320 | 4,650 | 2,240 | 7,600 | 2,160 | 3,980 | 1,650 | 720 | 1,890 |
| 20 | 1,390 | 1,550 | 1,830 | 14,020 | 4,750 | 2,450 | 8,140 | 2,040 | 3,360 | 1,420 | 440 | 1,720 |
| 21 | 1,500 | 1,390 | 1,410 | 15,770 | 3,250 | 2,390 | 3,850 | 2,040 | 3,150 | 1,020 | 450 | 1,800 |
| 22 | 1,780 | 1,760 | 1,370 | 17,230 | 2,260 | 2,360 | 6,880 | 1,990 | 4,470 | 990 | 450 | 1,880 |
| 23 | 1,000 | 1,450 | 1,420 | 19,210 | 2,010 | 2,570 | 3,310 | 1,970 | 4,050 | 1,120 | 360 | 1,710 |
| 24 | 1,700 | 1,600 | 1,480 | 11,360 | 1,520 | 2,400 | 2,270 | 1,980 | 1,930 | 790 | 390 | 1,710 |
| 25 | 1,410 | 1,640 | 1,780 | 10,410 | 1,780 | 2,800 | 2,380 | 2,020 | 1,910 | 1,060 | 400 | 990 |
| 26 | 2,060 | 1,330 | 1,910 | 10,650 | 1,890 | 2,710 | 2,120 | 4,880 | 1,920 | 1,010 | 450 | 1,900 |
| 27 | 1,560 | 1,420 | 1,510 | 20,040 | 3,440 | 2,560 | 2,860 | 2,700 | 1,960 | 610 | 860 | 1,810 |
| 28 | 1,590 | 1,600 | 1,940 | 22,110 | 2,690 | 2,280 | 2,260 | 1,910 | 1,830 | 840 | 980 | 1,700 |
| 29 | 1,390 | ------- | 1,940 | 20,360 | 2,980 | 2,760 | 6,250 | 1,950 | 1,360 | 730 | 450 | 1,760 |
| 30 | 1,170 | ------- | 1,990 | 20,240 | 2,570 | 2,860 | 6,250 | 1,790 | 1,960 | 750 | 810 | 2,000 |
| 31 | 1,600 | ------- | 1,350 | ------- | 3,050 | ------- | 3,240 | 1,910 | ------- | 780 | ------- | 1,960 |

*Mean daily flow, in second-feet, of Penobscot River at Millinocket, Me.*—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2,230 | 1,930 | 2,140 | 13,150 | 11,180 | 4,130 | 3,040 | 2,520 | 2,300 | 2,140 | 2,240 | 5,140 |
| 2 | 2,860 | 2,630 | 2,110 | 14,110 | 11,180 | 2,890 | 2,820 | 2,520 | 2,640 | 2,030 | 2,090 | 2,620 |
| 3 | 2,160 | 2,180 | 2,110 | 13,820 | 11,190 | 5,430 | 2,580 | 1,570 | 2,160 | 2,070 | 4,860 | 2,360 |
| 4 | 2,160 | 2,090 | 2,110 | 13,380 | 11,070 | 6,300 | 460 | 2,540 | 2,540 | 2,090 | 2,410 | 2,370 |
| 5 | 2,130 | 2,110 | 2,110 | 14,050 | 11,420 | 11,600 | 330 | 2,440 | 2,190 | 2,330 | 2,410 | 2,390 |
| 6 | 2,010 | 2,040 | 2,100 | 14,050 | 12,600 | 11,600 | 1,420 | 2,540 | 2,150 | 2,540 | 2,530 | 2,130 |
| 7 | 2,040 | 2,100 | 2,180 | 15,030 | 12,580 | 12,440 | 2,560 | 2,560 | 1,790 | 2,410 | 2,580 | 2,010 |
| 8 | 2,010 | 1,940 | 2,340 | 14,120 | 15,030 | 17,240 | 2,570 | 2,510 | 2,420 | 2,200 | 2,220 | 5,390 |
| 9 | 2,020 | 3,440 | 2,350 | 13,240 | 13,380 | 20,040 | 2,570 | 2,980 | 2,180 | 2,250 | 2,220 | 2,950 |
| 10 | 1,950 | 2,120 | 2,530 | 13,180 | 12,960 | 19,370 | 2,560 | 2,820 | 2,420 | 2,290 | 2,510 | 2,570 |
| 11 | 1,740 | 2,020 | 2,320 | 13,170 | 14,840 | 20,590 | 2,560 | 2,250 | 2,380 | 2,140 | 2,470 | 2,400 |
| 12 | 2,030 | 2,000 | 2,820 | 13,070 | 12,140 | 20,230 | 2,560 | 2,450 | 2,170 | 1,940 | 2,480 | 2,440 |
| 13 | 2,030 | 2,060 | 2,820 | 13,340 | 12,150 | 17,510 | 2,380 | 2,430 | 2,070 | 2,110 | 2,090 | 2,340 |
| 14 | 2,030 | 1,970 | 2,700 | 13,210 | 10,470 | 15,590 | 2,550 | 2,410 | 1,780 | 2,450 | 2,520 | 2,420 |
| 15 | 2,020 | 1,870 | 2,690 | 12,310 | 16,920 | 11,860 | 2,570 | 2,500 | 2,100 | 2,150 | 2,440 | 4,390 |
| 16 | 2,190 | 3,090 | 2,500 | 12,400 | 6,350 | 11,600 | 2,550 | 2,430 | 2,110 | 2,770 | 2,540 | 2,530 |
| 17 | 2,030 | 3,370 | 5,500 | 12,390 | 6,220 | 10,870 | 2,560 | 2,010 | 2,520 | 2,420 | 2,650 | 2,510 |
| 18 | 1,910 | 2,060 | 5,390 | 12,010 | 9,590 | 10,980 | 2,560 | 2,220 | 2,110 | 2,640 | 2,570 | 2,480 |
| 19 | 2,560 | 2,110 | 6,430 | 6,770 | 9,050 | 7,710 | 2,540 | 2,260 | 2,070 | 2,330 | 2,500 | 2,600 |
| 20 | 1,980 | 2,120 | 6,960 | 8,380 | 7,680 | 9,560 | 2,290 | 4,380 | 2,060 | 2,460 | 2,540 | 2,520 |
| 21 | 1,950 | 2,130 | 8,760 | 9,030 | 5,880 | 3,210 | 2,550 | 4,330 | 1,910 | 2,180 | 2,410 | 2,190 |
| 22 | 1,970 | 2,020 | 8,580 | 7,840 | 8,820 | 3,930 | 2.550 | 4,310 | 2,120 | 2,490 | 2,390 | 3,970 |
| 23 | 2,070 | 3,440 | 8,190 | 7,940 | 8,920 | 3,930 | 2,550 | 3,870 | 2,080 | 2,170 | 1,350 | 2,440 |
| 24 | 1,960 | 2,110 | 9,950 | 7,950 | 8,800 | 3,570 | 2,560 | 1,890 | 2,120 | 2,160 | 2,700 | 1,960 |
| 25 | 2,080 | 2,120 | 9,910 | 9,740 | 6,220 | 3,290 | 2,550 | 2,480 | 2,130 | 2,170 | 2,440 | 570 |
| 26 | 2,660 | 2,130 | 9,790 | 10,180 | 5,940 | 3,290 | 2,530 | 2,280 | 2,140 | 1,960 | 2,450 | 3,490 |
| 27 | 1,950 | 2,140 | 9,820 | 11,330 | 8,260 | 3,270 | 2,370 | 2,460 | 2,110 | 2,150 | 2,440 | 2,470 |
| 28 | 1,800 | 2,120 | 9,790 | 11,740 | 3,090 | 3,900 | 2,560 | 2,410 | 1,870 | 2,570 | 2,500 | 2,230 |
| 29 | 3,270 | ------- | 9,840 | 11,190 | 3,120 | 2,970 | 2,800 | 2,330 | 2,090 | 2,590 | 2,410 | 2,200 |
| 30 | 2,170 | ------- | 9,970 | 11,200 | 3,110 | 2,870 | 2,590 | 2,450 | 2,480 | 2,160 | 1,440 | 2,150 |
| 31 | 2,160 | ------- | 9,970 | ------- | 3,110 | ------- | 2,700 | 1,930 | ------- | 2,520 | ------- | 2,160 |

*Estimated monthly discharge of Penobscot River at Millinocket, Me.*

[Drainage area, 1,880 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1901. | | | | | |
| January 11 to 31 | 2,060 | 960 | 1,430 | 0.76 | 0.88 |
| February | 2,360 | 1,050 | 1,629 | .87 | .91 |
| March | 2,030 | 1,160 | 1,617 | .86 | .99 |
| April | 22,110 | 1,370 | 9,447 | 5.02 | 5.60 |
| May | 20,220 | 1,520 | 6,578 | 3.50 | 4.04 |
| June | 3,370 | 2,240 | 2,654 | 1.41 | 1.57 |
| July | 8,140 | 1,540 | 3,599 | 1.91 | 2.20 |
| August | 6,500 | 1,690 | 2,584 | 1.37 | 1.58 |
| September | 4,470 | 1,360 | 2,600 | 1.38 | 1.54 |
| October | 2,000 | 610 | 1,364 | .73 | .84 |
| November | 1,230 | 330 | 656 | .35 | .39 |
| December | 2,000 | 410 | 1,158 | .62 | .71 |
| The year | 22,110 | 330 | 2,943 | 1.56 | 21.25 |
| 1902. | | | | | |
| January | 3,270 | 1,740 | 2,133 | 1.13 | 1.30 |
| February | 3,440 | 1,870 | 2,266 | 1.21 | 1.26 |
| March | 9,970 | 2,100 | 5,380 | 2.86 | 3.30 |
| April | 15,030 | 6,770 | 11,777 | 6.26 | 6.98 |
| May | 16,920 | 3,090 | 9,460 | 5.03 | 5.80 |
| June | 20,590 | 2,870 | 9,392 | 5.00 | 5.58 |
| July | 3,040 | 330 | 2,398 | 1.28 | 1.48 |
| August | 4,380 | 1,570 | 2,615 | 1.39 | 1.60 |
| September | 2,640 | 1,780 | 2,174 | 1.16 | 1.29 |
| October | 2,770 | 1,940 | 2,287 | 1.22 | 1.41 |
| November | 4,860 | 1,350 | 2,447 | 1.30 | 1.45 |
| December | 5,390 | 570 | 2,658 | 1.41 | 1.63 |
| The year | 20,590 | 330 | 4,582 | 2.44 | 33.08 |

EAST BRANCH OF PENOBSCOT RIVER AT GRINDSTONE, ME.

This station was established October 23, 1902, by F. E. Pressey. It is located at the Bangor and Aroostook Railroad bridge, one-half mile south of the hotel. The measurements are made from the railroad bridge. The drainage area at this point is 1,130 square miles, including the Chamberlain Lake basin (270 square miles). The initial point for soundings is on the left bank, at the lower end of the inclined end post. The gage is of the usual wire type, and the scale board, graduated to feet and tenths, is nailed to the guard timber on the upper side of the bridge. The gage is read daily, at 7 a. m. and 5. p. m., by L. B. Trask. The channel both above and below this station is straight. The bed of the stream is rocky, and the stream is confined in the channel by the abutments of the bridge. The bench mark is located on the east abutment, at the southwest corner of the bridge seat. Elevation, 26.32 feet above the zero of the gage. During 1902 the following measurements were made by F. E. Pressey:

October 23: Gage height, 5.15 feet; discharge, 706 second-feet.
November 26: Gage height, 5.41 feet; discharge, 921 second-feet.

*Daily gage height, in feet, of East Branch of Penobscot River at Grindstone, Me., for 1902.*

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 6.15 | 5.50 | 12 | ..... | 5.65 | 5.30 | 23 | 5.15 | 5.60 | ..... |
| 2 | ..... | 6.05 | 5.50 | 13 | ..... | 5.80 | 5.30 | 24 | 5.10 | 5.60 | ..... |
| 3 | ..... | 5.90 | 5.40 | 14 | ..... | 5.55 | (a) | 25 | 5.10 | 5.55 | ..... |
| 4 | ..... | 5.90 | 5.20 | 15 | ..... | 5.50 | ..... | 26 | 5.10 | 5.50 | ..... |
| 5 | ..... | 5.90 | 5.20 | 16 | ..... | 5.50 | ..... | 27 | 5.10 | 5.60 | ..... |
| 6 | ..... | 5.80 | 5.30 | 17 | ..... | 5.70 | ..... | 28 | 5.50 | 5.70 | ..... |
| 7 | ..... | 5.80 | 5.30 | 18 | ..... | 5.60 | ..... | 29 | 7.65 | 5.55 | ..... |
| 8 | ..... | 5.70 | 5.30 | 19 | ..... | 5.55 | ..... | 30 | 7.05 | 5.50 | ..... |
| 9 | ..... | 5.65 | 5.30 | 20 | ..... | 5.50 | ..... | 31 | 6.45 | ..... | ..... |
| 10 | ..... | 5.70 | 5.30 | 21 | ..... | 5.55 | ..... | | | | |
| 11 | ..... | 5.60 | 5.30 | 22 | ..... | 5.60 | ..... | | | | |

(a) Frozen from December 14 to 31.

MATTAWAMKEAG RIVER AT MATTAWAMKEAG, ME.

This station was established August 26, 1902, by F. E. Pressey. It is located at the Maine Central Railroad bridge over the Mattawamkeag River in the town of Mattawamkeag. The area of the drainage basin at this point is 1,510 square miles. The initial point for soundings is on the left bank, at the south end of the bridge, at the lower end of the inclined end post. The gage is of the usual wire type, and the scale board, which is graduated to feet and tenths, is nailed to the guard timber of the lower side of the bridge. The gage is read at 8 a. m. and 4 p. m. by Leon D. Mincher. The channel both above and below this station is straight, and the bed of the stream is rocky and

the water is confined to the channel by the abutments of the bridge. The bench mark is on the north abutment at the southwest corner of the bridge seat. Its elevation is 26.78 feet above the zero of the gage.

The following discharge measurements were made during 1902 by F. E. Pressey:

July 31: Gage height, 4.4 feet; discharge, 1,318 second-feet.
August 27: Gage height, 4.7 feet; discharge, 1,847 second-feet.
September 16: Gage height, 5.0 feet; discharge, 1,970 second-feet.
November 8: Gage height, 5.89 feet; discharge, 3,556 second-feet.

*Daily gage height, in feet, of Mattawamkeag River at Mattawamkeag, Me., for 1902.*

| Day. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 4.10 | 4.60 | 7.85 | 5.65 | 17 | ..... | 5.00 | 4.80 | 5.50 | 7.00 |
| 2 | ..... | 4.05 | 4.60 | 7.40 | 5.45 | 18 | ..... | 4.90 | 4.80 | 5.50 | 7.45 |
| 3 | ..... | 4.40 | 4.60 | 7.00 | 5.45 | 19 | ..... | 4.85 | 4.80 | 5.50 | 7.80 |
| 4 | ..... | 4.70 | 4.55 | 6.65 | 5.25 | 20 | ..... | 4.70 | 4.85 | 5.50 | (a) |
| 5 | ..... | 4.60 | 4.40 | 6.35 | 5.35 | 21 | ..... | 4.50 | 5.05 | 5.40 | ..... |
| 6 | ..... | 4.60 | 4.45 | 6.10 | 5.30 | 22 | ..... | 4.40 | 5.20 | 5.50 | ..... |
| 7 | ..... | 4.50 | 4.75 | 6.00 | 5.35 | 23 | ..... | 4.40 | 5.15 | 5.50 | ..... |
| 8 | ..... | 4.40 | 5.25 | 5.90 | 7.25 | 24 | ..... | 4.40 | 5.00 | 5.50 | ..... |
| 9 | ..... | 4.30 | 5.45 | 5.75 | 7.05 | 25 | ..... | 4.35 | 4.85 | 5.50 | ..... |
| 10 | ..... | 4.45 | 5.40 | 5.65 | 6.70 | 26 | 4.60 | 4.40 | 4.70 | 5.45 | ..... |
| 11 | ..... | 4.50 | 5.20 | 5.45 | 6.45 | 27 | 4.70 | 4.40 | 4.65 | 5.35 | ..... |
| 12 | ..... | 4.60 | 5.10 | 5.30 | 6.40 | 28 | 4.60 | 4.25 | 5.05 | 5.40 | ..... |
| 13 | ..... | 4.70 | 4.95 | 5.25 | (a) | 29 | 4.50 | 4.30 | 6.80 | 5.55 | ..... |
| 14 | ..... | 4.80 | 4.90 | 5.20 | ..... | 30 | 4.40 | 4.35 | 7.80 | 5.70 | ..... |
| 15 | ..... | 4.80 | 4.80 | 5.30 | ..... | 31 | 4.25 | ..... | 8.00 | ..... | ..... |
| 16 | ..... | 5.00 | 4.80 | 5.40 | ..... | | | | | | |

a Frozen December 13 to 16 and 20 to 31.

PISCATAQUIS RIVER AT LOW'S BRIDGE, NEAR FOXCROFT, ME.

This station was established August 17, 1902, by F. E. Pressey. It is located at Low's bridge, about half way between Guilford and Foxcroft, Me. The area of the drainage basin at this point is 280 square miles. The initial point for soundings is on the left bank, at the stream side edge of the top stone of the left abutment. The gage is a painted staff, graduated to feet and tenths, spiked to the left abutment. It is read at 7 a. m. and 5 p. m. by A. F. D. Harlow. The channel both above and below the station is straight, the banks are high and gravelly, and the bed is rocky. The bench mark is on the left abutment, at the top of the second course from the top. Elevation, 17.8 feet above the zero of the gage.

The following discharge measurements were made during 1902 by F. E. Pressey:

August 13: Gage height, 3.7 feet; discharge, 998 second-feet.
August 16: Gage height, 2.8 feet; discharge, 332 second-feet.
September 10: Gage height, 2.75 feet; discharge, 288 second-feet.
October 18: Gage height, 2.0 feet; discharge, 61 second-feet.

*Daily gage height, in feet, of Piscataquis River at Low's bridge, near Foxcroft, Me., for 1902.*

| Day. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 2.45 | 2.65 | 3.90 | 3.05 | 17 | 2.45 | 3.15 | 2.60 | 3.50 | (a) |
| 2 | | 2.35 | 2.65 | 3.55 | 3.00 | 18 | 2.75 | 2.85 | 2.25 | 3.35 | |
| 3 | | 2.40 | 2.55 | 3.50 | 2.90 | 19 | 2.55 | 2.75 | 2.00 | 3.05 | |
| 4 | | 2.40 | 2.45 | 3.50 | 2.80 | 20 | 2.50 | 2.75 | 2.90 | 3.25 | |
| 5 | | 2.50 | 2.40 | 3.30 | 2.70 | 21 | 2.85 | 2.70 | 3.35 | 3.25 | |
| 6 | | 2.40 | 2.30 | 3.35 | (a) | 22 | 2.65 | 2.65 | 3.10 | 3.15 | |
| 7 | | 2.35 | 2.90 | 3.10 | | 23 | 2.40 | 2.55 | 2.95 | 3.05 | |
| 8 | | 2.55 | 3.15 | 3.15 | | 24 | 2.35 | 2.70 | 2.95 | 3.05 | |
| 9 | | 2.55 | 3.10 | 3.00 | | 25 | 2.65 | 2.60 | 2.90 | 3.00 | |
| 10 | | 3.30 | 2.95 | 3.10 | | 26 | 2.70 | 2.60 | 2.70 | 3.00 | |
| 11 | | 3.60 | 2.75 | 2.90 | | 27 | 2.75 | 2.55 | 2.75 | 2.80 | |
| 12 | | 3.25 | 2.50 | 3.25 | | 28 | 2.70 | 2.20 | 4.00 | 3.05 | |
| 13 | | 2.45 | 2.70 | 3.85 | | 29 | 2.50 | 2.35 | 6.25 | 3.00 | |
| 14 | | 2.70 | 2.35 | 3.50 | | 30 | 2.45 | 2.65 | 5.10 | 2.95 | |
| 15 | | 2.95 | 2.10 | 3.40 | | 31 | 1.75 | | 4.25 | | |
| 16 | | 3.15 | 2.15 | 3.30 | | | | | | | |

[a] Frozen December 6 to 31.

*Rating table for Piscataquis River at Low's bridge, near Foxcroft, Me., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 2.0 | 60 | 2.6 | 230 | 3.2 | 595 | 3.8 | 1,075 |
| 2.1 | 75 | 2.7 | 270 | 3.3 | 675 | 3.9 | 1,155 |
| 2.2 | 100 | 2.8 | 320 | 3.4 | 755 | 4.0 | 1,235 |
| 2.3 | 125 | 2.9 | 380 | 3.5 | 835 | | |
| 2.4 | 160 | 3.0 | 445 | 3.6 | 915 | | |
| 2.5 | 195 | 3.1 | 515 | 3.7 | 995 | | |

*Estimated monthly discharge of Piscataquis River at Low's bridge, near Foxcroft, Me.*

[Drainage area, 280 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| August 17 to 31 | | | 218 | 0.78 | 0.44 |
| September | 1,155 | 100 | 299 | 1.07 | 1.19 |
| October | 3,035 | 60 | 506 | 1.81 | 2.09 |
| November | 1,155 | 320 | 638 | 2.28 | 2.54 |
| December 1 to 5 | 480 | 270 | 379 | 1.35 | .25 |

## KENNEBEC RIVER DRAINAGE BASIN.

Kennebec River is one of the best streams in the United States for the development of water power. Its basin lies between those of the Androscoggin and the Penobscot and extends from the Canada line to the ocean. The basin measures 150 miles in length and varies in width from 50 to 80 miles in the main portion, embracing a total area of 6,110 square miles. Of this area, 1,330 square miles are tributary to Moosehead Lake.

The river rises in Moosehead Lake, though its headwaters are collected by Moose River, Roach River, and a number of smaller streams rising in the hilly, forested areas lying to the east and west of that lake. The northern part of the drainage basin is broken by offsets from the White Mountains. Nearly the whole of the upper portion of the drainage area is forest covered and in its original wild state. Below the outlet of Moosehead Lake the hills close in upon the river, forming a narrow, rocky chasm, with steep and precipitous sides. From Moosehead Lake to The Forks the river is a torrent, falling over a rocky bed 500 feet in a distance of 23 miles. At The Forks the waters of Dead River, which rises near the western boundary of the State at an elevation of about 2,000 feet, are joined to the main stream. Below this junction the river flows through a broad vayle, with gentle slopes upon either side, still covered to some extent with forest growth, but largely cleared and with occasional cultivated farms. About 60 miles from the coast the hills again rise, though not to a considerable height. There are on the river a number of large falls, which have been developed by the construction of dams and are now used for sawmills, pulp mills, and cotton mills.

The prevailing rock in the northern part of the basin is slate, with a belt of sandstone to the west and a district of granite to the east of Moosehead. South of Bingham mica-schists run into the clay slate in spots and elsewhere into gneiss, but (except where broken by intrusions of granite, as at Hallowell and Augusta) the slate prevails as far as Gardiner. Below the latter city gneiss predominates, with stretches of mica-schists on the east bank. The surface materials are finely pulverized, and water-retaining sands and gravels are more abundant in the northern part, succeeded by a greater proportion of loam and clay to the south.

The areas of the drainage basins of the river and its principal tributaries are given in the following table:

*Drainage areas of Kennebec River and principal tributaries.*

| River. | Locality. | Drainage area. |
|---|---|---|
| | | *Square miles.* |
| Kennebec | Outlet of Moosehead Lake | 1,330 |
| Do | The Forks | 1,670 |
| Do | Immediately below mouth of Dead River | 2,540 |
| Do | Carritunk Falls, Solon | 2,790 |
| Do | North Anson, above mouth of Carrabassett River. | 2,880 |
| Do | Madison | 3,310 |
| Do | Norridgewock | 4,020 |
| Do | Fairfield | 4,370 |
| Do | Waterville, above mouth of Sebasticook River. | 4,380 |
| Do | Waterville, below mouth of Sebasticook River. | 5,310 |
| Do | Augusta | 5,710 |
| Do | Head of Merrymeeting Bay | 6,110 |
| Moose | Mouth | 680 |
| Roach | Roach River | 85 |
| Dead | Mouth, The Forks | 870 |
| Carrabassett | North Anson, above Embden Brook | 340 |
| Sandy | Farmington | 350 |
| Do | Mouth | 670 |
| Sebasticook | do | 930 |
| Messalonskee | do | 220 |
| Cobbosseecontee | do | 240 |

The United States Geological Survey now maintains gaging stations at the following places on the Kennebec drainage: On the Kennebec at The Forks and at North Anson, on the Carrabassett River at North Anson, on Dead River at The Forks, on Moose River at Rockwood, and on Roach River at Roach River.

Since 1892 records have been kept at Waterville by the Hollingsworth & Whitney Pulp and Paper Company. Records for the years 1901 and 1902 are published in this report.

### KENNEBEC RIVER AT THE FORKS, ME.

This station was established by N. C. Grover, September 28, 1901, at the bridge across the Kennebec River at The Forks. The gage is a vertical rod, graduated to feet and tenths, and referred to a bench mark which is the top of a bolt on east abutment, north side of bridge; the elevation of the bench mark is 12.85 feet above the zero of the gage. The initial point of soundings is on the left bank, marked by a rod across the bridge, just above the abutment and below

the bridge floor. The channel is straight above the station for about 200 feet and below for a distance of 500 feet. The current is swift, the banks high and rocky, with a rocky and permanent stream bed. The gage is read twice daily, 7 a. m. and 5 p. m., by William W. Young. The drainage area of the Kennebec River at this point is 1,670 square miles. The following measurements of flow of the Kennebec at this point have been made by N. C. Grover and F. E. Pressey:

*Discharge measurements of Kennebec River at The Forks, Me.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1901. | | *Feet.* | *Sec.-ft.* |
| September 28 | N. C. Grover | 2.60 | 1,863 |
| October 20 | do | .90 | 473 |
| 1902. | | | |
| April 25 | do | 3.70 | 3,495 |
| June 16 | do | 5.60 | 8,862 |
| June 25 | do | 4.75 | 5,896 |
| September 14 | F. E. Pressey | 2.10 | 1,475 |

*Daily gage height, in feet, of Kennebec River at The Forks, Me.*

| Day. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | |
| 1 | (a) | 8.60 | 6.85 | 4.10 | 6.00 | 4.50 | 1.95 | 2.05 | 1.10 | (b) |
| 2 | 2.55 | 8.40 | 8.05 | 5.75 | 6.15 | 4.50 | 1.95 | 1.80 | 1.10 | |
| 3 | 2.90 | 8.10 | 8.20 | 6.35 | 6.10 | 5.65 | 1.95 | 1.60 | 1.10 | |
| 4 | 3.10 | 7.95 | 8.20 | 6.50 | 6.00 | 4.05 | 2.40 | 2.00 | 1.45 | |
| 5 | 3.00 | 7.55 | 6.40 | 7.55 | 5.80 | 4.05 | 2.35 | 2.05 | 1.30 | |
| 6 | 2.95 | 7.15 | 6.05 | 7.80 | 5.80 | 3.80 | 2.60 | 2.00 | 1.45 | |
| 7 | 2.70 | 6.40 | 6.25 | 7.50 | 5.40 | 3.50 | 2.55 | 2.05 | 1.50 | |
| 8 | 2.85 | 6.60 | 6.25 | 7.60 | 4.80 | 3.40 | 2.65 | 2.05 | 1.50 | |
| 9 | 2.70 | 6.50 | 6.70 | 7.70 | 4.75 | 3.40 | 2.70 | 2.00 | 2.00 | |
| 10 | 2.60 | 6.45 | 6.35 | 7.80 | 4.50 | 3.40 | 2.65 | 1.80 | 2.00 | |
| 11 | 2.60 | 6.30 | 6.70 | 6.70 | 4.55 | 3.50 | 2.60 | 1.60 | 2.00 | |
| 12 | 2.00 | 5.35 | 6.80 | 6.40 | 4.50 | 3.50 | 2.55 | 1.60 | 2.10 | |
| 13 | 1.60 | 5.50 | 6.70 | 6.10 | 5.80 | 3.30 | 2.50 | 1.95 | 2.05 | |
| 14 | 1.60 | 5.30 | 7.10 | 5.80 | 4.95 | 3.35 | 2.45 | 2.00 | 2.10 | |
| 15 | 1.50 | 5.25 | 6.90 | 7.30 | 4.65 | 3.15 | 2.40 | 2.05 | 2.00 | |
| 16 | 1.45 | 5.10 | 5.50 | 5.70 | 4.75 | 3.00 | 2.30 | 2.20 | (b) | |
| 17 | 2.00 | 5.60 | 5.75 | 5.55 | 4.65 | 3.05 | 2.10 | 2.20 | | |
| 18 | 2.55 | 5.70 | 5.30 | 5.45 | 4.65 | 3.00 | 2.00 | 1.60 | | |
| 19 | 2.90 | 5.90 | 5.50 | 5.90 | 4.65 | 2.95 | 2.00 | 2.00 | | 3.00 |
| 20 | 3.80 | 5.85 | 4.50 | 5.90 | 4.65 | 2.75 | 2.00 | 2.10 | | 3.00 |
| 21 | 4.00 | 6.10 | 4.90 | 4.70 | 4.65 | 2.85 | 2.50 | 2.50 | | 3.00 |
| 22 | 4.30 | 6.25 | 4.90 | 5.50 | 4.50 | 2.80 | 2.80 | 2.35 | | 3.00 |
| 23 | 4.40 | 5.80 | 4.80 | 5.15 | 5.20 | 2.80 | 2.50 | 2.55 | | 3.00 |
| 24 | 4.30 | 5.05 | 5.00 | 5.20 | 3.80 | 2.80 | 2.05 | 2.45 | | 3.00 |
| 25 | 3.85 | 4.20 | 5.60 | 6.10 | 2.70 | 2.80 | 2.45 | 2.60 | | 3.00 |
| 26 | 3.50 | 3.75 | 6.50 | 5.30 | 2.90 | 2.60 | 2.00 | 2.40 | | 3.00 |
| 27 | 3.60 | 4.80 | 6.50 | 5.55 | 3.15 | 2.20 | 2.25 | 2.40 | | 3.00 |
| 28 | 4.00 | 6.05 | 4.50 | 4.45 | 4.25 | 2.00 | 2.15 | 2.55 | | (a) |
| 29 | 4.35 | 6.10 | 4.00 | 4.30 | 4.15 | 2.00 | 2.10 | 2.55 | | |
| 30 | 6.00 | 6.00 | 3.75 | 4.80 | 4.15 | 2.00 | 2.15 | 2.50 | | |
| 31 | 7.80 | | 4.60 | | 4.30 | 2.10 | | 1.80 | | |

[a] Frozen from January 1 to March 1 and December 28 to 31.

[b] No measurements, November 16 to December 18.

*Rating table for Kennebec River at The Forks, Me., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 1.0 | 560 | 3.2 | 2,635 | 5.4 | 8,000 | 7.6 | 16,800 |
| 1.2 | 720 | 3.4 | 2,950 | 5.6 | 8,800 | 7.8 | 17,600 |
| 1.4 | 880 | 3.6 | 3,310 | 5.8 | 9,600 | 8.0 | 18,400 |
| 1.6 | 1,040 | 3.8 | 3,700 | 6.0 | 10,400 | 8.5 | 20,400 |
| 1.8 | 1,200 | 4.0 | 4,120 | 6.2 | 11,200 | 9.0 | 22,400 |
| 2.0 | 1,365 | 4.2 | 4,560 | 6.4 | 12,000 | 9.5 | 24,400 |
| 2.2 | 1,525 | 4.4 | 5,020 | 6.6 | 12,800 | 10.0 | 26,400 |
| 2.4 | 1,700 | 4.6 | 5,510 | 6.8 | 13,600 | 10.5 | 28,400 |
| 2.6 | 1,900 | 4.8 | 6,040 | 7.0 | 14,400 | 11.0 | 30,400 |
| 2.8 | 2,105 | 5.0 | 6,620 | 7.2 | 15,200 | 11.5 | 32,400 |
| 3.0 | 2,350 | 5.2 | 7,270 | 7.4 | 16,000 | 12.0 | 34,400 |

*Estimated monthly discharge of Kennebec River at The Forks, Me.*

[Drainage area, 1,670 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1901. | | | | | |
| October | 2,350 | 480 | 1,585 | 0.95 | 1.10 |
| November | 1,900 | 1,120 | 1,442 | 0.86 | 0.96 |
| December 8 to 19 | | | [b] 8,498 | [b] 5.09 | [b] 2.27 |
| 1902. | | | | | |
| March [a] | 17,600 | 920 | 3,336 | 2.00 | 2.31 |
| April | 20,800 | 3,600 | 11,109 | 6.65 | 7.42 |
| May | 19,200 | 3,600 | 10,531 | 6.31 | 7.29 |
| June | 17,600 | 4,330 | 10,628 | 6.36 | 7.09 |
| July | 11,000 | 2,000 | 6,285 | 3.76 | 4.34 |
| August | 9,000 | 1,365 | 2,875 | 1.72 | 1.98 |
| September | 2,105 | 1,325 | 1,651 | 0.99 | 1.10 |
| October | 1,900 | 1,040 | 1,461 | 0.87 | 1.00 |
| November 1 to 15 | 1,445 | 640 | [b] 1,082 | [b] 0.65 | [b] 0.31 |
| December 19 to 27 | 2,350 | 2,350 | [b] 2,350 | [b] 1.41 | [b] 0.51 |

[a] Frozen during January and February. [b] Partial month.

## KENNEBEC RIVER AT NORTH ANSON, ME.

This station was established on October 18, 1901, by N. C. Grover. It is located 1½ miles east of North Anson, and is reached by private conveyance. Measurements are made from the bridge across the

Kennebec. The gage is a vertical rod graduated to feet and tenths and fastened to the bridge pier. It is referred to two bench marks, one being the top of pier back of gage, elevation 22.5 feet, and the other the top of the southeast corner of the twelfth stone from the top of west abutment, elevation 9.55 feet above the zero of the gage. The initial point of soundings is on the left bank at the outside of the end post of the bridge. The channel is straight above the station for 500 feet, and below for 1,000 feet. The current is swift, the right bank high and rocky, while the left bank is comparatively low and subject to overflow at the time of highest water. The bed of the stream is rocky, with sand over a portion of the section. The gage is read twice daily, at 8 a. m. and 4 p. m., by C. S. Benjamin, the toll collector at the bridge. The drainage area is 2,880 square miles. The following measurements have been made by N. C. Grover and F. E. Pressey:

October 14, 1901: Gage height, 3.2 feet; discharge, 3,114 second-feet.
October 18, 1901: Gage height, 3.0 feet; discharge, 2,458 second-feet.
July 29, 1902: Gage height, 4.55 feet; discharge, 6,224 second-feet.

*Daily gage height, in feet, of Kennebec River at North Anson, Me.*

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | |
| 1 | (a) | 12.65 | 10.75 | 6.95 | 6.10 | 4.10 | 3.25 | 3.15 | 5.10 | 3.25 |
| 2 | | 11.70 | 10.45 | 6.70 | 5.85 | 4.50 | 3.35 | 3.25 | 3.95 | 3.40 |
| 3 | | 10.75 | 11.30 | 6.10 | 5.85 | 5.30 | 3.15 | 3.00 | 3.50 | 3.50 |
| 4 | | 9.00 | 9.90 | 7.40 | 5.60 | 4.85 | 3.00 | 2.95 | 3.25 | 3.45 |
| 5 | | 7.90 | 7.55 | 8.75 | 5.45 | 4.50 | 3.45 | 2.90 | 3.10 | 3.35 |
| 6 | | 7.00 | 7.25 | 8.90 | 5.35 | 4.15 | 3.35 | 3.10 | 3.15 | (a) |
| 7 | | 7.15 | 7.55 | 8.95 | 5.05 | 4.20 | 3.20 | 3.25 | 3.10 | |
| 8 | | 7.20 | 8.60 | 8.60 | 5.00 | 4.15 | 3.45 | 3.45 | 3.05 | |
| 9 | | 7.45 | 8.15 | 9.90 | 4.80 | 4.25 | 3.35 | 3.30 | 3.05 | |
| 10 | | 7.00 | 7.90 | 9.25 | 4.85 | 4.20 | 3.75 | 2.90 | 3.20 | |
| 11 | | 6.90 | 6.45 | 8.30 | 5.00 | 4.20 | 3.95 | 2.80 | 3.05 | |
| 12 | | 6.85 | 7.45 | 7.65 | 5.00 | 4.40 | 3.65 | 2.65 | 2.95 | |
| 13 | | 6.75 | 6.95 | 6.70 | 5.05 | 4.15 | 3.40 | 2.90 | 3.20 | |
| 14 | | 6.30 | 6.95 | 6.45 | 4.90 | 3.70 | 3.80 | 3.05 | 3.35 | |
| 15 | | 6.50 | 5.95 | 6.30 | 4.90 | 3.60 | 4.10 | 3.15 | 3.60 | |
| 16 | | 6.85 | 5.80 | 6.10 | 5.05 | 3.65 | 3.95 | 3.40 | 3.85 | |
| 17 | | 6.75 | 5.75 | 6.20 | 5.10 | 3.20 | 3.50 | 3.20 | 4.05 | |
| 18 | | 6.05 | 5.75 | 6.25 | 5.20 | 3.00 | 3.10 | 3.10 | 4.10 | |
| 19 | | 6.80 | 5.35 | 5.65 | 5.10 | 2.55 | 3.05 | 3.05 | 4.00 | |
| 20 | | 6.35 | 5.15 | 5.55 | 5.30 | 2.70 | 3.25 | 3.70 | 3.85 | |
| 21 | | 7.35 | 5.35 | 5.20 | 5.55 | 3.20 | 4.00 | 3.65 | 3.85 | |
| 22 | | 7.15 | 5.55 | 5.65 | 5.55 | 3.15 | 4.25 | 3.95 | 3.85 | |
| 23 | 11.30 | 7.55 | 5.80 | 5.55 | 5.25 | 3.80 | 4.00 | 3.90 | 3.70 | |
| 24 | 8.75 | 7.30 | 5.90 | 6.10 | 5.25 | 4.15 | 3.90 | 3.65 | 3.80 | |
| 25 | 7.75 | 6.30 | 5.80 | 5.65 | 5.05 | 4.15 | 3.30 | 3.50 | 3.65 | |
| 26 | 6.75 | 6.55 | 6.65 | 6.75 | 5.05 | 3.65 | 3.00 | 3.00 | 3.45 | |
| 27 | 6.05 | 6.55 | 7.65 | 7.45 | 5.00 | 3.35 | 3.00 | 2.95 | 3.40 | |
| 28 | 5.75 | 6.85 | 8.25 | 6.60 | 4.65 | 3.15 | 3.05 | 3.65 | 3.15 | |
| 29 | 7.55 | 7.10 | 9.25 | 5.95 | 4.40 | 3.00 | 3.20 | 5.95 | 3.15 | |
| 30 | 11.60 | 7.65 | 7.55 | 5.70 | 4.45 | 2.85 | 3.15 | 5.85 | 3.15 | |
| 31 | 11.35 | | 7.30 | | 4.25 | 2.95 | | 5.80 | | |

(a) Frozen January 1 to March 22 and December 6 to 31.

## KENNEBEC RIVER AT WATERVILLE, ME.

The only long-continued observations of the volume of the river are those which have been made at Waterville by the Hollingsworth & Whitney Company, which kindly furnished the results for publication herein. The works of that company are above the mouth of Sebasticook River. The tributary drainage area of the Kennebec at that point is about 4,380 square miles. The figures really represent the flow 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 at dams upstream, and as giving most nearly the average for the day.

A summary of these results, including 1900, will be found in Water-Supply Paper, No. 69. The following tables give the results for 1901 and 1902:

*Daily discharge, in second-feet, of Kennebec River at Waterville, Me.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | 3,740 | 2,990 | 2,050 | 11,600 | 29,600 | 5,140 | 9,080 | 6,480 | 1,470 | 2,770 | 3,710 | 170 |
| 2 | 3,530 | 2,920 | 2,270 | 15,260 | 30,570 | 6,540 | 8,350 | 5,270 | 4,760 | 2,160 | 3,080 | 2,580 |
| 3 | 3,240 | 2,180 | 1,620 | 19,580 | 29,620 | 8,700 | 8,330 | 4,810 | 4,270 | 1,590 | 480 | 2,630 |
| 4 | 2,990 | 2,690 | 2,840 | 25,040 | 28,080 | 12,930 | 4,020 | 2,410 | 3,910 | 2,140 | 3,020 | 2,310 |
| 5 | 2,420 | 2,680 | 4,080 | 54,490 | 23,350 | 11,380 | 7,940 | 3,890 | 3,640 | 2,730 | 3,630 | 2,540 |
| 6 | 1,880 | 2,670 | 4,290 | 57,960 | 21,380 | 9,990 | 7,330 | 3,170 | 3,630 | 960 | 3,090 | 2,410 |
| 7 | 3,100 | 2,700 | 4,350 | 42,370 | 13,300 | 9,110 | 5,110 | 3,290 | 3,040 | 3,090 | 3,370 | 1,990 |
| 8 | 3,280 | 3,000 | 4,220 | 76,410 | 11,800 | 9,930 | 5,130 | 5,820 | 1,140 | 2,460 | 2,810 | 230 |
| 9 | 3,220 | 2,420 | 4,130 | 76,590 | 13,290 | 15,250 | 6,020 | 6,180 | 2,870 | 2,740 | 2,530 | 2,480 |
| 10 | 3,040 | 2,000 | 2,870 | 60,700 | 12,340 | 13,900 | 5,770 | 5,640 | 3,120 | 2,390 | 560 | 2,470 |
| 11 | 3,240 | 2,680 | 4,090 | 53,410 | 16,330 | 10,000 | 5,750 | 3,240 | 2,790 | 2,470 | 2,620 | 3,080 |
| 12 | 3,240 | 2,690 | 4,010 | 39,290 | 22,880 | 10,120 | 5,450 | 5,640 | 3,070 | 2,380 | 2,210 | 4,060 |
| 13 | 2,780 | 2,690 | 3,970 | 35,610 | 23,110 | 7,830 | 5,440 | 5,920 | 3,650 | 670 | 2,220 | 4,220 |
| 14 | 3,230 | 2,660 | 4,060 | 33,250 | 21,770 | 7,830 | 3,310 | 5,410 | 3,700 | 3,050 | 2,930 | 4,220 |
| 15 | 2,940 | 2,340 | 3,390 | 31,460 | 18,120 | 7,470 | 4,860 | 5,010 | 1,700 | 6,430 | 1,640 | 10,300 |
| 16 | 3,430 | 2,350 | 3,410 | 30,220 | 14,230 | 5,660 | 4,600 | 3,840 | 3,370 | 6,680 | 2,270 | 15,100 |
| 17 | 3,530 | 2,000 | 3,080 | 29,300 | 14,210 | 7,840 | 4,450 | 5,640 | 3,090 | 5,060 | 1,260 | 46,750 |
| 18 | 3,960 | 2,900 | 3,700 | 28,820 | 12,110 | 6,640 | 4,400 | 4,630 | 2,830 | 4,360 | 2,830 | 29,730 |
| 19 | 4,040 | 2,640 | 3,440 | 29,150 | 10,450 | 7,170 | 4,450 | 4,700 | 1,910 | 4,230 | 2,530 | 19,870 |
| 20 | 2,840 | 2,650 | 3,110 | 27,600 | 14,560 | 6,630 | 4,840 | 4,060 | 2,800 | 1,870 | 2,570 | 11,770 |
| 21 | 3,250 | 2,670 | 3,640 | 28,540 | 11,930 | 6,290 | 4,010 | 3,900 | 2,560 | 2,810 | 2,590 | 6,380 |
| 22 | 3,490 | 2,380 | 4,180 | 45,590 | 7,560 | 6,420 | 4,220 | 3,650 | 750 | 2,830 | 2,330 | 5,230 |
| 23 | 3,500 | 2,390 | 5,050 | 65,770 | 9,860 | 5,620 | 3,940 | 3,120 | 3,160 | 2,340 | 2,270 | 3,980 |
| 24 | 3,520 | 1,430 | 700 | 65,970 | 7,600 | 6,960 | 3,480 | 3,800 | 3,190 | 2,920 | 1,470 | 6,480 |
| 25 | 3,230 | 2,140 | 8,510 | 49,700 | 7,590 | 6,020 | 3,400 | 3,530 | 2,800 | 2,960 | 2,810 | 8,110 |
| 26 | 3,260 | 2,320 | 8,500 | 44,710 | 6,620 | 6,880 | 3,720 | 4,100 | 2,810 | 3,720 | 2,200 | 7,520 |
| 27 | 2,380 | 2,530 | 12,890 | 42,510 | 9,090 | 6,970 | 3,810 | 3,900 | 2,420 | 1,280 | 2,330 | 7,100 |
| 28 | 2,990 | 1,990 | 10,530 | 39,950 | 8,260 | 7,050 | 2,810 | 2,880 | 2,380 | 3,100 | 2,090 | 6,360 |
| 29 | 3,260 | ..... | 13,340 | 38,280 | 9,060 | 6,980 | 4,510 | 1,890 | 790 | 2,840 | 2,260 | 3,740 |
| 30 | 2,950 | ..... | 8,440 | 34,780 | 5,140 | 7,800 | 4,520 | 1,840 | 3,010 | 2,790 | 2,430 | 4,600 |
| 31 | 2,970 | ..... | 4,120 | ..... | 6,420 | ..... | 5,740 | 1,850 | ..... | 2,850 | ..... | 4,920 |

*Daily discharge, in second-feet, of Kennebec River at Waterville, Me.*—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 4,610 | 4,020 | 11,790 | 47,870 | 34,410 | 15,370 | 12,200 | 4,990 | 3,190 | 4,090 | 8,020 | 4,100 |
| 2 | 4,280 | 2,670 | 23,180 | 37,920 | 28,840 | 15,350 | 12,670 | 5,370 | 4,120 | 4,120 | 5,980 | 4,080 |
| 3 | 3,960 | 4,100 | 35,110 | 36,530 | 28,890 | 13,050 | 13,200 | 4,630 | 4,060 | 4,110 | 5,670 | 4,090 |
| 4 | 3,150 | 3,840 | 54,340 | 29,290 | 26.340 | 12,500 | 10,310 | 9,010 | 3,280 | 4,080 | 4,830 | 4,070 |
| 5 | 900 | 3,850 | 38,650 | 25,220 | 19,740 | 17,860 | 10,930 | 7,480 | 3,740 | 2,020 | 3,760 | 3,390 |
| 6 | 3,460 | 3,980 | 30,250 | 19,460 | 17,210 | 19,750 | 9,890 | 6,490 | 4,090 | 3,510 | 4,130 | 4,070 |
| 7 | 3,730 | 4,010 | 25,920 | 21,340 | 17,860 | 19,140 | 10,470 | 5,320 | 1,580 | 4,170 | 4,220 | 1,020 |
| 8 | 3,490 | 4,010 | 22,280 | 21,260 | 24,290 | 16,830 | 9,850 | 5,130 | 3,500 | 5,550 | 4,080 | 3,710 |
| 9 | 2,960 | 2,850 | 20,240 | 20,020 | 20,720 | 26,140 | 8,880 | 5,240 | 4,040 | 4,160 | 3,040 | 3,190 |
| 10 | 3,260 | 3,990 | 17,740 | 24,790 | 17,520 | 24,550 | 8,910 | 4,420 | 4,000 | 4,160 | 4,120 | 3,580 |
| 11 | 3,760 | 3,970 | 20,940 | 23,370 | 15,730 | 20,390 | 9,510 | 5,090 | 7,540 | 3,770 | 4,090 | 2,900 |
| 12 | 2,240 | 3,910 | 13,160 | 23,470 | 13,030 | 16,510 | 9,410 | 5,730 | 5,850 | 1,750 | 4,100 | 4,090 |
| 13 | 3,840 | 3,910 | 14,230 | 21,340 | 13,490 | 14,760 | 7,260 | 5.850 | 5,390 | 3,510 | 4,020 | 3,990 |
| 14 | 3,410 | 3,940 | 17,590 | 21,290 | 13,600 | 13,040 | 5,440 | 5,180 | 3,430 | 3,780 | 4,180 | 2,350 |
| 15 | 2,890 | 3,950 | 18,940 | 16,970 | 10,480 | 11,700 | 6,940 | 3,860 | 7,570 | 3,730 | 4,380 | 3,990 |
| 16 | 3,210 | 2,100 | 18,860 | 18,730 | 10,530 | 11,210 | 7,340 | 3,980 | 5,860 | 4,060 | 4,550 | 3,970 |
| 17 | 3,180 | 3,950 | 27,940 | 17,540 | 9,720 | 11,340 | 7,200 | 1,890 | 5,180 | 4,120 | 5,450 | 6,930 |
| 18 | 3,160 | 3,370 | 46,630 | 16,940 | 8,410 | 11,590 | 6,920 | 3,740 | 4,140 | 4,080 | 5,420 | 5,150 |
| 19 | 1,790 | 3,930 | 22,400 | 17,500 | 5,560 | 10,670 | 6,940 | 3,440 | 4,100 | 2,060 | 5,040 | 5,480 |
| 20 | 3,550 | 3,660 | 27,320 | 17,880 | 8,420 | 10,550 | 5,740 | 2,640 | 4,100 | 4,200 | 4,920 | 4,900 |
| 21 | 2,870 | 3,440 | 46,570 | 18,740 | 9,640 | 9,710 | 6,780 | 2,300 | 2,410 | 4,980 | 4,680 | 3,420 |
| 22 | 2,860 | 3,660 | 45,320 | 21,250 | 8,950 | 8,400 | 7,010 | 3,320 | 4,730 | 4,510 | 4,380 | 4,710 |
| 23 | 7,810 | 3,150 | 46,670 | 24,030 | 12,320 | 13,110 | 6,940 | 5,950 | 4,530 | 4,560 | 4,470 | 6,220 |
| 24 | 10,510 | 4,080 | 36,990 | 21,290 | 8,990 | 10,620 | 6,460 | 12,670 | 4,180 | 4,200 | 4,600 | 6,900 |
| 25 | 6,360 | 4,100 | 27,490 | 17,640 | 13,030 | 10,160 | 6,230 | 8,250 | 3,990 | 4,130 | 4,160 | 5,460 |
| 26 | 4,620 | 4,840 | 22,900 | 13,910 | 13,560 | 10,200 | 4,870 | 6,590 | 3,820 | 2,730 | 4,300 | 5,160 |
| 27 | 4,070 | 4,420 | 18,720 | 13,430 | 21,690 | 33,940 | 4,500 | 4,030 | 4,020 | 3,950 | 3,450 | 5,150 |
| 28 | 3,870 | 4,700 | 13,920 | 18,620 | 23,800 | 21,870 | 5,100 | 4,130 | 2,060 | 7,830 | 4,200 | 4,660 |
| 29 | 3,880 | ..... | 20,670 | 19,500 | 29,210 | 15,370 | 5,170 | 4,150 | 3,950 | 24,980 | 4,140 | 5,000 |
| 30 | 3,910 | ..... | 57,970 | 18,600 | 19,250 | 12,130 | 4,950 | 4,040 | 4,100 | 15,170 | 3,130 | 4,540 |
| 31 | 3,940 | ..... | 47,070 | ..... | 17,820 | ..... | 4,950 | 1,860 | ..... | 10,830 | ..... | 4,450 |

*Estimated monthly discharge of Kennebec River at Waterville, Me.*

[Drainage area, 4,380 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1901. | | | | | |
| January | 4,040 | 1,880 | 3,176 | 0.73 | 0.84 |
| February | 3,000 | 1,430 | 2,489 | .57 | .59 |
| March | 13,340 | 700 | 4,805 | 1.10 | 1.27 |
| April | 76,590 | 11,600 | 41,130 | 9.39 | 10.47 |
| May | 30,570 | 5,140 | 15,169 | 3.46 | 3.99 |
| June | 15,250 | 5,140 | 8,235 | 1.88 | 2.10 |
| July | 9,080 | 2,810 | 5,122 | 1.17 | 1.35 |
| August | 6,480 | 1,840 | 4,178 | .95 | 1.10 |

*Estimated monthly discharge of Kennebec River at Waterville, Me.*—Continued.

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1901. | | | | | |
| September | 4,760 | 750 | 2,821 | .64 | .71 |
| October | 6,680 | 670 | 2,925 | .67 | .77 |
| November | 3,710 | 480 | 2,405 | .55 | .61 |
| December | 46,750 | 170 | 7,527 | 1.72 | 1.98 |
| The year | 76,590 | 170 | 8,332 | 1.90 | 25.78 |
| 1902. | | | | | |
| January | 10,510 | 900 | 3,856 | .88 | 1.01 |
| February | 4,840 | 2,100 | 3,800 | .87 | .91 |
| March | 57,970 | 11,790 | 28,768 | 6.57 | 7.57 |
| April | 47,870 | 13,430 | 22,191 | 5.07 | 5.66 |
| May | 34,410 | 5,560 | 16,873 | 3.85 | 4.44 |
| June | 33,940 | 8,400 | 15,260 | 3.48 | 3.88 |
| July | 13,200 | 4,500 | 7,840 | 1.79 | 2.06 |
| August | 12,670 | 1,860 | 5,057 | 1.15 | 1.33 |
| September | 7,570 | 1,580 | 4,218 | .96 | 1.07 |
| October | 24,980 | 1,750 | 5,255 | 1.20 | 1.38 |
| November | 8,020 | 3,040 | 4,517 | 1.03 | 1.15 |
| December | 6,930 | 1,020 | 4,346 | .99 | 1.14 |
| The year | 57,970 | 900 | 10,165 | 2.32 | 31.60 |

## CARRABASSETT RIVER NEAR NORTH ANSON, ME.

This river enters the Kennebec from the west at North Anson. Its basin has steep slopes, partly in farm lands, with no large natural reservoirs. Dams have been constructed and power used at New Portland, East New Portland, and North Anson. On October 19, 1901, a gaging station was established on the Carrabassett, 4 miles west of North Anson, by N. C. Grover. The station is located above Embden Brook and below Anson Brook. The drainage area is 340 square miles at this point. The gaging is made from a boat held in position by a manila rope stretched across the stream. The gage is a vertical rod graduated to feet and tenths, and referred to a bench mark on a blazed spruce tree 40 feet from the gage. The elevation of bench mark is 10.78 feet above the zero of the gage. The gage is read every morning by N. Q. Hilton, a farmer in North Anson, Me.

*Discharge measurements of Carrabassett River near North Anson, Me.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Sec.-ft.* |
| June 27 | N. C. Grover | 4.3 | 4,168 |
| July 30 | F. E. Pressey | 0.6 | 192 |
| October 30 | do | 2.48 | 1,812 |
| Do | do | 2.68 | 2,120 |
| October 31 | do | 2.00 | 1,369 |
| November 1 | do | 1.69 | 1,129 |
| Do | do | 1.60 | 1,083 |
| November 2 | do | 1.42 | 882 |
| November 3 | do | 1.35 | 851 |

*Daily gage height, in feet, of Carrabassett River near North Anson, Me.*

| Day. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | |
| 1 | | 1.40 | 0.40 | 0.70 | 0.90 | 1.70 | 1.00 |
| 2 | | 1.80 | .40 | .80 | 1.10 | 1.50 | 1.00 |
| 3 | | 1.60 | 1.50 | .70 | 1.00 | 1.40 | .90 |
| 4 | | 1.50 | 1.20 | .70 | .90 | 1.30 | 1.00 |
| 5 | | 1.30 | 1.00 | .90 | .80 | 1.20 | 1.10 |
| 6 | | 1.10 | .90 | .80 | 1.20 | 1.10 | 1.10 |
| 7 | | 1.00 | .80 | .70 | 1.70 | 1.10 | 1.20 |
| 8 | | .90 | .80 | .90 | 1.30 | 1.10 | 1.20 |
| 9 | | .80 | .80 | .80 | 1.10 | 1.10 | 1.10 |
| 10 | | .80 | .80 | 2.80 | 1.10 | 1.00 | 1.10 |
| 11 | | .90 | .70 | 1.90 | 1.00 | 1.00 | 1.10 |
| 12 | | .70 | .90 | 1.40 | .90 | 1.00 | .90 |
| 13 | | .70 | .90 | 1.20 | .90 | 1.10 | 1.10 |
| 14 | | .60 | .70 | 2.80 | .90 | 1.10 | (a) |
| 15 | | .60 | .60 | 2.10 | 1.00 | 1.40 | |
| 16 | | .60 | .50 | 1.60 | .90 | 1.50 | |
| 17 | | .60 | .50 | 1.30 | .80 | 1.50 | |
| 18 | | .50 | .50 | 1.10 | .80 | 1.30 | |
| 19 | | .50 | .50 | 1.00 | .80 | 1.20 | |
| 20 | | .60 | .30 | 1.40 | 1.40 | 1.20 | |
| 21 | | .60 | .30 | 1.10 | 1.60 | 1.20 | |
| 22 | | 1.00 | .30 | 1.10 | 1.30 | 1.10 | |
| 23 | | 1.00 | 6.40 | 1.00 | 1.10 | 1.20 | |
| 24 | | .80 | 3.60 | 1.10 | 1.10 | 1.10 | |
| 25 | | .80 | 2.30 | .90 | .90 | 1.10 | |
| 26 | 4.80 | .70 | 1.60 | .80 | 1.00 | 1.00 | |
| 27 | 4.90 | .60 | 1.40 | .80 | .90 | 1.00 | |
| 28 | 3.10 | .60 | 1.10 | .80 | 1.50 | 1.10 | |
| 29 | 2.20 | .60 | 1.00 | 1.00 | 4.30 | 1.00 | |
| 30 | 1.70 | .50 | .80 | 1.00 | 2.50 | 1.00 | |
| 31 | | .50 | .70 | | 2.00 | | |

a Frozen December 14 to 31.

*Rating table for Carrabassett River near North Anson, Me., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 0.4 | 70 | 1.8 | 1,235 | 3.2 | 2,665 | 4.6 | 4,565 |
| .6 | 192 | 2.0 | 1,400 | 3.4 | 2,935 | 4.8 | 4,840 |
| .8 | 365 | 2.2 | 1,575 | 3.6 | 3,210 | 5.0 | 5,100 |
| 1.0 | 540 | 2.4 | 1,750 | 3.8 | 3,480 | ..... | ..... |
| 1.2 | 715 | 2.6 | 1,950 | 4.0 | 3,755 | ..... | ..... |
| 1.4 | 885 | 2.8 | 2,160 | 4.2 | 4,030 | ..... | ..... |
| 1.6 | 1,060 | 3.0 | 2,400 | 4.4 | 4,300 | ..... | ..... |

*Estimated monthly discharge of Carrabassett River near North Anson, Me.*

[Drainage area, 340 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| June 26 to 30 | ..... | ..... | [b]3,012 | [b]8.86 | [b]1.67 |
| July | 1,235 | 130 | 408 | 1.20 | 1.38 |
| August | 6,920 | 45 | 713 | 2.10 | 2.42 |
| September | 2,160 | 275 | 716 | 2.11 | 2.35 |
| October | 1,850 | 365 | 763 | 2.24 | 2.58 |
| November | 1,145 | 540 | 703 | 2.07 | 2.31 |
| December 1 to 13 [a] | 715 | 450 | [b]595 | [b]1.75 | [b].85 |

[a] Gage frozen remainder of month. [b] Partial month.

## DEAD RIVER NEAR THE FORKS, ME.

This tributary of the Kennebec has its headwaters in the mountains between Maine and Canada and flows in a general easterly direction, entering the Kennebec at The Forks. Its basin contains 870 square miles and is 40 miles in extreme length by 30 in width and almost wholly wooded. Through a large portion of its length the river flows through swamps; in its lower course it has considerable fall. The only dams on the stream are owned by the log-driving companies, and the gates are kept open after the drive is out of the river. A gaging station was established on Dead River near The Forks on September 29, 1901, by N. C. Grover. The station is 1½ miles west of The Forks, and is reached by private conveyance. The measurements are made from a car suspended from a steel cable. There are two gages, one on either bank. The gage on the right bank is a vertical rod grad-

uated to feet and tenths and referred to two bench marks. One is on the right bank on the top of large bowlder at end of wharf on which gage is placed; its elevation is 4.48 feet above the zero of the gage. The other is on the left bank, 200 feet above the gage, on the top of bowlder; its elevation is 10.89 feet. The gage on the left bank is an inclined rod graduated to feet and tenths of vertical elevation, and referred to one bench mark marked by a cross on a granite bowlder near the gage; its elevation is 5.55 feet above the zero of the gage. The channel is straight for 500 feet above and below the cable, the current swift. The banks are rocky, though subject to overflow at the time of highest water. The bed is rocky and permanent. The gage is read twice daily, 6 a. m. and 6 p. m., by Jeremiah Durgin, jr., a farmer at The Forks.

The following discharge measurement was made during the year 1901 by N. C. Grover:

September 29; Gage height, 0.40 foot; discharge, 225 second-feet.

*Daily gage height, in feet, of Dead River near The Forks, Me.*

| Day. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | |
| 1 | ..... | 2.57 | 2.35 | 0.80 | 1.00 | 2.40 | 1.00 |
| 2 | ..... | 2.10 | 2.25 | .90 | 1.00 | 1.85 | 1.00 |
| 3 | ..... | 1.85 | 2.20 | 1.00 | .90 | 1.75 | 1.20 |
| 4 | ..... | 1.55 | 1.95 | 1.10 | .90 | 1.75 | 1.20 |
| 5 | ..... | 1.70 | 1.80 | 1.15 | 1.00 | 1.55 | 1.10 |
| 6 | ..... | 1.50 | 1.60 | 1.00 | .90 | 1.45 | 1.00 |
| 7 | ..... | 1.40 | 1.50 | 1.10 | 1.15 | 1.35 | (a) |
| 8 | ..... | 1.40 | 1.40 | 1.00 | 1.55 | 1.30 | ..... |
| 9 | ..... | 1.30 | 1.40 | .90 | 1.55 | 1.25 | ..... |
| 10 | ..... | 1.10 | 1.35 | 1.00 | 1.50 | 1.10 | ..... |
| 11 | ..... | 1.00 | 1.25 | 1.10 | 1.20 | 1.00 | ..... |
| 12 | ..... | .80 | 1.10 | 1.45 | 1.25 | 1.40 | ..... |
| 13 | ..... | 1.20 | 1.00 | 1.75 | 1.45 | 1.80 | ..... |
| 14 | ..... | 1.15 | .90 | 1.80 | 1.60 | 1.90 | 1.10 |
| 15 | ..... | 1.10 | .80 | 1.70 | 1.60 | 1.85 | 1.20 |
| 16 | ..... | 1.10 | .70 | 1.60 | 1.60 | 1.70 | 1.20 |
| 17 | ..... | 1.10 | 1.10 | 1.50 | 2.00 | 1.90 | 1.10 |
| 18 | ..... | 1.10 | 1.00 | 1.55 | 1.50 | 1.80 | 1.10 |
| 19 | ..... | 1.10 | 1.00 | 1.60 | ..... | 1.80 | 1.20 |
| 20 | ..... | 1.00 | 1.00 | 1.75 | 1.00 | 1.65 | 1.20 |
| 21 | ..... | .85 | .90 | 1.75 | 1.00 | 1.55 | 1.30 |
| 22 | ..... | .70 | .80 | 1.80 | .90 | 1.50 | 1.45 |
| 23 | ..... | .70 | .70 | 1.70 | .90 | 1.50 | 1.50 |
| 24 | ..... | .90 | 1.00 | 1.55 | 1.00 | 1.40 | 1.50 |
| 25 | 1.60 | 1.00 | 1.80 | 1.35 | 1.10 | 1.30 | 1.50 |
| 26 | 2.00 | 1.10 | 1.50 | 1.20 | 1.15 | 1.30 | 1.50 |
| 27 | 3.30 | 1.20 | 1.30 | 1.10 | 1.10 | 1.20 | 1.40 |
| 28 | 3.20 | 1.45 | 1.20 | 1.10 | 1.20 | 1.10 | (a) |
| 29 | 4.15 | 1.65 | 1.10 | 1.10 | 1.00 | 1.05 | ..... |
| 30 | 3.20 | 2.00 | 1.00 | 1.00 | 1.50 | 1.00 | ..... |
| 31 | ..... | 2.10 | .90 | ..... | 1.85 | ..... | ..... |

a Frozen December 7 to 13 and 28 to 31.

## MOOSE RIVER NEAR ROCKWOOD, ME.

This station was established September 7, 1902, by N. C. Grover. It is located 4 miles west of Kineo, Me., 2 miles from the mouth of the river, and is reached by steamer on the lake and rowboat on the river. The drainage basin is 680 square miles at this point. Measurements are made from a car suspended from a steel cable. The initial point for soundings is on the right bank, 1 foot from a birch tree, to which the tag line and cable are attached. The gage is a painted post, graduated to feet and tenths, driven into the clay bed of the river, and braced from several trees. For high-water stages a gage is placed on a fir tree about 20 feet upstream from the low-water gage. The gage is read daily at 7 a. m. and 4 p. m. by Peter Callaghan. The channel, both above and below the station, is straight, the banks are high and rocky, and the bed of the stream is rocky. The bench mark is a horizontal mark on the fir tree behind and on a level with the 10-foot mark of the high-water gage.

During 1902 the following measurements were made by F. E. Pressey:

September 7: Gage height, 2.4 feet; discharge, 385 second-feet.
November 23: Gage height, 3.9 feet; discharge, 1,168 second-feet.

*Daily gage height, in feet, of Moose River near Rockwood, Me., for 1902.*

| Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 3.60 | 4.60 | 3.50 | 17 | 3.00 | 3.30 | 3.90 | 2.80 |
| 2 | ..... | 3.60 | 4.60 | 3.50 | 18 | 2.90 | 3.25 | 3.90 | 2.80 |
| 3 | ..... | 3.50 | 4.50 | 3.50 | 19 | 2.90 | 3.30 | 3.90 | 2.80 |
| 4 | ..... | 3.45 | 4.40 | 3.40 | 20 | 3.10 | 3.40 | 3.90 | 2.80 |
| 5 | ..... | 3.40 | 4.35 | 3.40 | 21 | 3.10 | 3.45 | 3.90 | 2.80 |
| 6 | ..... | 3.40 | 4.30 | 3.40 | 22 | 3.40 | 3.45 | 3.90 | 2.85 |
| 7 | 2.40 | 3.40 | 4.20 | 3.35 | 23 | 3.70 | 3.50 | 3.90 | 2.90 |
| 8 | 2.40 | 3.50 | 4.20 | 3.25 | 24 | 3.80 | 3.50 | 3.90 | 2.90 |
| 9 | 2.40 | 3.50 | 4.05 | 3.15 | 25 | 3.80 | 3.50 | 3.85 | 2.65 |
| 10 | 2.50 | 3.45 | 4.00 | 3.10 | 26 | 3.80 | 3.45 | 3.80 | 2.70 |
| 11 | 2.50 | 3.40 | 3.90 | 3.00 | 27 | 3.80 | 3.40 | 3.75 | 2.90 |
| 12 | 2.60 | 3.40 | 3.85 | 2.95 | 28 | 3.75 | 3.50 | 3.70 | 2.90 |
| 13 | 2.60 | 3.30 | 3.80 | 2.90 | 29 | 3.70 | 4.05 | 3.65 | 2.90 |
| 14 | 2.75 | 3.30 | 3.80 | 2.90 | 30 | 3.70 | 4.45 | 3.60 | 2.90 |
| 15 | 2.85 | 3.30 | 3.80 | 2.80 | 31 | ..... | 4.60 | ..... | 2.90 |
| 16 | 2.90 | 3.30 | 3.80 | 2.80 | | | | | |

## ROACH RIVER AT ROACH RIVER, ME.

This stream, entering Moosehead Lake from the east, rises in the highland region of Maine, its basin being well wooded and containing several ponds of considerable size. At the foot of Lower Roach Pond is a dam, owned by the log drivers, which controls the flow of the river. The drainage area of the river at this point is 85 square miles.

The station at Roach River was established November 10, 1901, by N. C. Grover. It is reached by stage from Lily Bay. The gage is a vertical rod spiked to the timber retaining embankment on the right bank of the stream. It is divided into feet and tenths and referred to a bench mark, a cross on the top timber to which the gage is spiked, the elevation of this mark being 9 feet. The gage is read twice daily, at 9 a. m. and 3 p. m., by C. H. Sawyer, hotel keeper.

During 1902 the following measurements were made by F. E. Pressey:

September 2: Gage height, 2.50 feet; discharge, 112 second-feet.
September 2: Gage height, 2.70 feet; discharge, 200 second-feet.
September 2: Gage height, 2.90 feet; discharge, 286 second-feet.
September 3: Gage height, 2.30 feet; discharge, 72 second-feet.
September 3: Gage height, 2.11 feet; discharge, 32 second-feet.

*Daily gage height, in feet, of Roach River at Roach River, Me.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2.80 | 2.90 | 2.60 | 2.30 | 5.60 | 2.50 | 2.80 | 2.25 | 2.50 | 2.30 | 2.30 | 2.50 |
| 2 | 2.80 | 2.80 | 2.60 | 2.30 | 3.80 | 2.50 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 3 | 2.80 | 2.80 | 2.85 | 2.30 | 5.40 | 2.50 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 4 | 2.60 | 2.80 | 3.00 | 2.30 | 3.80 | 2.50 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 5 | 2.60 | 2.80 | 3.15 | 3.75 | 5.40 | 2.50 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 6 | 2.60 | 2.80 | 3.20 | 5.15 | 3.80 | 2.50 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 7 | 2.90 | 2.80 | 3.20 | 5.10 | 3.80 | 2.50 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 8 | 2.90 | 2.80 | 3.15 | 2.30 | 2.20 | 2.50 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 9 | 2.90 | 2.80 | 3.00 | 5.10 | 5.50 | 3.00 | 2.80 | 2.50 | 2.50 | 2.30 | 2.50 | 2.50 |
| 10 | 2.90 | 2.80 | 3.00 | 3.75 | 3.85 | 3.00 | 2.80 | 2.50 | 2.40 | 2.30 | 2.50 | 2.50 |
| 11 | 2.90 | 2.80 | 3.00 | 5.20 | 2.20 | 3.00 | 2.80 | 2.50 | 2.40 | 2.30 | 2.50 | 2.50 |
| 12 | 2.90 | 2.80 | 3.00 | 3.75 | 5.50 | 3.00 | 2.80 | 2.50 | 2.40 | 2.30 | 2.50 | 2.50 |
| 13 | 2.90 | 2.80 | 3.00 | 3.75 | 3.85 | 3.00 | 2.80 | 2.50 | 2.40 | 2.30 | 2.50 | 2.50 |
| 14 | 2.90 | 2.80 | 3.00 | 5.20 | 3.85 | 3.00 | 2.80 | 2.50 | 2.40 | 2.30 | 2.50 | 2.50 |
| 15 | 2.90 | 2.60 | 3.00 | 3.75 | 2.20 | 2.60 | 2.80 | 2.50 | 2.40 | 2.30 | 2.50 | 2.50 |
| 16 | 2.90 | 2.60 | 3.00 | 3.75 | 3.85 | 2.60 | 2.80 | 2.50 | 2.40 | 2.30 | 2.50 | 2.50 |
| 17 | 2.90 | 2.60 | 3.10 | 5.20 | 3.85 | 2.60 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 18 | 2.90 | 3.60 | 3.40 | 5.20 | 2.20 | 2.60 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 19 | 2.90 | 2.60 | 3.50 | 2.30 | 2.20 | 2.60 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 20 | 2.90 | 2.60 | 4.50 | 3.75 | 2.20 | 2.60 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 21 | 2.90 | 2.60 | 5.35 | 3.75 | 3.85 | 2.60 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 22 | 2.90 | 2.60 | 4.00 | 4.90 | 3.85 | 2.80 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 23 | 3.10 | 2.60 | 4.90 | 4.90 | 2.20 | 2.80 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 24 | 3.00 | 2.60 | 3.95 | 5.30 | 5.50 | 2.80 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.50 |
| 25 | 2.90 | 2.60 | 4.20 | 5.25 | 5.50 | 2.80 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.20 |
| 26 | 2.90 | 2.60 | 3.90 | 5.10 | 5.50 | 2.80 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.20 |
| 27 | 2.90 | 2.60 | 2.70 | 2.30 | 5.50 | 2.80 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.20 |
| 28 | 2.90 | 2.60 | 2.20 | 2.30 | 3.50 | 2.80 | 2.80 | 2.50 | 2.30 | 2.30 | 2.50 | 2.20 |
| 29 | 2.90 | ..... | 2.25 | 4.60 | 3.05 | 2.80 | 2.50 | 2.50 | 2.30 | 2.30 | 2.50 | 2.20 |
| 30 | 2.90 | ..... | 2.30 | 4.90 | 2.60 | 2.80 | 2.20 | 2.50 | 2.30 | 2.30 | 2.50 | 2.20 |
| 31 | 2.90 | ..... | 2.30 | ..... | 2.60 | ..... | 2.20 | 2.50 | ..... | 2.30 | ..... | 2.20 |

*Rating table for Roach River at Roach River, Me., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 2.1 | 31 | 2.8 | 244 | 3.5 | 538 | 4.4 | 916 |
| 2.2 | 48 | 2.9 | 286 | 3.6 | 580 | 4.6 | 1,000 |
| 2.3 | 67 | 3.0 | 328 | 3.7 | 622 | 4.8 | 1,084 |
| 2.4 | 90 | 3.1 | 370 | 3.8 | 664 | 5.0 | 1,168 |
| 2.5 | 118 | 3.2 | 412 | 3.9 | 706 | 5.2 | 1,252 |
| 2.6 | 156 | 3.3 | 454 | 4.0 | 748 | 5.4 | 1,336 |
| 2.7 | 200 | 3.4 | 496 | 4.2 | 832 | 5.6 | 1,420 |

*Estimated monthly discharge of Roach River at Roach River, Me.*

[Drainage area, 85 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1901. | | | | | |
| November 10 to 30 | ---------- | ---------- | 53 | 0.62 | 0.69 |
| December | 601 | 67 | 261 | 3.07 | 3.54 |
| 1902. | | | | | |
| January | 370 | 156 | 273 | 3.21 | 3.70 |
| February | 286 | 156 | 202 | 2.38 | 2.48 |
| March | 1,315 | 48 | 432 | 5.08 | 5.86 |
| April | 1,294 | 67 | 750 | 8.82 | 9.83 |
| May | 1,420 | 48 | 687 | 8.08 | 9.31 |
| June | 328 | 118 | 207 | 2.44 | 2.72 |
| July | 244 | 48 | 227 | 2.67 | 3.08 |
| August | 118 | 57 | 116 | 1.36 | 1.57 |
| September | 118 | 67 | 88 | 1.04 | 1.16 |
| October | 67 | 67 | 67 | .79 | .91 |
| November | 118 | 67 | 116 | 1.36 | 1.52 |
| December | 118 | 48 | 102 | 1.20 | 1.38 |
| The year | 1,420 | 48 | 272 | 3.20 | 43.52 |

## COBBOSSEECONTEE RIVER AT GARDINER, ME.

Cobbosseecontee River drains a group of lakes lying from 5 to 15 miles westerly from Augusta, and empties into the Kennebec 6 miles below that city at Gardiner, its drainage area amounting to about 240

square miles. From the ordinary surface of Lake Maranacook, one of the upper lakes, to mean tide at the mouth of the river the fall is 206 feet, and in the lower three-fourths of a mile it is said to be 136 feet. From above the uppermost of the 8 dams controlled by the Gardiner Water Power Company, which are in the latter three-fourths of a mile, the municipal water supply for Gardiner is drawn and pumped by water power. Record is kept of the water pumped and of the water that passes the dam through a waste gate. The sum of these quantities represents the yield of the drainage area at the upper dam, records of which have been kept by the Gardiner Water Power Company for a series of years, and have been furnished to the Survey by their engineer, A. H. Twombly. The record for 1902 is presented in the accompanying table. On Sundays and on legal holidays the gates are closed and no water is permitted to run unless the lakes are full. This is a most remarkable example of the regularity of flow that can be obtained with proper storage.

*Mean daily flow, in second-feet, of Cobbosseecontee River at Gardiner, Me.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 500 | 463 | 2,400 | 1,803 | 713 | 0 | 280 | 280 | 280 | 280 | 270 | 270 |
| 2 | 348 | 280 | 2,400 | 1,748 | 713 | 280 | 280 | 280 | 280 | 280 | 0 | 270 |
| 3 | 294 | 280 | 2,222 | 1,593 | 650 | 280 | 280 | 0 | 280 | 280 | 270 | 270 |
| 4 | 280 | 280 | 1,702 | 1,540 | 566 | 280 | 20 | 280 | 280 | 280 | 270 | 270 |
| 5 | 0 | 280 | 1,583 | 1,390 | 514 | 280 | 21 | 280 | 280 | 0 | 270 | 270 |
| 6 | 280 | 280 | 1,370 | 1,071 | 465 | 280 | 0 | 280 | 280 | 280 | 270 | 270 |
| 7 | 280 | 280 | 1,165 | 848 | 415 | 280 | 280 | 280 | 0 | 280 | 270 | 0 |
| 8 | 280 | 280 | 1,017 | 280 | 393 | 0 | 280 | 280 | 280 | 280 | 270 | 270 |
| 9 | 280 | 280 | 878 | 280 | 373 | 280 | 280 | 280 | 280 | 280 | 0 | 270 |
| 10 | 280 | 280 | 878 | 354 | 506 | 280 | 280 | 0 | 280 | 280 | 270 | 250 |
| 11 | 280 | 280 | 1,065 | 705 | 280 | 280 | 280 | 280 | 280 | 280 | 270 | 250 |
| 12 | 0 | 280 | 1,114 | 819 | 280 | 280 | 280 | 280 | 280 | 0 | 270 | 250 |
| 13 | 280 | 280 | 1,214 | 927 | 280 | 280 | 0 | 280 | 280 | 280 | 270 | 250 |
| 14 | 280 | 280 | 1,267 | 900 | 280 | 280 | 280 | 280 | 0 | 280 | 270 | 0 |
| 15 | 280 | 280 | 1,017 | 705 | 280 | 0 | 280 | 280 | 280 | 280 | 270 | 250 |
| 16 | 280 | 280 | 746 | 584 | 280 | 280 | 280 | 280 | 280 | 270 | 0 | 250 |
| 17 | 280 | 280 | 833 | 531 | 280 | 280 | 230 | 0 | 280 | 270 | 270 | 250 |
| 18 | 280 | 280 | 1,423 | 465 | 0 | 280 | 280 | 280 | 280 | 270 | 270 | 250 |
| 19 | 0 | 280 | 1,267 | 438 | 280 | 280 | 280 | 280 | 280 | 0 | 270 | 250 |
| 20 | 280 | 280 | 1,531 | 438 | 280 | 280 | 0 | 280 | 280 | 270 | 270 | 250 |
| 21 | 280 | 280 | 1,765 | 415 | 280 | 280 | 280 | 280 | 0 | 270 | 270 | 0 |
| 22 | 280 | 280 | 1,702 | 369 | 280 | 0 | 280 | 280 | 280 | 270 | 270 | 250 |
| 23 | 1,642 | 280 | 1,583 | 369 | 280 | 280 | 280 | 280 | 280 | 270 | 0 | 256 |
| 24 | 1,446 | 280 | 1,478 | 345 | 280 | 280 | 280 | 0 | 280 | 270 | 270 | 276 |
| 25 | 1,097 | 280 | 1,370 | 313 | 0 | 280 | 280 | 280 | 280 | 270 | 270 | 40 |
| 26 | 924 | 280 | 1,267 | 313 | 280 | 280 | 280 | 280 | 280 | 0 | 270 | 290 |
| 27 | 752 | 280 | 1,165 | 94 | 280 | 280 | 0 | 280 | 280 | 270 | 270 | 264 |
| 28 | 776 | 280 | 1,017 | 367 | 280 | 280 | 280 | 280 | 0 | 270 | 270 | 264 |
| 29 | 719 | ..... | 789 | 367 | 280 | 0 | 280 | 280 | 280 | 270 | 270 | 256 |
| 30 | 479 | ..... | 1,531 | 350 | 280 | 280 | 280 | 280 | 280 | 270 | 0 | 250 |
| 31 | 479 | ..... | 1,531 | ..... | 280 | ..... | 280 | 0 | ..... | 270 | ..... | 250 |

## ANDROSCOGGIN RIVER DRAINAGE BASIN.

Androscoggin River is formed by the junction of Magalloway River and the outlet of the Umbagog-Rangeley lakes near the Maine-New Hampshire boundary line. For about 35 miles it flows southward into the State of New Hampshire, then turns abruptly to the east and flows into the State of Maine, then turns to the south and joins the Kennebec in Merrymeeting Bay. The last fall on the Androscoggin is at Brunswick, Me., above which place the drainage area is 3,470 square miles, about 80 per cent of which is in Maine. The greatest length of the basin is 110 miles, the greatest width 70 miles, while the river itself measures about 200 miles in length from the sources of Magalloway River to the coast. The following table gives the drainage areas of the river at various points, and some of its chief tributaries:

*Drainage areas of Androscoggin River and principal tributaries.*

| River. | Locality. | Drainage area. |
|---|---|---|
| | | *Square miles.* |
| Androscoggin | Immediately below junction of Umbagog outlet and Magalloway River, at Errol Dam. | 1,090 |
| Do | Berlin | 1,350 |
| Do | Rumford Falls | 2,090 |
| Do | Dixfield | 2,230 |
| Do | Livermore Falls | 2,550 |
| Do | Lewiston Falls | 2,950 |
| Do | Brunswick | 3,470 |
| Umbagog Outlet | Immediately above junction with Magalloway River | 590 |
| Magalloway | Mouth | 500 |
| Little Androscoggin | do | 380 |

The lower part of the basin is hilly and moderately wooded, while the upper two-thirds is broken and mountainous, heavily timbered, and with a gravelly, sandy soil. Granite, gneiss, and mica-schists abound along the main course of the river, with clay slate in the upper part of the basin. The river, like others on the southern slopes of Maine, generally has a rocky bed, particularly where falls occur, has high banks, and is seldom subject to overflow, all of which are features of advantage in the development of water powers. Below Berlin the stream is nowhere more than 10 miles from a railroad, and for considerable portions of its course it is immediately

skirted by railroads. Tide-water navigation extends about 6 miles above the mouth, or to the falls at Brunswick.

### ANDROSCOGGIN RIVER AT DIXFIELD, ME.

This station was established August 22, 1902, by F. E. Pressey. It is located about one-half mile west of Dixfield, Me., at the highway bridge on the road between Dixfield and West Peru. The measurements are taken from this bridge, and the initial point for soundings is at the lower end of the inclined end-post on the left bank of the river. The gage is of the usual wire type; the scale board is graduated to feet and tenths, and is nailed to the guard timber of the lower side of the bridge. The gage is read daily at 7 a. m. and 5 p. m. by S. F. Robinson. The channel at this point is about 600 feet wide; the current is swift in the left half and sluggish in the right half. The bed of the stream is rocky in the left half and sandy in the right half. The bench mark is located on the north abutment at the southeast corner of the bridge seat and has an elevation of 24.77 feet above the zero of the gage.

During 1902 the following measurements were made by F. E. Pressey:

August 23: Gage height, 8.85 feet; discharge, 4,665 second-feet.
September 18: Gage height, 8.33 feet; discharge, 3,013 second-feet.

*Daily gage height, in feet, of Androscoggin River at Dixfield, Me., for 1902.*

| Day. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 7.55 | 8.60 | 9.55 | 8.55 | 17 | ..... | 8.35 | 8.05 | 8.95 | (a) |
| 2 | ..... | 8.15 | 8.80 | 9.35 | 8.50 | 18 | ..... | 8.35 | 8.00 | 8.90 | ..... |
| 3 | ..... | 7.95 | 8.65 | 9.20 | 8.50 | 19 | ..... | 8.20 | 8.10 | 8.90 | ..... |
| 4 | ..... | 7.90 | 8.45 | 9.00 | 8.45 | 20 | ..... | 8.65 | 8.10 | 8.95 | ..... |
| 5 | ..... | 8.00 | 8.55 | 8.85 | 8.40 | 21 | ..... | 8.55 | 8.65 | 8.90 | ..... |
| 6 | ..... | 8.05 | 8.30 | 8.70 | 7.70 | 22 | 8.25 | 8.45 | 8.45 | 8.90 | ..... |
| 7 | ..... | 8.15 | 8.85 | 8.70 | 8.05 | 23 | 9.05 | 8.35 | 8.30 | 8.95 | ..... |
| 8 | ..... | 8.15 | 8.50 | 8.60 | 8.55 | 24 | 9.40 | 8.40 | 8.30 | 8.85 | ..... |
| 9 | ..... | 8.10 | 8.25 | 8.70 | (a) | 25 | 8.90 | 8.40 | 8.25 | 8.75 | ..... |
| 10 | ..... | 9.00 | 8.10 | 8.50 | ..... | 26 | 8.55 | 8.25 | 8.40 | 8.70 | ..... |
| 11 | ..... | 9.05 | 8.15 | 8.50 | ..... | 27 | 8.45 | 8.40 | 8.15 | 8.70 | ..... |
| 12 | ..... | 8.60 | 8.05 | 8.50 | ..... | 28 | 8.30 | 8.50 | 9.45 | 8.65 | ..... |
| 13 | ..... | 8.40 | 7.75 | 8.65 | ..... | 29 | 8.25 | 8.60 | 11.35 | 8.50 | ..... |
| 14 | ..... | 9.10 | 8.25 | 8.80 | ..... | 30 | 8.15 | 8.60 | 9.95 | 8.70 | ..... |
| 15 | ..... | 8.85 | 8.20 | 8.90 | ..... | 31 | 8.10 | ..... | 9.70 | ..... | ..... |
| 16 | ..... | 8.55 | 8.15 | 8.95 | ..... | | | | | | |

a Frozen December 9 to 31.

### ANDROSCOGGIN RIVER AT ERROL DAM, NEW HAMPSHIRE.

Errol dam on the Androscoggin River is the last one of the series of storage dams in the Rangeley Lakes. It is below the mouth of the Magalloway, and consequently stores the flow of that river in Umbagog Lake. The total run-off from the basins of the Magalloway and of

the Umbagog-Rangeley system must pass through this dam. These basins aggregate 1,090 square miles in area. The United States Geological Survey cooperating with Walter H. Sawyer, agent for the Union Water Power Company, of Lewiston, Me., has begun a series of measurements of the flow through the gates at Errol dam. Thirteen measurements of the flow at different gate openings have been made, but the results are not yet available for publication. A continuous record of gate opening is kept, and when a sufficient number of measurements have been made to give a rating for the gates, a constant record of flow will be available.

### ANDROSCOGGIN RIVER AT RUMFORD FALLS, ME.

At Rumford Falls there is one of the finest water powers on the Atlantic coast. Here the Androscoggin descends 177 feet in 1 mile, in several pitches over granite ledges. A comprehensive plan of development has been laid out and partially executed. It contemplates the use of power from three levels—a high-level canal, with a fall of 97 feet, to the middle level, the latter receiving also a direct and independent supply of water from the river, the water to be used from the middle-level canal and discharged, after a fall of 50 feet, into the low level, 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. Water for power was first used in important amounts in the summer of 1893, and its use increased from time to time, so that at present about 19,000 horsepower is in use, the greater part being utilized in the manufacture of pulp and paper. If the entire fall of 177 feet were utilized there would be available, at Rumford Falls, from 30,000 to 54,000 horsepower. This power is 85 miles, by rail, from Portland, and for pulp and paper manufacture has the advantage of excellent transportation facilities—Androscoggin River, for floating down pulp wood and timber from the headwaters to the mills, and the Rumford Falls and Rangeley Lakes Railroad, extending into the forests, with a contemplated extension into the Megantic region which will make available additional spruce, poplar, and birch forests. Altogether Rumford Falls possesses the greatest water power in the New England States. Much of it is now unutilized, but it is likely that before long the city of Rumford Falls will be a great manufacturing center.

The discharge of the Androscoggin River at Rumford Falls since 1892 has been computed by Charles A. Mixer, resident engineer of the Rumford Falls Power Company. These figures are obtained by adding the actual measured quantities passing through the wheels and the computed flow over the dam, using the customary Francis weir formula, and they have been published from time to time by the Survey, and a complete record up to 1902 will be found in Water-Supply Paper No. 69.

The following table gives the record for the year 1902:

*Mean daily flow, in second-feet, of Androscoggin River at Rumford Falls, Me.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2,084 | 2,523 | 6,123 | 14,078 | 14,580 | 9,828 | 4,170 | 2,766 | 1,772 | 3,005 | 4,552 | 2,636 |
| 2 | 1,925 | 2,103 | 10,482 | 12,290 | 13,521 | 9,801 | 4,398 | 4,618 | 1,781 | 3,174 | 3,880 | 2,605 |
| 3 | 2,137 | 2,116 | 17,245 | 10,544 | 14,006 | 9,350 | 4,243 | 4,379 | 1,713 | 2,871 | 3,731 | 2,600 |
| 4 | 2,131 | 2,095 | 10,727 | 8,627 | 11,852 | 9,014 | 4,243 | 3,715 | 1,711 | 2,549 | 3,278 | 2,383 |
| 5 | 2,235 | 2,068 | 6,218 | 7,066 | 11,557 | 8,951 | 4,107 | 3,134 | 1,798 | 2,519 | 3,119 | 1,685 |
| 6 | 2,191 | 2,043 | 4,593 | 6,186 | 11,281 | 8,298 | 3,882 | 2,757 | 1,882 | 2,575 | 2,797 | 1,618 |
| 7 | 2,195 | 2,004 | 3,858 | 6,169 | 11,304 | 7,507 | 3,625 | 3,045 | 1,937 | 3,072 | 2,769 | 1,631 |
| 8 | 2,117 | 2,044 | 3,787 | 5,817 | 11,155 | 7,934 | 3,507 | 3,198 | 2,056 | 2,424 | 2,728 | 1,659 |
| 9 | 2,129 | 2,326 | 3,633 | 6,588 | 10,107 | 9,202 | 3,127 | 3,267 | 2,028 | 2,054 | 2,649 | 1,781 |
| 10 | 2,019 | 1,979 | 3,285 | 9,980 | 8,840 | 8,266 | 2,974 | 3,080 | 3,537 | 1,905 | 2,649 | 1,902 |
| 11 | 2,087 | 1,939 | 3,165 | 7,997 | 7,483 | 7,206 | 2,825 | 3,101 | 2,947 | 1,973 | 2,603 | 2,094 |
| 12 | 2,031 | 1,787 | 3,626 | 6,850 | 7,187 | 6,478 | 2,427 | 3,537 | 2,699 | 1,921 | 2,578 | 2,181 |
| 13 | 2,023 | 1,793 | 6,512 | 5,900 | 6,662 | 6,764 | 1,965 | 3,476 | 2,550 | 1,940 | 2,807 | 1,952 |
| 14 | 1,837 | 1,776 | 8,528 | 5,926 | 5,177 | 6,992 | 2,239 | 2,909 | 3,385 | 2,256 | 2,923 | 1,580 |
| 15 | 1,716 | 1,694 | 6,482 | 5,401 | 4,362 | 6,619 | 2,352 | 2,903 | 3,184 | 2,000 | 3,186 | 2,049 |
| 16 | 1,769 | 1,690 | 5,664 | 5,059 | 3,884 | 6,669 | 2,379 | 2,682 | 2,698 | 1,939 | 2,971 | 2,083 |
| 17 | 1,997 | 1,644 | 11,173 | 4,948 | 3,851 | 7,385 | 2,371 | 2,506 | 2,439 | 1,853 | 3,385 | 2,565 |
| 18 | 2,288 | 1,726 | 11,690 | 6,431 | 3,215 | 6,357 | 2,222 | 2,639 | 2,261 | 1,870 | 3,179 | 3,083 |
| 19 | 1,962 | 1,845 | 7,501 | 5,778 | 3,630 | 4,866 | 2,163 | 2,326 | 2,330 | 1,958 | 3,266 | 2,816 |
| 20 | 1,862 | 2,135 | 7,656 | 5,978 | 3,583 | 4,349 | 1,662 | 2,382 | 2,730 | 2,224 | 3,267 | 2,612 |
| 21 | 1,900 | 2,524 | 11,126 | 6,142 | 3,485 | 4,295 | 2,174 | 2,402 | 2,534 | 2,792 | 3,213 | 2,055 |
| 22 | 2,646 | 1,960 | 12,663 | 6,700 | 3,700 | 4,637 | 2,734 | 2,682 | 2,585 | 2,451 | 3,137 | 2,821 |
| 23 | 8,146 | 1,819 | 12,853 | 7,693 | 3,852 | 4,709 | 3,488 | 3,935 | 2,398 | 2,355 | 2,936 | 3,540 |
| 24 | 5,714 | 1,952 | 11,479 | 10,266 | 4,417 | 4,068 | 3,657 | 3,445 | 2,372 | 2,243 | 3,083 | 3,277 |
| 25 | 3,835 | 2,574 | 8,775 | 7,080 | 6,356 | 3,934 | 2,996 | 3,302 | 2,221 | 2,147 | 2,853 | 2,424 |
| 26 | 3,157 | 2,436 | 7,961 | 7,716 | 7,645 | 5,417 | 2,533 | 2,741 | 2,465 | 2,010 | 2,789 | 2,596 |
| 27 | 2,883 | 2,405 | 7,774 | 10,071 | 9,808 | 6,987 | 2,461 | 2,625 | 2,559 | 1,979 | 2,818 | 2,630 |
| 28 | 2,718 | 2,479 | 8,348 | 10,303 | 17,535 | 5,567 | 2,133 | 2,535 | 2,731 | 6,936 | 2,794 | 2,277 |
| 29 | 2,366 | ..... | 13,178 | 9,555 | 15,684 | 3,573 | 2,292 | 2,226 | 3,002 | 8,336 | 2,576 | 2,294 |
| 30 | 2,474 | ..... | 18,486 | 13,493 | 12,077 | 3,052 | 2,212 | 2,013 | 2,829 | 5,415 | 2,414 | 2,444 |
| 31 | 2,522 | ..... | 15,673 | ..... | 9,847 | ..... | 2,195 | 1,855 | ..... | 5,113 | ..... | 2,322 |

*Estimated monthly discharge of Androscoggin River at Rumford Falls, Me.*

[Drainage area, 2,090 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 8,146 | 1,716 | 2,551 | 1.22 | 1.41 |
| February | 2,574 | 1,644 | 2,053 | 0.98 | 1.02 |
| March | 18,486 | 3,165 | 8,718 | 4.17 | 4.81 |
| April | 14,078 | 4,948 | 7,888 | 3.77 | 4.21 |
| May | 17,535 | 3,215 | 8,440 | 4.04 | 4.66 |
| June | 9,828 | 3,052 | 6,604 | 3.16 | 3.53 |
| July | 4,398 | 1,662 | 2,895 | 1.39 | 1.60 |
| August | 4,618 | 1,855 | 2,973 | 1.42 | 1.64 |
| September | 3,537 | 1,711 | 2,438 | 1.17 | 1.31 |
| October | 8,336 | 1,853 | 2,835 | 1.36 | 1.57 |
| November | 4,552 | 2,414 | 3,031 | 1.45 | 1.62 |
| December | 3,540 | 1,580 | 2,329 | 1.11 | 1.28 |
| The year | 18,486 | 1,580 | 4,396 | 2.10 | 28.66 |

## PRESUMPSCOT RIVER.

This is one of the most interesting as well as one of the best water-power streams of its size in the United States. It is the outlet of Sebago Lake, which lies about 17 miles northwest of Portland. The lake is fed by Crooked River, a stream heading 35 miles farther north and within 3 miles of the Androscoggin. The area of the lake is 50 square miles, the area of its drainage basin at the outlet of the lake 420 square miles, and the total drainage area of the river at its mouth, 600 square miles. The northern part of the basin is mountainous and wooded, while the southern part is moderately hilly and cleared of trees. Granite, gneiss, and mica-schists appear at many points, and the soil is gravelly and sandy.

According to the survey made by Joseph A. Warren, of Cumberland Mills, the fall from the crest of the stone dam at the foot of Sebago Lake to mean low tide at the foot of the lower falls is 265.16 feet in a distance of 21.65 miles, or an average of 12.25 feet a mile. In the lower two-thirds of this distance, or from Gambo Falls to tide water, nearly one-half of the whole fall, or 132 feet, has been improved, and an aggregate probably exceeding 6,000 net horsepower is in use. The remainder of the fall, however, between Gambo Falls and Sebago Lake, amounting to 133 feet, is either unimproved or but slightly utilized. At Great Falls, in this stretch, there is a descent of 22 feet, which has been used in the past but is now idle. It is proposed, however, to employ the power in the generation of electricity for delivery in Portland.

The tributaries of Presumpscot River are not of much importance, but some of them are outlets of ponds and have considerable fall, thus affording constant though small power. Crooked River, the chief feeder of Sebago Lake, has a number of falls, some of which are utilized.

The chief interest attaching to the river is its regularity of flow, which is due to dams at the outlet of the lake. Nowhere in the United States is there a better example of the success of storage of water and regulation of the flow of a stream than on the Presumpscot. Since January, 1887, the flow from Sebago Lake has been regularly recorded, the quantity being deduced 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. Since January, 1872, a continuous record of the level of the lake surface has been kept. An unusually complete and valuable series of data has thus been obtained, which has been furnished to the United States Geological Survey by S. D. Warren & Co. The lake fills rapidly after the first of March, attaining its maximum height between the middle of April and the first of June, 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 the daily discharge of the river at the outlet of the lake, published in Water-Supply Paper No. 69, show the remarkable uniformity of flow, which, as already stated, is due largely to artificial regulation. There is no other river in the United States upon which so small variations occur thoughout the year. On Sundays the gates are closed, so that only the waste is allowed to reach the river.

The following table gives the record for the year 1902:

*Mean daily flow, in second-feet, of Presumpscot River at outlet of Sebago Lake.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 627 | 743 | 667 | 1,733 | 2,080 | 667 | 583 | 667 | 733 | 667 | 775 | 747 |
| 2 | 627 | 133 | 167 | 1,733 | 2,080 | 583 | 583 | 667 | 733 | 667 | 125 | 747 |
| 3 | 627 | 650 | 337 | 1,733 | 2,080 | 583 | 583 | 667 | 733 | 667 | 850 | 747 |
| 4 | 627 | 650 | 673 | 1,733 | 1,920 | 583 | 583 | 667 | 733 | 667 | 850 | 747 |
| 5 | 133 | 650 | 673 | 1,733 | 1,650 | 583 | 583 | 667 | 733 | 133 | 850 | 747 |
| 6 | 720 | 650 | 673 | 1,733 | 1,650 | 583 | 583 | 667 | 733 | 450 | 900 | 747 |
| 7 | 720 | 650 | 673 | 7,000 | 1,650 | 583 | 667 | 667 | 150 | 450 | 900 | 117 |
| 8 | 720 | 650 | 673 | 6,670 | 1,650 | 583 | 667 | 667 | 733 | 450 | 900 | 747 |
| 9 | 720 | 133 | 167 | 6,670 | 1,650 | 583 | 667 | 667 | 733 | 700 | 133 | 747 |
| 10 | 720 | 747 | 687 | 6,670 | 1,650 | 583 | 667 | 667 | 733 | 700 | 763 | 747 |
| 11 | 720 | 747 | 687 | 6,670 | 1,650 | 583 | 667 | 667 | 733 | 700 | 763 | 747 |
| 12 | 133 | 747 | 515 | 6,170 | 1,200 | 583 | 667 | 667 | 733 | 133 | 763 | 747 |
| 13 | 717 | 747 | 687 | 6,170 | 1,200 | 583 | 667 | 667 | 733 | 687 | 763 | 747 |
| 14 | 717 | 747 | 687 | 5,030 | 1,200 | 583 | 667 | 667 | 150 | 687 | 763 | 117 |
| 15 | 717 | 747 | 687 | 5,030 | 1,200 | 583 | 667 | 667 | 733 | 687 | 763 | 575 |
| 16 | 717 | 150 | 687 | 5,030 | 1,200 | 583 | 667 | 677 | 733 | 687 | 117 | 575 |
| 17 | 717 | 740 | 680 | 3,680 | 1,200 | 583 | 667 | 667 | 733 | 687 | 757 | 575 |
| 18 | 717 | 740 | 680 | 4,370 | 1,200 | 583 | 667 | 747 | 733 | 687 | 757 | 575 |
| 19 | 133 | 667 | 680 | 4,370 | 667 | 583 | 667 | 747 | 733 | 133 | 757 | 575 |
| 20 | 367 | 667 | 680 | 4,370 | 667 | 583 | 667 | 747 | 733 | 773 | 757 | 575 |
| 21 | 367 | 667 | 680 | 4,100 | 667 | 583 | 667 | 747 | 150 | 773 | 757 | 117 |
| 22 | 367 | 667 | 680 | 4,100 | 667 | 583 | 667 | 747 | 658 | 773 | 757 | 575 |
| 23 | 733 | 150 | 200 | 4,100 | 667 | 583 | 667 | 747 | 658 | 773 | 125 | 575 |
| 24 | 733 | 333 | 967 | 4,100 | 667 | 583 | 667 | 747 | 658 | 773 | 747 | 575 |
| 25 | 733 | 333 | 967 | 4,100 | 667 | 583 | 667 | 733 | 658 | 773 | 747 | 575 |
| 26 | 133 | 667 | 667 | 4,100 | 667 | 583 | 667 | 733 | 658 | 125 | 747 | 575 |
| 27 | 743 | 667 | 967 | 4,100 | 667 | 583 | 667 | 733 | 658 | 817 | 747 | 575 |
| 28 | 743 | 667 | 967 | 3,330 | 667 | 583 | 667 | 733 | 150 | 583 | 747 | 117 |
| 29 | 743 | ..... | 967 | 3,330 | 667 | 583 | 667 | 733 | 667 | 583 | 747 | 575 |
| 30 | 743 | ..... | 400 | 2,500 | 667 | 583 | 667 | 733 | 667 | 583 | 117 | 575 |
| 31 | 743 | ..... | 967 | ..... | 667 | ..... | 667 | 150 | ..... | 583 | ..... | 575 |

*Estimated monthly discharge of Presumpscot River at outlet of Sebago Lake, Maine.*

[Drainage area, 420 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 743 | 133 | 602 | 1.43 | 1.65 |
| February | 747 | 133 | 589 | 1.40 | 1.46 |
| March | 967 | 167 | 671 | 1.60 | 1.84 |
| April | 7,000 | 1,733 | 4,205 | 10.01 | 11.17 |
| May | 2,080 | 667 | 1,186 | 2.82 | 3.25 |
| June | 667 | 583 | 586 | 1.40 | 1.56 |
| July | 667 | 583 | 651 | 1.55 | 1.79 |
| August | 747 | 150 | 681 | 1.62 | 1.87 |
| September | 733 | 150 | 636 | 1.51 | 1.68 |
| October | 817 | 125 | 598 | 1.42 | 1.64 |
| November | 900 | 117 | 675 | 1.61 | 1.80 |
| December | 747 | 117 | 582 | 1.39 | 1.60 |
| The year | 7,000 | 117 | 972 | 2.31 | 31.31 |

NOTE.—Minima usually occurred on Sunday.

## CONNECTICUT RIVER DRAINAGE BASIN.

### CONNECTICUT RIVER AT ORFORD, N. H.

This river has its source in Connecticut Lake, in the extreme northern portion of New Hampshire. A gaging and observation station was established August 6, 1900, by E. G. Paul, on the covered highway bridge over the river between Orford, N. H., and Fairlee, Vt., about 75 miles from the source of the stream. The gage for making observations of the variations in the height of water in the river consists of a scaleboard 20 feet long, graduated to feet and tenths, fastened horizontally to the inside timbers on the upper side of the bridge, 125 feet from the left-bank abutment, and a steel sash chain running over a side pulley with a 5-pound weight, the length of the chain from the extreme end of the weight to the copper rivet marker being 42.95 feet.

The observer is Frank H. Gardner, of Orford, N. H.

The following discharge measurements were made during 1902 by Charles A. Holden:

April 10: Gage height, 11.63 feet; discharge, 10,719 second-feet.
November 22: Gage height, 6.80 feet; discharge, 4,474 second-feet.

*Daily gage height, in feet, of Connecticut River at Orford, N. H.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | (a) | 5.90 | 12.50 | 18.30 | 15.10 | 15.20 | 8.30 | 4.60 | 4.50 | 5.40 | 11.20 | 5.80 |
| 2 | | | 20.30 | 17.65 | 14.90 | 12.10 | 8.10 | 7.30 | 4.40 | 5.20 | 9.80 | 5.80 |
| 3 | | | 27.50 | 15.80 | 15.00 | 10.70 | 8.50 | 8.70 | 4.50 | 5.10 | 8.80 | 5.90 |
| 4 | | | 25.45 | 13.80 | 14.10 | 12.20 | 8.90 | 9.40 | 4.50 | 4.80 | 8.20 | 5.90 |
| 5 | 8.90 | 5.70 | 23.75 | 12.00 | 14.00 | 12.60 | 8.00 | 8.40 | 4.70 | 5.00 | 7.90 | 6.10 |
| 6 | | | 21.15 | 11.70 | 10.80 | 11.90 | 7.70 | 7.40 | 4.70 | 5.00 | 7.40 | 6.60 |
| 7 | | | 17.70 | 11.20 | 10.70 | 11.70 | 7.10 | 7.20 | 4.50 | 5.00 | 7.20 | 6.70 |
| 8 | | | 16.10 | 10.90 | 10.05 | 11.50 | 7.00 | 7.10 | 4.90 | 5.00 | 7.00 | 6.70 |
| 9 | | | 16.00 | 10.70 | 9.30 | 11.00 | 6.80 | 7.00 | 5.40 | 5.10 | 6.70 | (b) |
| 10 | | 5.80 | 16.00 | 11.30 | 9.10 | 12.70 | 6.80 | 7.20 | 6.30 | 5.50 | 6.40 | |
| 11 | 7.00 | | 16.30 | 12.80 | 9.10 | 12.10 | 6.60 | 7.00 | 7.10 | 5.60 | 6.20 | |
| 12 | | | 16.40 | 13.00 | 8.50 | 11.30 | 6.00 | 8.10 | 7.70 | 5.80 | 6.00 | |
| 13 | | | 16.90 | 13.70 | 8.10 | 10.50 | 5.70 | 10.00 | 7.60 | 5.60 | 6.20 | 6.60 |
| 14 | | | 16.40 | 13.00 | 7.40 | 9.60 | 5.60 | 8.60 | 7.40 | 5.50 | 7.40 | 6.70 |
| 15 | | | 16.10 | 12.80 | 7.70 | 9.40 | 5.40 | 7.20 | 7.00 | 5.40 | 8.40 | 7.10 |
| 16 | | | 16.00 | 12.00 | 7.90 | 9.20 | 6.00 | 7.00 | 6.70 | 5.30 | 8.50 | (b) |
| 17 | | 5.40 | 16.00 | 10.20 | 7.60 | 12.00 | 6.30 | 6.70 | 6.60 | 5.30 | 8.50 | |
| 18 | 6.40 | | 16.10 | 10.40 | 7.30 | 13.90 | 6.30 | 6.20 | 6.50 | 5.20 | 8.00 | |
| 19 | | | 16.00 | 10.70 | 7.00 | 14.30 | 6.40 | 5.60 | 5.20 | 5.20 | 7.70 | 7.10 |
| 20 | | | 16.20 | 10.70 | 7.10 | 11.40 | 6.40 | 5.20 | 5.00 | 5.30 | 7.10 | 8.00 |
| 21 | | | 16.20 | 10.90 | 7.00 | 9.00 | 6.50 | 4.90 | 6.80 | 5.80 | 7.00 | 7.40 |
| 22 | | 5.10 | 16.30 | 12.15 | 7.20 | 8.80 | 6.90 | 4.80 | 7.60 | 7.90 | 6.80 | (b) |
| 23 | | | 16.30 | 12.50 | 7.10 | 8.40 | 7.30 | 5.60 | 7.00 | 7.40 | 6.70 | |
| 24 | | | 16.00 | 12.60 | 7.90 | 7.90 | 7.10 | 6.70 | 6.60 | 7.00 | 6.80 | |
| 25 | 6.00 | | 15.90 | 12.80 | 8.45 | 7.50 | 7.00 | 7.00 | 5.50 | 6.60 | 6.80 | 7.00 |
| 26 | | 10.40 | 15.10 | 13.40 | 9.90 | 7.30 | 6.80 | 7.90 | 5.60 | 6.00 | 6.60 | (b) |
| 27 | | 8.00 | 14.00 | 14.80 | 12.35 | 9.00 | 6.40 | 7.60 | 5.70 | 5.60 | 6.40 | |
| 28 | | 5.40 | 12.20 | 14.90 | 21.30 | 10.10 | 5.90 | 5.30 | 5.60 | 8.40 | 6.30 | |
| 29 | | | 11.00 | 15.00 | 22.40 | 10.00 | 5.60 | 4.80 | 5.60 | 16.60 | 6.20 | 7.10 |
| 30 | | | 13.80 | 14.90 | 20.00 | 9.50 | 5.30 | 4.70 | 5.50 | 14.00 | 6.00 | 7.60 |
| 31 | | | 17.60 | | 17.00 | | 5.00 | 4.70 | | 12.40 | | 7.70 |

(a) Weekly readings January 1 to February 25 through ice.
(b) Frozen December 9 to 12, 16 to 18, 22 to 24, and 26 to 28.

*Estimated monthly discharge of Connecticut River at Orford, N. H.*

[Drainage area, 3,050 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | [a]6,660 | [a]3,500 | [a]4,637 | [a]1.52 | [a]1.75 |
| February | [a]8,474 | [a]2,686 | [a]3,389 | [a]1.11 | [a]1.16 |
| March | 29,165 | 9,200 | 16,314 | 5.35 | 6.17 |
| April | 18,033 | 8,232 | 11,483 | 3.76 | 4.19 |
| May | 22,994 | 4,500 | 9,248 | 3.03 | 3.49 |
| June | 14,282 | 4,820 | 8,917 | 2.92 | 3.26 |
| July | 6,660 | 2,600 | 4,235 | 1.39 | 1.60 |
| August | 7,990 | 2,268 | 4,361 | 1.43 | 1.65 |
| September | 5,260 | 2,108 | 3,453 | 1.13 | 1.26 |
| October | 15,976 | 2,432 | 4,234 | 1.39 | 1.60 |
| November | 9,442 | 3,500 | 4,917 | 1.61 | 1.80 |
| December | 5,600 | 3,312 | 4,360 | 1.43 | 1.65 |
| The year | 29,165 | 2,108 | 6,629 | 2.17 | 29.58 |

[a] Weekly readings through ice from January 1 to February 25.

## CONNECTICUT RIVER AT HARTFORD, CONN.

Daily readings of the height of water at Hartford have been recorded since February 8, 1896, by Edwin Dwight Graves, chief engineer Connecticut River bridge and highway district, and through his courtesy have been furnished to this Bureau.

These heights are read on what is known as the "Tollhouse gage," the zero of which is set at the low-water mark of 1801.[a] The highest water ever known in the river was in May, 1854—29 feet 10 inches; the lowest, in 1858—1½ inches below zero.

This datum was used in the various surveys of the river below Hartford in 1866–67 (see previous reference); also the survey above Hartford in 1871–1878;[b] also survey of 1897.[c] It is now being used in a further survey of the river above Hartford by an engineer commission appointed by the Secretary of War to study the problem of river improvements above Hartford.

During the low-water periods the tidal wave comes up the river to Hartford. The visible effect of this wave is dependent upon the height of the water and the direction and course of the wind.

[a] See report Theodore G. Ellis, 1867, Ex. Doc. H. R. No. 153, 40th Cong., 2d sess.
[b] Engineer's Report, 1878, pp. 348–391.
[c] Engineer's Report, 1898, pp. 976–988.

From figures given in the Report of the Chief of Engineers for 1878, pages 348–391, and from other data, computations of the discharge of the Connecticut River at Hartford from 1871 to 1886, inclusive, were prepared and published in Part II of the Fourteenth Annual Report of the United States Geological Survey, pages 140–146.

*Daily gage height, in feet, of Connecticut River at Hartford, Conn.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 12.6 | 11.6 | 15.6 | 16.7 | 13.4 | 11.6 | 5.6 | 4.2 | 3.0 | 7.0 | 12.0 | 3.9 |
| 2 | 10.3 | 10.7 | 18.9 | 13.0 | 14.5 | 10.3 | 5.4 | 3.9 | 2.4 | 7.0 | 10.2 | 4.0 |
| 3 | 8.8 | 11.3 | 22.6 | 15.0 | 13.8 | 8.8 | 5.2 | 3.4 | 2.2 | 6.4 | 8.7 | 4.3 |
| 4 | 7.4 | 10.9 | 25.5 | 13.3 | 12.5 | 7.5 | 4.8 | 3.4 | 3.0 | 5.2 | 7.6 | 4.4 |
| 5 | 8.8 | 10.5 | 25.2 | 12.4 | 11.5 | 6.8 | 6.5 | 3.8 | 2.0 | 4.4 | 6.8 | 4.9 |
| 6 | 9.6 | 9.5 | 21.7 | 10.8 | 10.6 | 6.5 | 6.5 | 4.7 | 2.0 | 4.7 | 6.2 | 4.4 |
| 7 | 9.7 | 8.6 | 17.3 | 9.8 | 10.0 | 6.5 | 5.9 | 4.7 | 1.8 | 4.8 | 5.8 | 3.6 |
| 8 | 9.5 | 7.8 | 13.8 | 9.3 | 9.2 | 6.5 | 5.4 | 4.5 | 2.3 | 4.3 | 5.5 | 3.8 |
| 9 | 9.4 | 6.6 | 11.9 | 10.6 | 8.5 | 6.3 | 4.6 | 4.0 | 2.5 | 4.3 | 5.4 | 4.2 |
| 10 | 9.0 | 6.4 | 12.3 | 15.7 | 7.8 | 6.0 | 4.2 | 3.5 | 2.9 | 4.1 | 5.2 | 4.8 |
| 11 | 8.3 | 6.2 | 11.3 | 17.5 | 7.3 | 6.0 | 3.5 | 4.5 | 3.5 | 4.0 | 5.0 | 4.5 |
| 12 | 7.9 | 5.9 | 10.8 | 17.0 | 6.9 | 6.4 | 3.5 | 7.0 | 3.8 | 4.8 | 5.1 | 4.8 |
| 13 | 7.2 | 5.7 | 12.1 | 15.4 | 6.5 | 6.4 | 3.4 | 7.4 | 4.3 | 5.8 | 4.8 | 5.2 |
| 14 | 6.5 | 5.5 | 16.7 | 13.6 | 6.0 | 6.0 | 3.4 | 6.9 | 3.4 | 5.8 | 5.0 | 5.2 |
| 15 | 6.6 | 5.1 | 18.7 | 12.2 | 5.6 | 5.5 | 3.4 | 6.2 | 3.4 | 5.1 | 4.8 | 5.6 |
| 16 | 6.3 | 4.6 | 17.9 | 11.0 | 5.2 | 5.1 | 3.2 | 5.2 | 4.0 | 4.5 | 4.7 | 6.1 |
| 17 | 6.0 | 4.6 | 17.1 | 10.0 | 4.8 | 5.4 | 3.0 | 4.8 | 3.6 | 3.8 | 5.0 | 8.6 |
| 18 | 5.8 | 4.4 | 19.4 | 9.3 | 4.6 | 6.1 | 2.8 | 4.0 | 3.4 | 4.0 | 5.2 | 12.6 |
| 19 | 5.3 | 4.6 | 20.0 | 8.6 | 4.5 | 7.5 | 3.0 | 3.5 | 3.2 | 3.6 | 5.1 | 13.9 |
| 20 | 5.0 | 4.0 | 18.0 | 8.2 | 4.5 | 7.4 | 3.0 | 3.4 | 3.2 | 3.6 | 5.0 | 13.6 |
| 21 | 5.1 | 4.7 | 15.4 | 8.0 | 4.3 | 6.9 | 4.5 | 3.2 | 3.8 | 4.0 | 4.9 | 12.4 |
| 22 | 6.3 | 5.0 | 14.0 | 8.0 | 4.2 | 6.0 | 8.0 | 3.0 | 4.4 | 4.1 | 4.7 | 13.2 |
| 23 | 11.8 | 4.6 | 14.0 | 8.0 | 3.9 | 5.3 | 7.6 | 2.8 | 4.1 | 4.6 | 4.2 | 14.8 |
| 24 | 13.7 | 4.7 | 15.0 | 8.0 | 3.7 | 5.7 | 7.3 | 2.9 | 3.8 | 4.5 | 4.3 | 14.7 |
| 25 | 13.4 | 5.0 | 15.0 | 8.7 | 3.5 | 5.0 | 6.5 | 3.0 | 3.6 | 4.6 | 4.4 | 12.8 |
| 26 | 12.0 | 5.1 | 14.0 | 8.4 | 4.0 | 5.0 | 6.5 | 3.4 | 3.7 | 4.3 | 5.4 | 10.9 |
| 27 | 11.1 | 6.9 | 12.7 | 8.2 | 5.1 | 4.4 | 5.9 | 3.4 | 4.0 | 4.5 | 5.0 | 9.7 |
| 28 | 10.4 | 9.0 | 11.6 | 9.8 | 6.5 | 4.4 | 5.3 | 3.5 | 4.4 | 6.0 | 4.4 | 8.5 |
| 29 | 12.2 | ..... | 11.4 | 11.0 | 9.9 | 4.5 | 5.0 | 3.5 | 5.3 | 11.0 | 4.0 | 7.5 |
| 30 | 13.0 | ..... | 13.9 | 10.9 | 12.2 | 5.3 | 4.8 | 3.4 | 6.5 | 14.9 | 3.7 | 7.2 |
| 31 | 12.4 | ..... | 16.2 | ..... | 12.5 | ..... | 4.6 | 3.0 | ..... | 14.0 | ..... | 6.8 |

## MERRIMAC RIVER DRAINAGE BASIN.

### MERRIMAC RIVER AT LAWRENCE, MASS.

Records of flow of this river at Lawrence have been kept for more than fifty years, but have never been published in full. Figures for the monthly maximum and minimum discharge from 1890 to 1897 were published in the Nineteenth Annual Report, Part IV; the daily discharge for 1897, 1898, and 1899 in Water-Supply Paper No. 35; the daily discharge for 1900 in Water-Supply Paper No. 47. These figures are furnished by R. A. Hale, principal assistant engineer of the Essex Water Power Company.

For a portion of the year water from the Sudbury and Nashua drainage basins is wasted into the Merrimac. During the dry months a very small amount is received, therefore the drainage area is a somewhat variable quantity. The following tables give the flow of the Merrimac at Lawrence, also the quantity wasted from the Sudbury and Nashua drainage basins, which reaches the Merrimac. The latter table is based on data furnished by the Metropolitan Water and Sewerage Board of Boston. The drainage areas are as follows:

*Drainage areas in Merrimac Basin.*

| | Square miles. |
|---|---|
| Total Merrimac River drainage basin above Lawrence | 4,664 |
| Nashua River drainage basin above gaging station | 119 |
| Sudbury drainage basin, Framingham, Dam No. 1 | 75 |
| Cochituate drainage basin | 19 |
| Total Nashua, Sudbury, and Cochituate drainage basins | 213 |
| Net drainage basin of Merrimac, excluding Nashua, Sudbury, and Cochituate basins | 4,451 |

The quantity as measured at Lawrence includes the water from Sudbury, Nashua, and Cochituate, 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 of the Merrimac and the net flow of the Merrimac, or by getting the total yield of both the Sudbury and Nashua with the Merrimac and using the total area.

*Estimated monthly discharge of Nashua, Sudbury, and Lake Cochituate drainage basins.*

| Month. | Nashua River. | | Sudbury River. | | Lake Cochituate. | |
|---|---|---|---|---|---|---|
| | Average yield. | Average waste. | Average yield. | Average waste. | Average yield. | Average waste. |
| 1901. | *Second-feet.* | *Second-feet.* | *Second-feet.* | *Second-feet.* | *Second-feet.* | *Second-feet.* |
| January | 95.5 | 6.9 | 50.8 | 23.9 | 15.8 | 0.0 |
| February | 65.6 | 6.5 | 34.9 | 12.7 | 11.9 | 0.0 |
| March | 500.5 | 255.5 | 320.5 | 67.2 | 72.6 | 0.0 |
| April | 917.8 | 853.7 | 489.1 | 353.4 | 87.7 | 31.5 |
| May | 502.4 | 414.6 | 343.7 | 290.0 | 69.9 | 60.4 |
| June | 181.4 | 78.1 | 87.6 | 59.4 | 19.2 | 9.8 |
| July | 87.8 | 11.2 | 35.6 | 5.3 | 14.9 | 0.0 |
| August | 94.2 | 9.9 | 49.3 | 36.4 | 20.8 | 0.0 |
| September | 58.9 | 7.6 | 35.5 | 31.6 | 19.1 | 0.0 |
| October | 119.1 | 31.3 | 47.9 | 34.3 | 20.4 | 0.0 |
| November | 95.1 | 7.9 | 55.2 | 58.7 | 19.5 | 0.0 |
| December | 595.3 | 425.8 | 313.6 | 148.9 | 69.4 | 7.5 |

*Estimated monthly discharge of Nashua, Sudbury, and Lake Cochituate drainage basins*—Continued.

| Month. | Nashua River. | | Sudbury River. | | Lake Cochituate. | |
|---|---|---|---|---|---|---|
| | Average yield. | Average waste. | Average yield. | Average waste. | Average yield. | Average waste. |
| 1902. | *Second-feet.* | *Second-feet.* | *Second-feet.* | *Second-feet.* | *Second-feet.* | *Second-feet.* |
| January | 317.6 | 136.3 | 205.1 | 203.0 | 39.1 | 19.6 |
| February | 249.5 | 113.5 | 194.8 | 169.2 | 36.5 | 12.5 |
| March | 739.3 | 691.5 | 488.6 | 342.5 | 113.6 | 90.0 |
| April | 397.1 | 265.7 | 219.3 | 180.2 | 51.7 | 26.1 |
| May | 200.4 | 58.0 | 86.4 | 57.3 | 18.0 | 11.6 |
| June | 91.5 | 5.8 | 35.3 | 2.5 | 6.0 | 0.0 |
| July | 60.4 | 5.4 | 7.6 | 2.2 | 7.5 | 0.0 |
| August | 58.0 | 3.9 | 15.7 | 2.2 | 11.4 | 0.0 |
| September | 48.0 | 4.1 | 20.8 | 2.3 | 13.0 | 0.0 |
| October | 155.8 | 38.0 | 58.8 | 2.3 | 15.4 | 0.0 |
| November | 124.0 | 9.2 | 51.7 | 20.4 | 13.4 | 0.0 |
| December | 320.8 | 199.7 | 207.0 | 103.9 | 38.7 | 0.0 |

*Mean daily discharge, in second-feet, of Merrimac River at Lawrence, Mass.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | 4,628 | 2,888 | 2,360 | 14,080 | 16,296 | 19,479 | 4,048 | 4,869 | 2,010 | 2,929 | 3,150 | 2,435 |
| 2 | 4,574 | 2,191 | 1,792 | 12,510 | 15,547 | 16,315 | 2,881 | 4,577 | 2,481 | 2,508 | 2,186 | 4,630 |
| 3 | 4,284 | 1,630 | 745 | 12,580 | 15,222 | 15,139 | 2,694 | 3,212 | 4,093 | 2,703 | 2,070 | 3,294 |
| 4 | 3,850 | 3,919 | 3,189 | 18,100 | 14,601 | 13,616 | 603 | 2,424 | 3,507 | 3,012 | 4,259 | 3,287 |
| 5 | 3,343 | 3,007 | 2,851 | 31,650 | 12,554 | 12,666 | 2,633 | 4,404 | 2,926 | 1,635 | 3,168 | 2,882 |
| 6 | 2,192 | 2,957 | 2,991 | 34,200 | 11,766 | 11,270 | 2,586 | 3,016 | 2,916 | 1,087 | 3,119 | 2,754 |
| 7 | 4,462 | 2,526 | 2,906 | 33,950 | 10,749 | 9,972 | 2,403 | 2,951 | 1,831 | 3,626 | 2,931 | 2,065 |
| 8 | 3,210 | 2,531 | 2,897 | 61,200 | 9,831 | 9,470 | 3,905 | 4,722 | 1,467 | 2,818 | 3,048 | 1,333 |
| 9 | 2,872 | 1,916 | 2,116 | 62,511 | 8,815 | 9,653 | 3,260 | 11,252 | 4,086 | 2,682 | 1,936 | 4,103 |
| 10 | 3,284 | 640 | 1,851 | 48,756 | 9,053 | 10,520 | 3,083 | 8,627 | 2,879 | 2,686 | 1,460 | 3,628 |
| 11 | 3,796 | 3,356 | 4,591 | 38,023 | 10,048 | 9,175 | 3,522 | 6,705 | 2,951 | 2,557 | 3,952 | 4,187 |
| 12 | 2,595 | 2,726 | 12,620 | 31,463 | 13,099 | 7,948 | 3,913 | 6,982 | 2,355 | 1,731 | 2,878 | 5,111 |
| 13 | 2,259 | 2,510 | 14,060 | 26,155 | 15,886 | 7,024 | 2,416 | 5,592 | 2,519 | 607 | 2,618 | 6,865 |
| 14 | 4,480 | 2,667 | 11,920 | 22,319 | 14,640 | 6,571 | 2,405 | 4,790 | 1,599 | 3,595 | 2,827 | 6,447 |
| 15 | 3,402 | 2,516 | 9,600 | 20,832 | 13,081 | 5,519 | 4,315 | 4,358 | 1,749 | 6,149 | 3,697 | 9,440 |
| 16 | 3,359 | 1,846 | 7,870 | 19,528 | 11,072 | 4,746 | 3,080 | 3,941 | 3,764 | 13,374 | 2,615 | 34,100 |
| 17 | 3,626 | 889 | 5,660 | 17,686 | 9,684 | 5,777 | 2,907 | 2,928 | 3,133 | 11,552 | 2,361 | 41,500 |
| 18 | 3,757 | 3,312 | 7,690 | 16,317 | 8,362 | 4,808 | 2,832 | 3,965 | 3,182 | 8,434 | 4,972 | 24,200 |
| 19 | 2,712 | 2,850 | 6,110 | 15,627 | 9,095 | 4,220 | 2,959 | 4,864 | 1,450 | 6,509 | 3,127 | 15,690 |
| 20 | 2,348 | 2,785 | 5,980 | 15,010 | 19,104 | 3,916 | 2,292 | 3,619 | 4,232 | 5,038 | 3,138 | 12,580 |
| 21 | 4,641 | 2,712 | 5,770 | 13,764 | 28,185 | 4,186 | 2,455 | 3,396 | 2,602 | 5,785 | 3,274 | 10,390 |
| 22 | 3,408 | 2,803 | 12,390 | 16,027 | 27,308 | 3,286 | 4,055 | 3,078 | 1,790 | 4,575 | 3,478 | 7,100 |
| 23 | 3,462 | 1,929 | 15,210 | 21,961 | 21,863 | 3,520 | 3,185 | 3,017 | 4,004 | 4,421 | 2,164 | 7,370 |
| 24 | 3,388 | 560 | 13,420 | 26,279 | 18,063 | 4,987 | 2,754 | 1,968 | 2,963 | 3,908 | 1,661 | 6,370 |
| 25 | 3,363 | 3,272 | 14,110 | 28,294 | 16,986 | 4,382 | 2,802 | 3,185 | 2,615 | 4,239 | 4,785 | 6,750 |
| 26 | 2,415 | 2,857 | 13,650 | 31,770 | 17,300 | 4,119 | 2,753 | 5,422 | 2,525 | 2,805 | 3,996 | 9,220 |
| 27 | 2,265 | 2,476 | 20,800 | 29,915 | 17,588 | 4,238 | 1,779 | 5,132 | 2,641 | 2,659 | 3,893 | 7,760 |
| 28 | 4,303 | 2,394 | 26,350 | 23,868 | 18,588 | 4,013 | 629 | 4,721 | 1,759 | 4,527 | 1,461 | 7,722 |
| 29 | 3,392 | ..... | 26,300 | 19,629 | 23,391 | 2,850 | 3,755 | 4,223 | 300 | 3,525 | 4,511 | 7,568 |
| 30 | 3,075 | ..... | 21,600 | 16,732 | 23,766 | 2,239 | 3,193 | 3,659 | 3,367 | 3,200 | 2,765 | 15,858 |
| 31 | 3,070 | ..... | 15,400 | ..... | 22,417 | ..... | 3,522 | 2,308 | ..... | 3,054 | ..... | 25,800 |

*Mean daily discharge, in second-feet, of Merrimac River at Lawrence, Mass.*—Cont'd.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 26,500 | 7,638 | 22,629 | 28,212 | 19,442 | 7,914 | 4,069 | 3,755 | 2,147 | 9,696 | 12,377 | 5,362 |
| 2 | 22,250 | 7,471 | 51,985 | 24,483 | 25,470 | 7,499 | 4,422 | 2,057 | 4,144 | 9,021 | 9,338 | 4,873 |
| 3 | 16,650 | 9,057 | 59,880 | 20,272 | 20,161 | 6,408 | 3,974 | 2,052 | 2,961 | 7,985 | 9,053 | 4,569 |
| 4 | 13,090 | 8,605 | 61,185 | 17,209 | 15,792 | 5,978 | 4,465 | 4,125 | 2,838 | 6,477 | 7,943 | 5,455 |
| 5 | 11,189 | 8,313 | 44,377 | 14,803 | 14,881 | 5,764 | 7,016 | 3,170 | 2,603 | 5,296 | 7,179 | 6,115 |
| 6 | 9,652 | 7,315 | 28,452 | 12,842 | 14,091 | 5,476 | 6,569 | 2,842 | 1,468 | 6,640 | 6,538 | 4,782 |
| 7 | 7,856 | 6,398 | 21,990 | 12,015 | 13,870 | 4,376 | 5,650 | 2,889 | 512 | 7,766 | 6,421 | 3,481 |
| 8 | 8,130 | 5,124 | 19,471 | 11,374 | 12,816 | 3,828 | 4,937 | 2,957 | 2,997 | 8,643 | 5,486 | 5,395 |
| 9 | 7,623 | 4,947 | 17,656 | 15,265 | 12,424 | 5,249 | 4,532 | 2,235 | 2,785 | 7,849 | 5,200 | 4,239 |
| 10 | 6,985 | 5,981 | 18,624 | 32,204 | 10,881 | 4,697 | 3,841 | 2,226 | 2,780 | 6,242 | 6,443 | 4,422 |
| 11 | 6,130 | 5,287 | 18,834 | 39,195 | 9,104 | 5,179 | 3,973 | 4,540 | 2,988 | 4,884 | 5,195 | 4,155 |
| 12 | 5,737 | 5,098 | 18,973 | 35,563 | 9,162 | 4,663 | 2,618 | 5,371 | 4,967 | 4,327 | 5,161 | 4,168 |
| 13 | 6,856 | 4,862 | 23,909 | 27,127 | 7,858 | 3,856 | 2,881 | 8,544 | 3,655 | 6,258 | 5,203 | 3,409 |
| 14 | 5,387 | 4,635 | 33,547 | 22,988 | 7,690 | 3,732 | 4,503 | 7,500 | 3,260 | 6,370 | 5,295 | 3,542 |
| 15 | 5,247 | 3,502 | 34,170 | 19,045 | 6,799 | 3,373 | 3,146 | 6,082 | 5,178 | 5,899 | 5,385 | 5,354 |
| 16 | 5,646 | 3,591 | 28,373 | 16,452 | 6,486 | 5,009 | 3,026 | 4,351 | 4,914 | 5,477 | 5,114 | 4,234 |
| 17 | 5,701 | 4,987 | 26,745 | 14,485 | 5,591 | 4,297 | 3,493 | 3,362 | 4,760 | 5,061 | 6,106 | 4,811 |
| 18 | 5,069 | 4,180 | 34,954 | 13,602 | 4,814 | 6,974 | 3,654 | 4,806 | 4,206 | 4,006 | 5,251 | 8,820 |
| 19 | 4,924 | 4,009 | 34,583 | 12,194 | 6,008 | 7,067 | 2,490 | 3,266 | 3,236 | 3,502 | 5,185 | 12,509 |
| 20 | 5,821 | 4,194 | 26,041 | 11,090 | 5,260 | 5,850 | 2,595 | 3,123 | 2,624 | 5,263 | 4,976 | 11,628 |
| 21 | 5,217 | 4,120 | 22,375 | 11,580 | 5,444 | 4,434 | 4,732 | 3,066 | 2,804 | 5,286 | 4,787 | 9,860 |
| 22 | 6,735 | 2,995 | 22,754 | 10,922 | 5,405 | 4,118 | 4,475 | 3,247 | 5,081 | 6,358 | 4,342 | 11,812 |
| 23 | 15,405 | 3,075 | 23,191 | 10,713 | 5,139 | 5,644 | 5,511 | 2,638 | 3,849 | 5,831 | 3,857 | 17,858 |
| 24 | 21,308 | 4,835 | 23,697 | 10,737 | 4,224 | 5,487 | 5,976 | 4,052 | 4,021 | 5,178 | 5,234 | 19,966 |
| 25 | 18,738 | 3,801 | 21,764 | 10,966 | 4,238 | 5,077 | 6,120 | 5,653 | 3,867 | 4,203 | 4,491 | 16,553 |
| 26 | 14,659 | 4,113 | 19,186 | 10,138 | 6,239 | 4,363 | 4,977 | 4,534 | 3,511 | 3,510 | 4,431 | 14,345 |
| 27 | 13,144 | 6,870 | 17,877 | 11,369 | 7,018 | 4,674 | 4,021 | 3,944 | 2,179 | 5,320 | 2,935 | 11,940 |
| 28 | 12,472 | 12,369 | 16,966 | 16,672 | 10,379 | 6,680 | 5,015 | 3,631 | 2,106 | 5,087 | 5,614 | 10,307 |
| 29 | 11,416 | ..... | 15,766 | 15,144 | 13,962 | 5,347 | 3,955 | 2,906 | 4,961 | 15,154 | 4,065 | 9,968 |
| 30 | 9,689 | ..... | 22,711 | 13,106 | 14,080 | 5,762 | 3,887 | 2,183 | 6,161 | 22,253 | 3,831 | 8,707 |
| 31 | 8,851 | ..... | 31,751 | ..... | 10,466 | ..... | 3,627 | 1,551 | ..... | 17,176 | ..... | 9,063 |

## 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 northerly, entering Merrimac River immediately below the city of Lowell. Storage reservoirs have been constructed by the city of Boston, 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 Water Works.

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 Board, and records of rainfall in the Sudbury Basin have been kept since 1875, and in the Cochit-

uate Basin since 1852, but the latter are considered of doubtful accuracy previous to 1872. The records of run-off from 1875 to 1898, inclusive, for Sudbury River, were published in the Twentieth Annual Report, Part IV, and those for Lake Cochituate from 1863 to 1899, inclusive, in Water-Supply and Irrigation Paper No. 35.

The following tables, furnished by Frederic P. Stearns, give the results for 1902, also the averages for twenty-eight years.
which records have been taken:

*Estimated monthly discharge of Sudbury River at Framingham, Mass.*

[Drainage area, 75.2 square miles.]

| Month. | Run-off. | | Rainfall. |
|---|---|---|---|
| | Second-feet per square mile. | Depth in inches. | |
| 1902. | | | *Inches.* |
| January | 2.728 | 3.145 | 2.52 |
| February | 2.590 | 2.697 | 6.18 |
| March | 6.497 | 7.491 | 5.34 |
| April | 2.916 | 3.254 | 4.13 |
| May | 1.149 | 1.325 | 1.86 |
| June | .469 | .523 | 2.89 |
| July | .101 | .117 | 2.94 |
| August | .208 | .240 | 3.40 |
| September | .276 | .308 | 4.54 |
| October | .782 | .902 | 4.44 |
| November | .688 | .767 | 1.45 |
| December | 2.753 | 3.173 | 6.38 |
| The year | 1.764 | 23.942 | 46.07 |
| *Average for 28 years, 1875 to 1902, inclusive.* | | | |
| January | 1.894 | 2.184 | 4.20 |
| February | 2.911 | 3.055 | 4.40 |
| March | 4.594 | 5.296 | 4.59 |
| April | 3.201 | 3.571 | 3.44 |
| May | 1.776 | 2.048 | 3.45 |
| June | .732 | .817 | 2.88 |
| July | .292 | .337 | 3.76 |
| August | .456 | .526 | 4.08 |
| September | .366 | .408 | 3.29 |
| October | .801 | .924 | 4.30 |
| November | 1.404 | 1.566 | 4.12 |
| December | 1.748 | 2.015 | 3.87 |
| The year | 1.675 | 22.747 | 46.38 |

*Estimated monthly discharge of Lake Cochituate at Cochituate, Mass.*

[Drainage area, 18.87 square miles.]

| Month. | Run-off. | | Rainfall. |
|---|---|---|---|
| | Second-feet per square mile. | Depth in inches. | |
| 1902. | | | *Inches.* |
| January | 2.071 | 2.388 | 2.11 |
| February | 1.934 | 2.014 | 6.67 |
| March | 6.022 | 6.942 | 5.04 |
| April | 2.741 | 3.058 | 3.66 |
| May | .955 | 1.101 | 1.24 |
| June | .319 | .356 | 2.42 |
| July | .398 | .459 | 3.53 |
| August | .604 | .697 | 3.39 |
| September | .688 | .767 | 4.91 |
| October | .814 | .938 | 4.05 |
| November | .710 | .792 | 1.37 |
| December | 2.052 | 2.366 | 6.22 |
| The year | 1.612 | 21.878 | 44.61 |
| *Average for 40 years, 1863–1902.* | | | |
| January | 1.749 | 2.017 | 3.93 |
| February | 2.510 | 2.636 | 4.06 |
| March | 3.418 | 3.942 | 4.44 |
| April | 2.627 | 2.932 | 3.59 |
| May | 1.552 | 1.789 | 3.82 |
| June | .694 | .775 | 2.90 |
| July | .469 | .541 | 4.22 |
| August | .672 | .775 | 4.44 |
| September | .660 | .736 | 3.48 |
| October | .914 | 1.054 | 4.48 |
| November | 1.299 | 1.449 | 4.30 |
| December | 1.524 | 1.759 | 3.58 |
| The year | 1.502 | 20.405 | 47.24 |

## SOUTH BRANCH OF NASHUA RIVER AT CLINTON, MASS.

Since July, 1896, the flow of the South Branch of Nashua River has been measured at Clinton, Mass., by the engineers of the Metropolitan Water Board. The results of these measurements have been furnished by Frederic P. Stearns, chief engineer. Beginning with 1897 the flow has been corrected for loss and gain of storage in ponds and

mill reservoirs on the watershed, so that the results show the natural flow of the stream. The flow for 1896, however, has not been corrected for storage. The following tables give the results for 1902, also the average for the years 1897–1902.

*Estimated monthly discharge of South Branch of Nashua River at Clinton, Mass.*

[Drainage area, 119 square miles.]

| Month. | Run-off. | | Rainfall. |
|---|---|---|---|
| | Second-feet per square mile. | Depth in inches. | |
| 1902. | | | *Inches.* |
| January | 2.579 | 2.990 | 2.72 |
| February | 2.168 | 2.258 | 4.91 |
| March | 6.176 | 7.120 | 5.27 |
| April | 3.341 | 3.728 | 4.36 |
| May | 1.595 | 1.839 | 2.24 |
| June | .635 | .708 | 2.51 |
| July | .452 | .521 | 3.87 |
| August | .459 | .529 | 3.95 |
| September | .372 | .416 | 4.26 |
| October | 1.471 | 1.696 | 6.36 |
| November | .982 | 1.095 | .93 |
| December | 2.859 | 3.295 | 7.20 |
| The year | 1.930 | 26.195 | 48.58 |
| *Average for 6 years, 1897–1902.* | | | |
| January | 1.919 | 2.212 | 3.68 |
| February | 2.441 | 2.543 | 4.33 |
| March | 4.913 | 5.666 | 5.05 |
| April | 4.064 | 4.534 | 4.24 |
| May | 2.207 | 2.544 | 3.90 |
| June | 1.172 | 1.307 | 3.56 |
| July | .803 | .926 | 4.70 |
| August | .892 | 1.029 | 4.83 |
| September | .514 | .573 | 3.34 |
| October | 1.000 | 1.153 | 3.97 |
| November | 1.524 | 1.700 | 4.36 |
| December | 2.925 | 3.373 | 5.36 |
| The year | 2.030 | 27.560 | 51.32 |

## BLACKSTONE RIVER.

The Blackstone River, rising in Massachusetts and flowing to tide water at Providence, R. I., is one of the great water-power rivers of the United States. Its flow is largely affected by the many dams built across the river for the development of water power. A station for systematically measuring the flow of the Blackstone was established in May, 1901, by John E. Hill, professor of civil engineering, Brown University, and measurements of flow have been made under his charge by four students of the university, George H. Gilbert, Henry D. Drowne, E. Vanderbilt, and R. P. Hovey. The station is located at a bridge about one-fifth of a mile west of the New York, New Haven and Hartford Railroad station at Berkeley. The drainage area at this point is 429 square miles. At this point the Blackstone River is paralleled by Blackstone canal, and measurements of the canal are usually made immediately after the measurements of the river are completed. The canal begins at the Ashton dam, three-fourths of a mile upstream, and terminates at the Lonsdale mills, 2 miles below the station. Throughout the late spring and summer the gates at Lonsdale are closed at 12.30 p. m. on Saturdays. The combined flow of the river and canal represents the total flow from the drainage area of the Blackstone above Berkeley. The gagings are made from bridges over the river and canal. The gages are vertical rods nailed to the bridges, the river gage being referred to two bench marks—the first is a large stone 20 feet south of road, 90 feet east of bridge, and 12 feet southwest of old oak tree, the elevation being 8.87 feet; the second is the west end of stone doorsill to office of Berkeley Mills; elevation, 18 feet. There are two benches for the canal gage, the first being the top of the same stone as used for the river gage, its elevation being 2.10 feet below the zero of the gage rod, while the stone sill just described has an elevation of 7.03 feet. The banks of both the river and canal are high, the river having a straight course above the station, though slightly curved below. The gages were read twice a day, 7.30 a. m. and 4.30 p. m., by Joseph A. Ray, master mechanic in the Berkeley Mills, from May 17 to August 17, and since September 22 by A. E. Glover, station agent, New York, New Haven and Hartford Railroad.

The following tables of discharges and gage heights give the data which was collected to that date.

February 27: Gage height, 4.27 feet; discharge in river, 2,118 second-feet.
March 4: Gage height, 5.10 feet; discharge in river, 3,791 second-feet.
February 27: Gage height, 3 feet; discharge in canal, 74 second-feet.

*Daily gage height, in feet, of Blackstone River at Berkeley, R. I.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | |
| 1 | ..... | 4.50 | 8.35 | 4.25 | 4.45 | 4.10 | 3.90 | 3.90 | 4.10 | 4.20 | 4.00 |
| 2 | ..... | 4.50 | 7.75 | 4.35 | 4.45 | 4.20 | 4.00 | 3.90 | 4.05 | 4.20 | 4.00 |
| 3 | ..... | 3.85 | 6.75 | 4.30 | 4.15 | 4.20 | 3.90 | 3.90 | 4.00 | 4.30 | 3.90 |
| 4 | ..... | 4.50 | 5.10 | 4.30 | 3.85 | 4.10 | 3.90 | 3.80 | 3.90 | 4.30 | 3.90 |
| 5 | 5.15 | 4.40 | 4.85 | 4.35 | 4.35 | 4.10 | 4.00 | 3.95 | 4.00 | 4.40 | 4.05 |
| 6 | 5.05 | 4.30 | 4.70 | 3.90 | 4.30 | 4.10 | 4.00 | 3.85 | 4.00 | 4.40 | 4.00 |
| 7 | 4.50 | 4.30 | 4.90 | 4.30 | 4.30 | 4.10 | 4.15 | 3.95 | 4.00 | 4.45 | 3.90 |
| 8 | 4.45 | 4.30 | 5.05 | 4.40 | 4.15 | 4.00 | 4.20 | 4.00 | 4.00 | 4.30 | 3.85 |
| 9 | 4.30 | 3.30 | 5.25 | 4.65 | 4.15 | 4.00 | 4.20 | 3.90 | 4.20 | 4.35 | 4.10 |
| 10 | 4.20 | 4.35 | 5.35 | 5.25 | 4.15 | 4.10 | 4.10 | 3.80 | 4.20 | 4.40 | 3.95 |
| 11 | 4.40 | 4.30 | 5.50 | 4.80 | 4.00 | 4.10 | 3.90 | 3.80 | 4.10 | 4.40 | 3.90 |
| 12 | 4.00 | 4.30 | 5.45 | 4.50 | 4.20 | 4.10 | 3.90 | 3.90 | 4.20 | 4.25 | 4.10 |
| 13 | 4.15 | 4.15 | 5.50 | 3.90 | 4.30 | 4.25 | 3.80 | 4.10 | 4.00 | 4.30 | 3.95 |
| 14 | 4.05 | 4.10 | 5.30 | 4.60 | 4.20 | 4.20 | 4.05 | 4.10 | 4.00 | 4.50 | 3.90 |
| 15 | 4.20 | 4.25 | 4.70 | 4.50 | 4.25 | 4.00 | 4.15 | 3.95 | 4.20 | 4.50 | 4.00 |
| 16 | 4.15 | 4.00 | 4.00 | 4.60 | 4.15 | 4.10 | 4.20 | 3.90 | 4.20 | 4.40 | ..... |
| 17 | 4.05 | 4.20 | 5.15 | 4.40 | 4.05 | 4.00 | 4.30 | 3.80 | 4.10 | 4.30 | ..... |
| 18 | 4.00 | 4.20 | 6.00 | 4.25 | 4.10 | 4.00 | 4.25 | 3.95 | 4.20 | 4.30 | ..... |
| 19 | 3.95 | 4.30 | 5.55 | 3.95 | 4.20 | 4.05 | 4.20 | 4.10 | 4.20 | 4.30 | ..... |
| 20 | 4.05 | 4.30 | 4.75 | 3.80 | 4.20 | 4.10 | 4.00 | 4.10 | 4.20 | 4.20 | ..... |
| 21 | 4.25 | 4.25 | 4.55 | 4.40 | 4.05 | 3.90 | 4.00 | 4.00 | 4.05 | 4.10 | ..... |
| 22 | 5.05 | 4.25 | 4.25 | 4.30 | 4.00 | 3.80 | 3.90 | 4.00 | 4.00 | 4.10 | ..... |
| 23 | 5.60 | 4.30 | 4.00 | 4.20 | 4.00 | 4.00 | 3.90 | 3.90 | 3.90 | 4.20 | ..... |
| 24 | 4.60 | 4.25 | 4.40 | 4.05 | 4.05 | 4.00 | 4.00 | 3.95 | 3.90 | 4.00 | ..... |
| 25 | 4.50 | 4.35 | 4.40 | 4.20 | 4.00 | 4.10 | 4.00 | 4.00 | 4.05 | 4.00 | ..... |
| 26 | 4.25 | 4.40 | 4.45 | 3.90 | 4.05 | 4.20 | 4.10 | 4.10 | 4.15 | 4.30 | ..... |
| 27 | 4.40 | 4.45 | 4.30 | 3.90 | 4.10 | 4.10 | 4.00 | 4.10 | 4.20 | 4.25 | ..... |
| 28 | 4.50 | 5.15 | 4.10 | 4.30 | 4.20 | 4.10 | 3.90 | 4.00 | 4.10 | 4.20 | ..... |
| 29 | 4.65 | ..... | 4.20 | 4.25 | 4.20 | 3.90 | 3.90 | 4.00 | 4.05 | 4.20 | ..... |
| 30 | 4.60 | ..... | 4.20 | 4.25 | 4.25 | 4.10 | 4.00 | 3.95 | 4.15 | 4.20 | ..... |
| 31 | 4.60 | ..... | 4.65 | ..... | 4.20 | ..... | 4.05 | 4.10 | ..... | 4.10 | ..... |

*Daily gage height, in feet, of Blackstone canal at Berkeley, R. I.*

| Day. | Jan. | Feb. | Mar.[a] | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | |
| 1 | ..... | 2.90 | ..... | 3.25 | 3.25 | 2.90 | 3.10 | 2.80 | 2.30 | 2.30 | 2.20 |
| 2 | ..... | 3.00 | ..... | 3.20 | 3.30 | 2.90 | 2.90 | 2.60 | 2.40 | 2.35 | 2.30 |
| 3 | ..... | 3.00 | ..... | 3.15 | 3.25 | 2.85 | 2.90 | 2.60 | 2.35 | 2.30 | 2.50 |
| 4 | ..... | 2.90 | ..... | 3.05 | 3.05 | 2.80 | 3.00 | 2.60 | 2.30 | 2.30 | 2.50 |
| 5 | 3.40 | 2.90 | ..... | 3.05 | 3.10 | 2.70 | 2.95 | 2.60 | 2.25 | 2.30 | 2.50 |
| 6 | 3.05 | 2.90 | ..... | 3.00 | 3.00 | 2.90 | 3.00 | 2.65 | 2.40 | 2.30 | 2.40 |
| 7 | 2.90 | 2.90 | ..... | 3.15 | 3.10 | 2.80 | 2.85 | 2.60 | 2.30 | 2.35 | 2.40 |
| 8 | 2.90 | 2.90 | ..... | 3.15 | 3.10 | 2.95 | 2.90 | 2.60 | 2.20 | 2.40 | 2.35 |
| 9 | 2.90 | 3.20 | ..... | 3.30 | 3.15 | 2.90 | 2.90 | 2.50 | 2.30 | 2.20 | 3.30 |
| 10 | 2.90 | 3.00 | ..... | 3.25 | 3.20 | (b) | 2.85 | 2.60 | 2.30 | 2.10 | 2.95 |
| 11 | 3.00 | 2.95 | ..... | 3.20 | 3.30 | (b) | 2.85 | 2.60 | 2.40 | 2.15 | 2.85 |
| 12 | 3.10 | 2.90 | ..... | 3.00 | 3.05 | (b) | 2.95 | 2.65 | 2.30 | ..... | 3.10 |
| 13 | 3.00 | 3.00 | ..... | 2.90 | 3.05 | (b) | (b) | 2.70 | 2.20 | ..... | 2.85 |
| 14 | 2.95 | 3.00 | ..... | 3.10 | 2.90 | (b) | 2.80 | 2.65 | 2.20 | ..... | 2.75 |
| 15 | 2.90 | 3.10 | ..... | 3.10 | 3.00 | 3.00 | 2.80 | 2.60 | 2.20 | ..... | 2.45 |
| 16 | 2.90 | 3.20 | ..... | 3.05 | 2.30 | 2.90 | 2.80 | 2.70 | 2.30 | ..... | ..... |
| 17 | 2.90 | 3.00 | ..... | 3.05 | 1.80 | 2.80 | 2.90 | 2.80 | 2.30 | ..... | ..... |
| 18 | 2.90 | 2.90 | ..... | 2.90 | 2.90 | 2.80 | 2.80 | 2.60 | 2.40 | ..... | ..... |
| 19 | 3.00 | 2.90 | ..... | 3.00 | 2.95 | 2.90 | 2.80 | 2.30 | 2.30 | 2.10 | ..... |
| 20 | 2.90 | 3.05 | ..... | 3.30 | 3.00 | 2.85 | (b) | 2.30 | 2.25 | 2.45 | ..... |
| 21 | 2.90 | 3.00 | ..... | 3.20 | 3.05 | 2.95 | (b) | 2.30 | 2.20 | 2.80 | ..... |
| 22 | 3.20 | 3.10 | ..... | 3.10 | 3.00 | 3.05 | (b) | 2.30 | 2.10 | 2.50 | ..... |
| 23 | 3.30 | 3.20 | ..... | 3.10 | 2.95 | 2.90 | 2.80 | 2.30 | 2.25 | 2.50 | ..... |
| 24 | 3.20 | 2.95 | ..... | 3.10 | (b) | 2.95 | 2.70 | 2.50 | 2.30 | 2.45 | ..... |
| 25 | 3.10 | 3.00 | ..... | 3.10 | (b) | 3.00 | 2.70 | 2.30 | 2.45 | 2.20 | ..... |
| 26 | 3.00 | 3.10 | ..... | 3.15 | (b) | 2.90 | 2.80 | 2.30 | 2.35 | 2.70 | ..... |
| 27 | 3.00 | 3.15 | 3.20 | 3.20 | 2.85 | 2.90 | 2.70 | 2.35 | 2.25 | 2.70 | ..... |
| 28 | 2.90 | 3.35 | 3.10 | 3.10 | 2.90 | 2.95 | 2.75 | 2.40 | 2.25 | 2.80 | ..... |
| 29 | 2.95 | ..... | 3.10 | 3.10 | ..... | 2.90 | 2.75 | 2.40 | 2.10 | 2.60 | ..... |
| 30 | 2.90 | ..... | 3.60 | 3.10 | ..... | 2.90 | 2.70 | 2.30 | 2.20 | 2.60 | ..... |
| 31 | 2.90 | ..... | 3.45 | ..... | ..... | ..... | 2.70 | 2.30 | ..... | 2.60 | ..... |

[a] No records on account of canal bank having washed out. [b] Repairing canal.

## WATER POWERS OF NEW YORK.

The following pages contain the results of gagings of streams in the State of New York, made by the Division of Hydrography of the United States Geological Survey in cooperation with the State engineer of New York. The work has been under the immediate supervision of Mr. Robert E. Horton. Acknowledgment is made of the hearty cooperation and assistance afforded by Edward A. Bond, State engineer and surveyor, and William Pierson Judson, deputy State engineer, as well as by many civil engineers, water-power users, and other individuals.

The methods of stream gagings utilized in New York State have been fully described in Water-Supply Paper No. 65, pages 91 to 98. The methods there described have been continued during the year 1902, and, in addition, particular attention has been devoted to securing reliable data relative to the yield of streams during the winter months and to the experimental determination of the best methods of

current-meter use on each of the streams. In addition, some attention has been devoted to the gagings of some very small watersheds not subject to any storage or artificial control.

Information concerning the yield of streams during the winter months is of great value wherever water power is used for electric-lighting purposes, as the heaviest load and hardest service usually occur in the winter. It is, however, a somewhat more difficult matter to secure reliable records of stream flow when the rivers are frozen over than during the open season. Where gaging stations are located at dams ice is likely to accumulate on the crest of the overflows, diminishing their effective capacity. At current-meter gaging stations the rating curves applicable during summer months may be inapplicable when the stream is frozen over, owing to the increase in the wetted perimeter.

Measurements of the run-off from small, uncontrolled watersheds of the Appalachian region are a matter of growing interest, inasmuch as the public water supplies of very many of the cities and towns of the region are drawn from such sources in preference to taking supplies from larger rivers and streams which contain greater pollution from sewage and manufacturing waste. The extent to which such gagings of small watersheds can be carried on is limited, owing to the fact that to obtain a given per cent of precision equal if not greater care is required in gaging a small stream than in gaging a large one. The number of such streams is, moreover, very great, and the number of persons likely to be interested and directly benefited by the measurement of any single stream is relatively small. Especial thanks are rendered to William S. Bacot, consulting engineer, Utica, N. Y.; also to the Consolidated Water Company, of Utica, N. Y., and the Greenwich Water Company, of Greenwich, Conn., for affording facilities for obtaining gaging records on a number of small natural watersheds in New York State.

The appropriating clause in chapter 594 of the New York State Laws of 1902 requires that the State shall cooperate with the United States Geological Survey in "determining the water supply available for canals and for potable and domestic uses and for the development of water power."

As illustrating the value of water resources of New York to the State, the following statistics from the Twelfth United States Census are given. They show an aggregate power of installed water wheels of 330,543 horsepower in 1900. In 1880 the water power in use in the State was determined by the census officials to be 219,348 horsepower. Since the census of 1900 was taken water-power development costing many millions of dollars has been completed. A large part of the power thus rendered available is utilized for electric lighting of municipalities and for electric traction purposes, two classes of power users which are not represented in the census returns.

The following table is a list of the various industries in New York which depend upon water power:

*Industries in New York State dependent on water power.*

| Industry. | Number of establishments. | Horsepower. | Industry. | Number of establishments. | Horsepower. |
|---|---|---|---|---|---|
| Agricultural implements | 19 | 1,101 | Linen goods | 1 | 100 |
| Boots and shoes | 7 | 590 | Lumber | 278 | 24,003 |
| Brick and tile | 1 | 50 | Lumber and timber products | 450 | 21,321 |
| Carpets and rugs | 5 | 1,660 | Paper | 175 | 189,737 |
| Carriages and wagons | 25 | 1,006 | Printing and publishing | 56 | 305 |
| Chemicals | 14 | 514 | Ship building | 4 | 1,541 |
| Cordage and twine | 3 | 800 | Shoddy | 5 | 299 |
| Cotton goods | 16 | 8,494 | Silk manufacturing | 7 | 828 |
| Cotton small wares | 1 | 36 | Wool hats | 2 | 275 |
| Dyeing and finishing | 5 | 560 | Woolen goods | 46 | 4,493 |
| Felt goods | 4 | 862 | Worsted goods | 3 | 3,310 |
| Flour and grist mills | 1,053 | 58,775 | Total | | 330,543 |
| Hosiery and knit goods | 71 | 7,164 | | | |
| Iron and steel | 3 | 1,300 | | | |
| Leather, tanned and curried | 34 | 1,419 | | | |

## LAKE ONTARIO DRAINAGE BASIN.

### MOOSE RIVER AT MOOSE RIVER, N. Y.

The gaging station on this stream is situated at the village of Moose River, 4 miles below McKeever railroad station. It was established June 5, 1900. The watershed is described in Water-Supply Paper No. 65, pages 98 to 100, and the mean of the two gage readings which are taken each day, is tabulated for 1900 in Water-Supply Paper No. 49, page 235, and for 1901 in Water-Supply Paper No. 65, page 99. The average daily gage heights for 1902 deduced from the observations by Christopher Hannan, the gage reader, are given in the accompanying table.

*Mean daily gage height, in feet, of Moose River at Moose River, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 1.75 | 1.15 | 2.85 | 4.60 | 4.90 | 2.80 | 1.85 | 1.05 | 0.60 | 1.05 | 2.55 | 1.85 |
| 2 | 2.15 | 1.10 | 3.85 | 4.20 | 3.65 | 2.65 | 2.05 | 1.35 | .90 | .85 | 2.35 | 1.75 |
| 3 | 2.20 | 1.20 | 5.05 | 3.95 | 3.60 | 2.40 | 2.75 | 1.60 | .65 | .95 | 2.15 | 1.65 |
| 4 | 2.10 | 1.30 | 5.25 | 3.65 | 3.65 | 2.70 | 4.50 | 1.55 | .70 | 1.05 | 1.95 | 2.30 |
| 5 | 2.25 | 1.40 | 4.80 | 3.45 | 3.55 | 2.90 | 3.55 | 1.40 | .85 | 1.20 | 1.75 | 2.30 |
| 6 | 2.45 | 1.40 | 4.20 | 3.30 | 3.05 | 2.45 | 2.90 | 1.75 | .80 | 1.30 | 1.75 | 1.90 |
| 7 | 2.25 | 1.50 | 3.75 | 3.25 | 2.80 | 2.25 | 2.50 | 3.10 | .80 | 1.45 | 1.75 | 1.50 |
| 8 | 2.15 | 1.40 | 3.55 | 3.20 | 2.45 | 2.15 | 2.25 | 2.85 | .55 | 1.55 | 1.55 | 1.20 |
| 9 | 2.15 | 1.40 | 3.15 | 3.10 | 2.20 | 2.70 | 2.05 | 3.50 | .65 | 1.45 | 1.55 | 1.75 |
| 10 | 1.95 | 1.40 | 2.85 | 4.60 | 2.05 | 2.55 | 1.85 | 2.70 | .80 | 1.30 | 1.45 | 1.65 |
| 11 | 1.60 | 1.40 | 2.65 | 4.45 | 1.95 | 2.45 | 1.65 | 2.25 | .85 | 1.25 | 1.25 | 1.75 |
| 12 | 1.25 | 1.30 | 2.65 | 4.20 | 1.70 | 2.25 | 1.55 | 2.70 | 1.10 | 1.20 | 1.60 | 1.85 |
| 13 | 2.25 | 1.35 | 3.40 | 3.60 | 1.55 | 2.10 | 1.45 | 2.10 | 1.40 | 1.10 | 2.25 | 1.75 |
| 14 | 2.45 | 1.45 | 4.65 | 3.85 | 1.65 | 2.05 | 1.55 | 1.80 | 1.20 | 1.45 | 2.90 | 1.75 |
| 15 | 2.40 | 1.45 | 3.45 | 3.25 | 1.45 | 2.25 | 1.80 | 1.45 | 1.35 | 1.55 | 2.70 | 1.85 |
| 16 | 2.25 | 1.45 | 4.50 | 4.00 | 1.25 | 2.45 | 1.75 | 1.25 | 1.25 | 1.35 | 2.35 | 1.70 |
| 17 | 2.05 | 1.45 | 6.00 | 4.40 | 1.20 | 2.25 | 1.45 | 1.15 | 1.15 | 1.15 | 1.95 | 2.00 |
| 18 | 2.25 | 1.45 | (a) | 3.40 | 1.10 | 2.05 | 1.35 | 1.05 | 1.25 | 1.15 | 1.95 | 2.30 |
| 19 | 2.05 | 1.60 | (a) | 2.85 | 1.05 | 1.85 | 1.65 | 1.05 | 1.25 | 1.25 | 1.75 | 2.25 |
| 20 | 1.85 | 1.75 | (a) | 2.50 | 1.10 | 2.15 | 2.95 | 1.00 | 1.10 | 1.25 | 1.75 | 2.05 |
| 21 | 1.75 | 1.90 | 4.50 | 2.85 | 1.00 | 2.25 | 2.25 | 1.05 | 1.15 | 1.45 | 1.65 | 1.90 |
| 22 | 1.70 | 1.90 | 4.15 | 2.50 | .85 | 2.85 | 2.05 | 1.10 | 1.20 | 1.55 | 1.65 | 2.90 |
| 23 | 1.70 | 2.00 | 3.80 | 3.05 | 1.10 | 2.40 | 1.85 | 1.15 | 1.10 | 1.35 | 1.85 | 3.65 |
| 24 | 1.80 | 2.10 | 3.75 | 2.75 | 1.80 | 1.95 | 1.55 | 1.10 | 1.05 | 1.25 | 1.95 | 3.35 |
| 25 | 1.65 | 2.10 | 3.60 | 2.50 | 2.65 | 1.85 | 1.45 | 1.95 | 1.20 | 1.45 | 1.75 | 3.05 |
| 26 | 1.55 | 2.05 | 3.40 | 3.10 | 3.30 | 1.95 | 1.80 | .85 | 1.25 | 1.65 | 1.75 | 2.85 |
| 27 | 1.35 | 2.05 | 3.15 | 4.80 | 3.90 | 2.40 | 1.40 | .80 | 1.20 | 1.75 | 1.75 | 2.65 |
| 28 | 1.40 | 2.25 | 3.10 | 4.25 | 3.45 | 2.10 | 1.05 | .75 | 1.30 | 1.95 | 1.95 | 2.45 |
| 29 | 1.30 | ..... | 4.05 | 3.75 | 3.25 | 1.85 | .95 | .65 | 1.20 | 3.35 | 1.80 | 2.25 |
| 30 | 1.30 | ..... | 6.40 | 4.75 | 3.35 | 1.55 | 1.00 | .65 | 1.25 | 3.95 | 1.75 | 2.05 |
| 31 | 1.20 | ..... | 5.20 | ..... | 3.50 | ..... | 1.10 | .65 | ..... | 3.20 | ..... | 1.95 |

(a) Ice breaking up; water above top of gage.

## BEAVER RIVER NEAR CROGHAN, N. Y.

Beaver River, like Moose River, is a stream draining a portion of the western Adirondack slope of New York. The watershed is described in Water-Supply Paper No. 65, pages 100 to 102. The gaging station was established at Tisses Bridge, situated between the villages of Croghan and Belfort, May 17, 1901. Daily gage heights from the readings taken once each day by Nicholas Tisse are given for 1901 in the Water-Supply Paper above cited. The observations for 1902 are contained in the following table.

August 6, 1902, a current-meter discharge measurement was made by C. C. Covert. Gage height, 2.32; discharge, 554 second-feet.

*Daily gage height, in feet, of Beaver River at Tisses Bridge, near Croghan, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 3.0 | 2.5 | 3.4 | 4.5 | 4.5 | 3.4 | 3.0 | 2.5 | 2.2 | 2.0 | 2.7 | 2.4 |
| 2 | 2.9 | 2.4 | 4.5 | 4.4 | 2.0 | 3.2 | 2.7 | 2.5 | 2.0 | 2.1 | 2.5 | 2.3 |
| 3 | 2.8 | 2.4 | 4.4 | 3.7 | 4.0 | 3.0 | 2.4 | 3.4 | 2.6 | 2.2 | 2.3 | 2.6 |
| 4 | 2.8 | 2.4 | 3.9 | 3.5 | 4.0 | 3.2 | 2.4 | 3.0 | 2.4 | 2.2 | 2.0 | 2.7 |
| 5 | 2.9 | 2.4 | 3.7 | 3.4 | 4.5 | 3.0 | 2.5 | 2.4 | 2.0 | 2.0 | 2.0 | 2.7 |
| 6 | 2.7 | 2.4 | 3.5 | 2.0 | 4.2 | 3.4 | 2.5 | 2.4 | 2.0 | 2.2 | 1.9 | 2.7 |
| 7 | 2.7 | 2.4 | 3.4 | 1.4 | 4.4 | 3.6 | 2.4 | 2.2 | 2.0 | 2.1 | 1.9 | 2.6 |
| 8 | 2.7 | 2.4 | 2.4 | 3.5 | 5.0 | 3.6 | 2.5 | 2.3 | 2.0 | 2.2 | 2.0 | 2.6 |
| 9 | 2.6 | 2.3 | 2.5 | 4.2 | 4.4 | 3.2 | 2.4 | 2.4 | 2.1 | 2.2 | 2.2 | 2.9 |
| 10 | 2.6 | 2.4 | 2.5 | 4.1 | 4.0 | 3.9 | 2.5 | 3.0 | 2.0 | 2.1 | 2.4 | 2.9 |
| 11 | 2.5 | 2.3 | 2.7 | 4.2 | 3.6 | 3.6 | 2.5 | 2.7 | 2.2 | 2.1 | 3.0 | 3.0 |
| 12 | 2.5 | 2.3 | 3.3 | 4.4 | 2.9 | 3.2 | 2.5 | 2.4 | 2.3 | 2.2 | 3.2 | 3.2 |
| 13 | 2.5 | 2.3 | 4.4 | 4.3 | 4.2 | 2.5 | 2.4 | 2.0 | 2.2 | 2.0 | 3.2 | 3.4 |
| 14 | 2.5 | 2.2 | 4.9 | 3.4 | 2.4 | 2.2 | 2.5 | 2.0 | 2.2 | 2.0 | 2.9 | 3.5 |
| 15 | 2.5 | 2.4 | 4.8 | 3.0 | 2.2 | 2.4 | 2.6 | 2.0 | 2.0 | 1.2 | 2.7 | 3.5 |
| 16 | 2.5 | 2.4 | 4.9 | 3.0 | 4.4 | 3.2 | 3.0 | 2.1 | 1.8 | 1.2 | 2.7 | 3.4 |
| 17 | 2.5 | 2.4 | 5.0 | 3.2 | 5.0 | 3.7 | 3.2 | 3.2 | 1.8 | 2.2 | 2.4 | 3.4 |
| 18 | 2.5 | 2.6 | 5.4 | 2.9 | 4.6 | 2.8 | 3.2 | 3.4 | 2.0 | 2.2 | 2.6 | 3.3 |
| 19 | 3.2 | 2.7 | 5.2 | 4.2 | 4.2 | 3.3 | 3.0 | 3.1 | 1.9 | 2.3 | 2.7 | 3.2 |
| 20 | 3.1 | 2.8 | 4.8 | 4.3 | 2.6 | 3.8 | 3.0 | 2.7 | 1.9 | 2.2 | 2.7 | 3.0 |
| 21 | 3.1 | 2.8 | 4.4 | 2.3 | 4.2 | 3.8 | 3.0 | 2.4 | 1.8 | 2.3 | 2.5 | 3.0 |
| 22 | 2.9 | 2.9 | 4.0 | 2.6 | 4.4 | 3.5 | 2.9 | 3.3 | 1.8 | 2.4 | 2.2 | 2.9 |
| 23 | 2.7 | 2.9 | 4.4 | 3.4 | 4.2 | 3.8 | 2.8 | 3.2 | 1.9 | 2.4 | 2.4 | 2.9 |
| 24 | 2.6 | 2.9 | 4.4 | 4.2 | 4.2 | 2.6 | 2.8 | 3.0 | 1.8 | 2.2 | 2.4 | 3.1 |
| 25 | 2.5 | 2.7 | 4.0 | 3.5 | 5.2 | 2.8 | 2.9 | 3.0 | 2.0 | 2.3 | 2.4 | 3.0 |
| 26 | 2.5 | 2.8 | 3.9 | 3.2 | 5.4 | 2.4 | 2.8 | 2.5 | 1.8 | 3.2 | 2.4 | 2.9 |
| 27 | 2.5 | 2.9 | 4.0 | 4.3 | 5.6 | 2.2 | 2.5 | 2.2 | 1.8 | 3.0 | 2.3 | 2.8 |
| 28 | 3.3 | 3.7 | 3.7 | 3.0 | 4.2 | 2.4 | 2.5 | 2.2 | 2.0 | 3.0 | 2.3 | 2.7 |
| 29 | 3.1 | ..... | 4.0 | 4.6 | 3.4 | 2.4 | 2.4 | 2.2 | 2.0 | 2.9 | 2.3 | 2.7 |
| 30 | 2.7 | ..... | 4.5 | 3.7 | 3.5 | 2.3 | 2.6 | 2.2 | 2.1 | 2.8 | 2.4 | 2.5 |
| 31 | 2.2 | ..... | 4.4 | ..... | 3.4 | ..... | 2.4 | 2.1 | ..... | 2.7 | ..... | 2.6 |

## BLACK RIVER NEAR FELTS MILLS, N. Y.

A gaging station maintained on Black River at Huntingtonville dam, near Watertown, from February 22, 1897, to December 13, 1901, is described in Water-Supply Paper No. 49, pages 236 to 239, and in Water-Supply Paper No. 65, pages 102 to 105. Owing to the washing out of a portion of the right wing of the Huntingtonville dam by a freshet, the record for Black River was transferred during 1902 to the dam of the Black River Traction Company, 2 miles above Felts Mills.

This dam is situated 9 miles above Watertown and 7 miles above the Huntingtonville gaging station, on the same stream. The drainage area is estimated at 1,851 square miles, or 37.5 square miles less than that at Huntingtonville. The intervening area is mainly drained by two small streams—Townsend Creek and Rutland Hollow Creek.

The dam is of squared timber and has a slope on the upstream face of 2.86 horizontal to 1 vertical. The crest is protected by boiler plate, and the downstream face is vertical, giving a free overfall. The main crest is 380.6 feet in length, is level, and at an elevation of 587.96 feet above tide. There are two additional sections on the right side; one, at an elevation of 590.96 feet, is 14.1 feet long, and the other, at an elevation of 593.46 feet, is 17.9 feet in length.

A similarly constructed dam 117 feet long at the left bank serves as an auxiliary spillway and as a headrace wall. It has an average crest elevation of 591 feet.

The gage is attached vertically to a crib at the juncture of the main and auxiliary spillways, 8 feet upstream from the crest, and a correction is made to the gage readings for velocity of approach during high water. The discharge over the spillways has been calculated by means of the weir formula, using coefficients derived from Cornell experiment No. 5 for a dam of similar cross section. The dam was constructed in 1900, rests on limestone foundation, and is very nearly water-tight. The headrace is closed by a bulkhead, no water wheels having been installed.

The gage readings are taken twice daily, at 7 a. m. and again at 6 p. m., by A. H. Tucker. A record of high water was kept at this dam May and June, 1901. The results are not available for publication at present.

*Mean daily flow, in second-feet, of Black River at Black River Traction Company's dam, near Felts Mills, N. Y., for 1902.*

| Day. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 3,460 | 4,220 | 7,180 | 5,560 | 18 | | 3,805 | 4,360 | 5,880 | 5,250 |
| 2 | | 3,590 | 4,140 | 6,200 | 5,100 | 19 | | 3,720 | 4,080 | 5,780 | 6,550 |
| 3 | | 3,940 | 4,280 | 5,880 | 4,940 | 20 | | 3,400 | 4,565 | 5,880 | 6,300 |
| 4 | | 3,860 | 3,860 | 5,100 | 8,740 | 21 | | 3,000 | 4,800 | 5,245 | 6,830 |
| 5 | | 3,665 | 3,180 | 4,500 | 7,920 | 22 | | 3,720 | 5,100 | 5,245 | 7,610 |
| 6 | | 3,460 | 4,000 | 4,420 | 5,880 | 23 | | 3,540 | 4,500 | 4,500 | 9,960 |
| 7 | | 2,860 | 4,800 | 4,420 | 6,040 | 24 | | 3,130 | 4,940 | 5,780 | 10,830 |
| 8 | | 4,080 | 4,800 | 4,500 | 5,660 | 25 | | 3,265 | 4,360 | 5,160 | 9,720 |
| 9 | | 4,140 | 5,000 | 4,420 | 5,400 | 26 | | 3,540 | 4,420 | 4,720 | 9,070 |
| 10 | | 4,140 | 4,650 | 4,280 | 5,190 | 27 | | 3,180 | 4,800 | 5,720 | 7,700 |
| 11 | | 5,245 | 4,650 | 4,220 | 4,660 | 28 | | 3,940 | 5,245 | 6,200 | 6,800 |
| 12 | | 4,800 | 3,940 | 4,280 | 4,020 | 29 | 3,590 | 4,280 | 7,285 | 6,200 | 6,300 |
| 13 | | 4,280 | 4,140 | 8,370 | 4,010 | 30 | 3,590 | 3,540 | 8,370 | 5,190 | 6,020 |
| 14 | | 3,665 | 4,940 | 8,840 | 4,170 | 31 | 3,400 | | 8,465 | | 5,800 |
| 15 | | 4,080 | 5,310 | 9,080 | 3,940 | Aver-age | 3,527 | 3,771 | 4,857 | 5,655 | 6,265 |
| 16 | | 3,940 | 4,940 | 7,285 | 4,310 | | | | | | |
| 17 | | 3,860 | 4,420 | 6,200 | 3,960 | | | | | | |

*Estimated monthly discharge of Black River at Black River Traction Company's dam, near Felts Mills, N. Y.*

[Drainage area, 1,851 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| August 29–31 | ---------- | ---------- | 3,527 | 1.90 | 2.19 |
| September | 5,245 | 3,000 | 3,771 | 2.04 | 2.28 |
| October | 8,465 | 3,180 | 4,857 | 2.62 | 3.02 |
| November | 9,080 | 4,220 | 5,655 | 3.05 | 3.52 |
| December | 10,830 | 3,940 | 6,265 | 3.38 | 3.90 |

## SALMON RIVER NEAR PULASKI, N. Y.

The gaging station on this stream is located at Fox Bridge, 2 miles above Pulaski village. The station was established September 5, 1900, and is described in Water-Supply Paper No. 49, page 234, and in No. 65, pages 105 to 107, where gage heights and estimated daily discharge are given.

Owing to obstruction of the stream by ice, and injury to the gage, the Salmon River record was interrupted during the winter of 1901–2.

A new gage was erected July 23, 1902, and the record resumed. The datum of the weight gage is at an elevation of 87.21, or 1.2 feet below that of the original gage. All gage readings and discharge measurements have been reduced to the original or board gage datum. Gage readings are taken twice daily by S. J. Fox. The gage is of the weight and wire variety, with a 15-foot decimal scale, near the center of the right bridge span. The following current-meter discharge measurements have been made during 1902:

*Current-meter discharge measurements of Salmon River near Pulaski, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.*[a] | *Second-feet.* |
| October 17 | R. E. Horton | 2.85 | 433 |
| July 23 | H. R. Beebe | 3.29 | 842 |
| July 2 | Horton and Beebe | 3.74 | 1,392 |
| July 5 | H. R. Beebe | 4.73 | 2,889 |
| July 6 | do | 4.83 | 2,916 |
| Do | do | 4.86 | 2,881 |

[a] Referred to old or original gage datum.

Salmon River, in common with other streams tributary to eastern Lake Ontario, is subject to great obstruction by anchor ice. Owing

to this, separate discharge measurements are required for the winter season before the gage readings for the ice period can be reduced to quantities of discharge. Arrangements have been made for the taking of such measurements during the coming winter.

*Mean daily flow, in second-feet, of Salmon River near Pulaski, N. Y., for 1902.*

| Day. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 394 | 294 | 378 | 692 | 708 | 18 | ..... | 442 | 246 | 506 | 692 | 1,301 |
| 2 | ..... | 1,640 | 330 | 330 | 618 | 618 | 19 | ..... | 756 | 220 | 650 | 820 | 1,110 |
| 3 | ..... | 884 | 378 | 378 | 570 | 674 | 20 | ..... | 692 | 246 | 735 | 905 | 990 |
| 4 | ..... | 650 | 330 | 330 | 554 | 2,135 | 21 | ..... | 554 | 234 | 618 | 756 | 862 |
| 5 | ..... | 490 | 474 | 282 | 258 | 1,244 | 22 | ..... | 554 | 246 | 522 | 692 | 1,015 |
| 6 | ..... | 535 | 282 | 570 | 522 | 692 | 23 | 862 | 671 | 234 | 570 | 1,215 | 883 |
| 7 | ..... | 554 | 294 | 246 | 650 | 586 | 24 | 714 | 586 | 234 | 634 | 1,010 | 1,098 |
| 8 | ..... | 820 | 378 | 258 | 586 | 538 | 25 | 714 | 474 | 234 | 798 | 820 | 1,131 |
| 9 | ..... | 820 | 362 | 777 | 388 | 442 | 26 | 607 | 410 | 246 | 671 | 735 | 1,011 |
| 10 | ..... | 692 | 1,470 | 586 | 474 | 554 | 27 | 538 | 394 | 294 | 708 | 862 | 905 |
| 11 | ..... | 820 | 799 | 506 | 474 | 708 | 28 | 671 | 362 | 294 | 947 | 1,157 | 777 |
| 12 | ..... | 1,325 | 586 | 426 | 474 | 798 | 29 | 535 | 306 | 306 | 1,301 | 798 | 884 |
| 13 | ..... | 798 | 474 | 394 | 1,914 | 841 | 30 | 346 | 294 | 378 | 976 | 862 | 905 |
| 14 | ..... | 1,442 | 394 | 618 | 1,552 | 1,011 | 31 | 362 | 282 | ..... | 777 | ..... | 841 |
| 15 | ..... | 490 | 362 | 884 | 1,131 | 1,032 | Average | 594 | 611 | 375 | 615 | 796 | 934 |
| 16 | ..... | 410 | 346 | 692 | 976 | 1,340 | | | | | | | |
| 17 | ..... | 394 | 282 | 998 | 735 | 1,340 | | | | | | | |

*Estimated monthly discharge of Salmon River near Pulaski, N. Y.*

[Drainage area, 264 square miles.]

| Month. | Mean discharge in second-feet. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | | | |
| July | 594 | 2.25 | 2.59 |
| August | 611 | 2.32 | 2.67 |
| September | 375 | 1.42 | 1.58 |
| October | 615 | 2.33 | 2.69 |
| November | 796 | 3.02 | 3.37 |
| December | 934 | 3.54 | 4.08 |

CHITTENANGO CREEK AT CHITTENANGO, N. Y.

This gaging station, which was established May 22, 1901, is described in Water-Supply Paper No. 65, pages 114 to 116, where daily gage heights and discharge measurements for 1901 may be found. The greatest known freshet on this stream occurred December 15, 1901. The water rose to elevation 7 on the gage board. This freshet went over the tops of the abutments and the adjacent highway. It also caused scour underneath the bridge, so that the discharge measure-

ments of 1902 are not strictly comparable with those of 1901 for similar stages of the stream. The following current-meter measurements have been made during 1902:

*Current-meter discharge measurements of Chittenango Creek at Chittenango, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| December 13 | C. C. Covert | 1.70 | 66.7 |
| August 23 | do | 1.77 | 70.8 |
| April 2 | E. C. Murphy | 2.33 | 205.0 |
| Do | do | 2.33 | 212.0 |
| July 2 | R. E. Horton | 2.34 | [a] 184.0 |
| Do | do | 2.36 | 216.6 |
| July 7 | H. R. Beebe | 2.50 | 280.6 |
| Do | do | 2.49 | 280.4 |

[a] At Polytechnia street bridge.

*Mean daily gage height, in feet, of Chittenango Creek at Chittenango, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2.00 | 1.80 | 4.95 | 2.30 | 1.70 | 1.85 | 2.25 | 2.35 | 1.45 | 1.90 | 1.90 | 1.75 |
| 2 | 2.00 | 1.80 | 4.52 | 2.30 | 1.70 | 1.80 | 2.00 | 2.45 | 1.65 | 2.15 | 1.90 | 1.75 |
| 3 | 2.00 | 4.05 | 4.10 | 2.20 | 1.70 | 2.00 | 2.50 | 2.20 | 1.60 | 1.90 | 1.90 | 2.00 |
| 4 | 2.00 | 2.80 | 3.50 | 2.30 | 1.70 | 3.65 | 2.20 | 2.10 | 1.60 | 1.90 | 2.00 | 1.80 |
| 5 | 2.00 | 2.90 | 3.00 | 2.20 | 1.70 | 2.70 | 2.40 | 2.00 | 1.60 | 1.90 | 2.20 | 1.80 |
| 6 | 1.95 | 2.60 | 2.30 | 2.30 | 1.70 | 2.40 | 2.73 | 3.00 | 1.60 | 2.10 | 2.20 | 1.80 |
| 7 | 1.85 | 2.60 | 2.45 | 2.30 | 1.70 | 2.20 | 2.80 | 2.40 | 1.55 | 2.20 | 2.20 | 1.80 |
| 8 | 1.80 | 2.30 | 2.60 | 2.20 | 1.70 | 2.50 | 2.50 | 2.45 | 1.50 | 2.25 | 2.15 | 1.80 |
| 9 | 1.70 | 2.00 | 2.60 | 2.90 | 1.70 | 2.50 | 2.30 | 2.25 | 1.65 | 2.20 | 2.10 | 1.75 |
| 10 | 1.70 | 1.85 | 2.60 | 3.05 | 1.70 | 2.60 | 2.68 | 2.20 | 2.05 | 2.10 | 1.85 | 1.75 |
| 11 | 1.70 | 1.70 | 2.77 | 2.60 | 1.65 | 2.75 | 2.35 | 2.20 | 1.70 | 2.10 | 1.85 | 1.75 |
| 12 | 1.70 | 1.70 | 4.05 | 2.60 | 1.60 | 2.90 | 2.10 | 2.10 | 1.60 | 2.05 | 1.95 | 1.80 |
| 13 | 1.70 | 1.70 | 4.20 | 2.60 | 1.60 | 2.50 | 2.00 | 2.00 | 1.50 | 1.95 | 1.90 | 1.80 |
| 14 | 1.70 | 1.70 | 3.50 | 2.50 | 1.60 | 2.35 | 2.20 | 1.95 | 1.50 | 1.85 | 1.90 | 1.80 |
| 15 | 1.70 | 1.70 | 3.10 | 2.50 | 1.60 | 2.85 | 2.25 | 1.90 | 1.70 | 1.80 | 2.00 | 1.80 |
| 16 | 1.70 | 1.70 | 3.10 | 2.33 | 1.60 | 2.75 | 2.20 | 1.85 | 1.70 | 1.85 | 2.00 | 2.40 |
| 17 | 1.70 | 1.70 | 4.30 | 2.20 | 1.60 | 2.45 | 2.05 | 1.90 | 1.70 | 2.00 | 1.95 | 2.30 |
| 18 | 1.70 | 1.70 | 3.30 | 2.20 | 1.60 | 2.20 | 2.00 | 1.90 | 1.70 | 2.10 | 1.90 | 2.20 |
| 19 | 1.70 | 1.70 | 2.80 | 2.20 | 1.70 | 2.13 | 2.00 | 1.90 | 1.70 | 2.33 | 1.90 | 2.23 |
| 20 | 1.70 | 1.70 | 2.60 | 2.20 | 1.80 | 2.10 | 2.05 | 1.85 | 1.70 | 1.95 | 1.80 | 2.20 |
| 21 | 1.70 | 1.70 | 2.60 | 2.10 | 1.75 | 2.20 | 2.65 | 1.80 | 1.70 | 1.75 | 1.80 | 2.20 |
| 22 | 1.85 | 1.80 | 2.80 | 2.00 | 1.70 | 2.10 | 3.25 | 1.80 | 1.70 | 1.75 | 1.80 | 3.15 |
| 23 | 1.80 | 1.70 | 2.80 | 1.9 | 1.70 | 2.00 | 2.50 | 1.75 | 1.65 | 1.85 | 1.80 | 2.70 |
| 24 | 1.70 | 1.70 | 2.50 | 1.9 | 1.70 | 1.90 | 2.35 | 1.70 | 1.60 | 1.90 | 1.80 | 2.50 |
| 25 | 1.70 | 1.70 | 2.50 | 1.9 | 1.80 | 1.90 | 2.15 | 1.70 | 1.60 | 1.90 | 1.65 | 2.30 |
| 26 | 1.70 | 1.70 | 2.50 | 1.9 | 2.15 | 2.20 | 2.10 | 1.70 | 1.90 | 1.90 | 1.65 | 2.30 |
| 27 | 2.00 | 1.70 | 2.40 | 1.8 | 1.80 | 2.05 | 3.25 | 1.60 | 1.90 | 1.90 | 1.70 | 2.25 |
| 28 | 1.90 | 3.50 | 2.40 | 1.8 | 1.85 | 1.90 | 2.80 | 1.60 | 1.90 | 3.10 | 1.75 | 2.20 |
| 29 | 1.80 | ..... | 2.40 | 1.7 | 2.10 | 1.95 | 2.45 | 1.50 | 1.85 | 2.45 | 1.75 | 2.20 |
| 30 | 1.80 | ..... | 2.40 | 1.7 | 2.10 | 2.10 | 2.20 | 1.50 | 1.80 | 2.10 | 1.75 | 2.20 |
| 31 | 1.80 | ..... | 2.40 | ..... | 2.00 | ..... | 2.20 | 1.50 | ..... | 1.95 | ..... | 2.20 |

## SKANEATELES OUTLET AT WILLOW GLEN, N. Y.

A description of the watershed of Skaneateles Lake, including gagings at various points from 1890 to the end of 1901, is given in Water-Supply Paper No. 65, pages 116 to 128. The following table gives the actual flow in the outlet for each day during 1902, as calculated by the Francis formula from readings taken daily at the Willow Glen weir. A table is also given showing the corresponding run-off from the watershed. The amount of diversion for the water supply of Syracuse from July, 1901, to September, 1902, has been furnished by the water department of Syracuse. The diversion added to the actual flow in the outlet comprises the total run-off of the watershed. A table showing these quantities is also given.

*Mean daily flow, in second-feet, of Skaneateles outlet at Willow Glen weir, New York.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 72.2 | 69.6 | 91.2 | 74.7 | 74.7 | 74.7 | 80.0 | 132.5 | 156.6 | 129.2 | 116.2 | 91.2 |
| 2 | 72.2 | 69.6 | 91.2 | 74.7 | 74.7 | 74.7 | 77.3 | 135.8 | 116.2 | 129.2 | 116.2 | 91.2 |
| 3 | 72.2 | 69.6 | 91.2 | 74.7 | 74.7 | 77.3 | 85.5 | 125.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 4 | 72.2 | 69.6 | 80.0 | 74.7 | 74.7 | 80.0 | 80.0 | 135.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 5 | 72.2 | 69.6 | 80.0 | 74.7 | 74.7 | 77.3 | 85.5 | 135.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 6 | 72.2 | 69.6 | 80.0 | 74.7 | 74.7 | 74.7 | 85.5 | 135.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 7 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 77.3 | 80.0 | 135.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 8 | 72.2 | 69.6 | 74.7 | 77.3 | 74.7 | 80.0 | 85.5 | 135.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 9 | 72.2 | 69.6 | 80.0 | 77.3 | 74.7 | 77.3 | 85.5 | 139.1 | 116.2 | 116.2 | 116.2 | 91.2 |
| 10 | 72.2 | 69.6 | 74.7 | 80.0 | 74.7 | 74.7 | 91.2 | 135.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 11 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 77.3 | 91.2 | 135.8 | 116.2 | 116.2 | 116.2 | 91.2 |
| 12 | 72.2 | 69.6 | 77.3 | 74.7 | 74.7 | 74.7 | 91.2 | 156.6 | 116.2 | 116.2 | 116.2 | 91.2 |
| 13 | 72.2 | 69.6 | 77.3 | 74.7 | 74.7 | 77.3 | 94.2 | 155.6 | 116.2 | 116.2 | 116.2 | 91.2 |
| 14 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 91.2 | 94.2 | 156.6 | 116.2 | 116.2 | 116.2 | 91.2 |
| 15 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 80.0 | 94.2 | 156.6 | 116.2 | 116.2 | 116.2 | 80.0 |
| 16 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 80.0 | 94.2 | 156.6 | 135.8 | 116.2 | 116.2 | 80.0 |
| 17 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 74.7 | 94.2 | 156.6 | 135.8 | 116.2 | 116.2 | 80.0 |
| 18 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 74.7 | 94.2 | 156.6 | 160.2 | 116.2 | 116.2 | 80.0 |
| 19 | 72.2 | 69.6 | 74.7 | 74.7 | 74.7 | 74.7 | 97.2 | 156.6 | 160.2 | 116.2 | 116.2 | 80.0 |
| 20 | 69.6 | 69.6 | 74.7 | 74.7 | 74.7 | 74.7 | 97.2 | 156.6 | 160.2 | 116.2 | 116.2 | 80.0 |
| 21 | 69.6 | 69.6 | 74.7 | 74.7 | 74.7 | 74.7 | 116.2 | 156.6 | 129.2 | 116.2 | 116.2 | 80.0 |
| 22 | 69.9 | 69.6 | 74.7 | 74.7 | 74.7 | 77.3 | 116.2 | 156.6 | 129.2 | 116.2 | 116.2 | 80.0 |
| 23 | 69.6 | 69.6 | 74.7 | 74.7 | 74.7 | 77.3 | 116.2 | 156.6 | 129.2 | 116.2 | 116.2 | 80.0 |
| 24 | 69.6 | 69.6 | 74.7 | 74.7 | 74.7 | 77.3 | 116.2 | 156.6 | 129.2 | 116.2 | 116.2 | 80.0 |
| 25 | 69.6 | 69.6 | 74.7 | 74.7 | 74.7 | 80.0 | 116.2 | 156.6 | 129.2 | 116.2 | 116.2 | 80.0 |
| 26 | 69.6 | 69.6 | 74.7 | 74.7 | 74.7 | 80.0 | 116.2 | 156.6 | 129.2 | 116.2 | 116.2 | 80.0 |
| 27 | 69.6 | 80.0 | 74.7 | 74.7 | 80.0 | 77.3 | 116.2 | 156.6 | 129.2 | 116.2 | 91.2 | 80.0 |
| 28 | 69.6 | 85.5 | 74.7 | 74.7 | 77.3 | 77.3 | 129.2 | 156.6 | 129.2 | 116.2 | 91.2 | 80.0 |
| 29 | 69.6 | ..... | 74.7 | 74.7 | 74.7 | 77.3 | 129.2 | 156.6 | 129.2 | 116.2 | 91.2 | 80.0 |
| 30 | 69.6 | ..... | 74.7 | 74.7 | 74.7 | 85.5 | 129.2 | 156.6 | 129.2 | 116.2 | 91.2 | 80.0 |
| 31 | 69.6 | ..... | 74.7 | ..... | 74.7 | ..... | 129.2 | 156.6 | ..... | 116.2 | ..... | 80.0 |
| Average | 70.8 | 70.5 | 77.1 | 75.0 | 75.0 | 77.7 | 100.2 | 149.2 | 127.5 | 117.0 | 112.2 | 85.0 |

*Estimated monthly discharge of Skaneateles outlet at Willow Glen weir, including diversion for supply of Syracuse.*

[Drainage area, 74 square miles.]

| Month. | Mean discharge in second-feet. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1901. | | | |
| July | 142.6 | 1.93 | 2.22 |
| August | 114.0 | 1.54 | 1.78 |
| September | 101.6 | 1.38 | 1.54 |
| October | 117.3 | 1.58 | 1.82 |
| November | 121.2 | 1.63 | 1.82 |
| December | 100.3 | 1.35 | 1.56 |
| 1902. | | | |
| January | 88.6 | 1.20 | 1.38 |
| February | 88.5 | 1.19 | 1.24 |
| March | 96.1 | 1.30 | 1.50 |
| April | 94.5 | 1.28 | 1.43 |
| May | 94.5 | 1.28 | 1.48 |
| June | 95.5 | 1.29 | 1.44 |
| July | 119.2 | 1.67 | 1.93 |
| August | 168.5 | 2.28 | 2.63 |
| September | 146.6 | 1.98 | 2.21 |

*Actual run-off of Skaneateles outlet at Willow Glen weir, 1902, in second-feet.*

| | | | |
|---|---|---|---|
| January | 70.8 | July | 100.2 |
| February | 70.5 | August | 149.2 |
| March | 77.1 | September | 127.5 |
| April | 75.0 | October | 117.0 |
| May | 75.0 | November | 112.2 |
| June | 77.7 | December | 85.0 |

## SENECA RIVER AT BALDWINSVILLE, N. Y.

This gaging station was established November 3, 1898, and is described in Water-Supply Papers No. 36, pages 183 to 184, and No. 65, pages 128 to 131, where also the estimated daily discharge and monthly run-off for preceding years may be found.

*Mean daily flow, in second-feet, of Seneca River at Baldwinsville, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 3,922 | 2,755 | 4,414 | 6,520 | 3,738 | 1,753 | 2,057 | 4,078 | 2,540 | 2,353 | 2,441 | 2,785 |
| 2 | 3,977 | 1,504 | 6,017 | 6,341 | 3,371 | 2,717 | 2,045 | 4,008 | 2,628 | 1,980 | 2,529 | 2,576 |
| 3 | 4,030 | 2,929 | 8,110 | 6,080 | 3,490 | 2,700 | 2,148 | 3,440 | 2,224 | 2,098 | 2,896 | 2,561 |
| 4 | 3,489 | 2,227 | 8,399 | 6,039 | 2,540 | 2,551 | 1,434 | 3,983 | 2,162 | 2,001 | 2,770 | 2,503 |
| 5 | 2,747 | 2,214 | 8,920 | 5,704 | 3,408 | 1,717 | 1,867 | 3,965 | 2,138 | 1,264 | 2,199 | 2,511 |
| 6 | 3,656 | 2,231 | 9,403 | 4,700 | 3,224 | 1,765 | 1,799 | 3,870 | 1,927 | 3,498 | 2,593 | 2,419 |
| 7 | 3,754 | 2,312 | 8,995 | 5,527 | 3,223 | 2,356 | 2,406 | 3,676 | 1,141 | 2,197 | 2,574 | 1,867 |
| 8 | 3,529 | 2,212 | 9,051 | 5,459 | 3,244 | 1,710 | 2,759 | 3,509 | 2,403 | 2,146 | 2,643 | 2,723 |
| 9 | 3,776 | 1,517 | 8,800 | 5,314 | 3,264 | 2,853 | 2,931 | 3,533 | 1,955 | 2,180 | 2,383 | 2,089 |
| 10 | 3,875 | 2,590 | 9,374 | 5,454 | 3,126 | 2,087 | 3,067 | 3,207 | 1,874 | 2,188 | 2,834 | 1,977 |
| 11 | 3,838 | 2,479 | 9,349 | 5,569 | 2,135 | 2,443 | 3,344 | 3,790 | 1,809 | 2,188 | 2,679 | 1,816 |
| 12 | 2,965 | 2,429 | 9,081 | 5,468 | 3,523 | 2,600 | 3,268 | 3,643 | 1,863 | 1,398 | 2,263 | 1,871 |
| 13 | 3,645 | 2,656 | 9,407 | 4,700 | 2,963 | 2,516 | 2,580 | 3,589 | 1,805 | 2,196 | 2,424 | 1,786 |
| 14 | 3,172 | 2,726 | 9,237 | 5,535 | 2,551 | 2,270 | 3,265 | 3,463 | 1,213 | 2,223 | 2,594 | 1,251 |
| 15 | 3,023 | 2,527 | 9,233 | 5,409 | 2,444 | 1,631 | 3,311 | 3,266 | 2,073 | 2,133 | 2,476 | 1,967 |
| 16 | 2,605 | 1,979 | 8,422 | 5,349 | 2,567 | 2,750 | 3,127 | 3,276 | 1,951 | 2,292 | 1,946 | 1,338 |
| 17 | 3,090 | 2,599 | 9,330 | 5,444 | 2,650 | 2,780 | 2,960 | 3,640 | 1,921 | 2,041 | 2,830 | 1,795 |
| 18 | 3,045 | 2,513 | 9,492 | 5,240 | 1,657 | 2,630 | 2,770 | 3,169 | 1,355 | 2,748 | 2,612 | 1,817 |
| 19 | 2,172 | 2,655 | 9,033 | 5,173 | 2,799 | 2,606 | 2,648 | 3,074 | 1,847 | 1,420 | 1,932 | 2,114 |
| 20 | 3,192 | 2,411 | 8,802 | 4,496 | 2,514 | 2,533 | 1,979 | 3,097 | 1,709 | 2,671 | 2,626 | 2,061 |
| 21 | 2,986 | 2,363 | 8,699 | 5,454 | 2,506 | 2,315 | 2,695 | 2,926 | 1,146 | 2,353 | 2,743 | 1,920 |
| 22 | 3,259 | 2,030 | 7,923 | 4,501 | 1,662 | 1,737 | 2,672 | 2,825 | 2,213 | 2,217 | 2,292 | 2,786 |
| 23 | 3,120 | 1,457 | 8,217 | 4,480 | 2,654 | 2,641 | 3,210 | 2,597 | 1,841 | 2,286 | 2,858 | 3,356 |
| 24 | 3,092 | 2,387 | 8,391 | 4,318 | 2,705 | 2,301 | 3,041 | 1,999 | 1,887 | 2,331 | 2,917 | 2,789 |
| 25 | 3,156 | 2,417 | 8,074 | 4,165 | 2,075 | 2,102 | 3,527 | 2,977 | 1,603 | 2,337 | 2,597 | 1,477 |
| 26 | 2,009 | 2,010 | 8,936 | 3,792 | 3,441 | 2,209 | 3,538 | 2,678 | 1,545 | 1,729 | 1,941 | 2,848 |
| 27 | 3,499 | 2,650 | 7,902 | 3,474 | 2,805 | 2,146 | 2,974 | 2,509 | 1,621 | 2,432 | 2,612 | 2,040 |
| 28 | 2,989 | 2,822 | 7,667 | 4,232 | 2,785 | 2,001 | 3,802 | 2,370 | 1,296 | 2,401 | 2,887 | 2,375 |
| 29 | 3,041 | ..... | 7,463 | 3,868 | 2,640 | 1,364 | 3,931 | 2,378 | 1,977 | 2,475 | 2,438 | 3,251 |
| 30 | 2,854 | ..... | 6,516 | 3,881 | 2,389 | 2,123 | 3,843 | 2,327 | 1,785 | 2,312 | 2,631 | 3,091 |
| 31 | 2,854 | ..... | 6,966 | ..... | 2,663 | ..... | 3,795 | 1,686 | ..... | 2,435 | ..... | 3,048 |

*Estimated monthly discharge of Seneca River at Baldwinsville, N. Y.*

[Drainage area, 3,103 square miles.]

| Month. | Mean discharge in second-feet. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | | | |
| January | 3,279 | 1.06 | 1.22 |
| February | 2,341 | .75 | .78 |
| March | 8,375 | 2.70 | 3.11 |
| April | 5,056 | 1.63 | 1.82 |
| May | 2,788 | .90 | 1.04 |
| June | 2,264 | .73 | .81 |
| July | 2,864 | .92 | 1.06 |
| August | 3,114 | 1.00 | 1.15 |
| September | 1,848 | .60 | .67 |
| October | 2,210 | .71 | .82 |
| November | 2,539 | .82 | .91 |
| December | 2,252 | .72 | .83 |
| The year | 3,245 | 1.04 | 14.22 |

## ONEIDA RIVER AT OAK ORCHARD, N. Y.

Oneida River forms the outlet of Oneida Lake and joins Seneca River at Three River Point to form Oswego River. Owing to the large surface storage in Oneida Lake and in other lakes and swamps within the watershed, the flow of the stream is unusually regular. There are two low dams in the stream; the one farther downstream at Oak Orchard is a State dam, having a lock at one end; the upper dam at Caughdenoy consists of five W-shaped barriers or eel weirs producing a combined fall of 5 feet during low water. Navigation in the stream is maintained by a lock around one end of the weirs. During extreme high water, the dams at Oak Orchard and Caughdenoy become entirely submerged. There is a dam 8 feet high at Phœnix on Oswego River, 4 miles below the mouth of Oneida River, and it is believed that backwater from this dam produces a smooth surface curve in Oswego and Oneida Rivers from Phœnix to Oneida Lake during extreme freshets. The gaging station was established at Oak Orchard August 30, 1902. The gage readings are taken from a bulkhead of the State lock, upstream from the dam, in order to avoid as much as possible the effect of backwater at ordinary stages, until its extent can be more definitely ascertained. Gage readings are taken twice daily at 7 a. m. and 6.30 p. m. by Arthur McArthur.

Discharge measurements are made at Schroeppel's bridge 0.4 of a mile below the dam. The bridge has five spans. The current is smooth and relatively deep and the stream bed regular and fairly permanent. The bridge spans are subdivided into smaller sections during low water by abandoned bridge piers underneath. A current-meter discharge measurement by R. E. Horton, July 22, 1902, gave the following results: Gage height, 2.75 feet; discharge, 3,307 second-feet.

*Mean daily gage height, in feet, of Oneida River at Oak Orchard, N. Y., for 1902.*

| Day. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 4.13 | 4.50 | 4.05 | 4.10 | 17 | ..... | 4,40 | 4.50 | 4.00 | 4.00 |
| 2 | ..... | 4.13 | 4.53 | 4.00 | 4.10 | 18 | ..... | 4.40 | 4.50 | 3.95 | 3.90 |
| 3 | ..... | 4.13 | 4.50 | 4.05 | 4.05 | 19 | ..... | 4.40 | 4.45 | 4.05 | 3.85 |
| 4 | ..... | 4.23 | 4.50 | 4.05 | 4.00 | 20 | ..... | 4.40 | 4.40 | 4.05 | 3.70 |
| 5 | ..... | 4.33 | 4.45 | 4.05 | 4.05 | 21 | ..... | 4.50 | 4.40 | 4.15 | 3.60 |
| 6 | ..... | 4.20 | 4.55 | 4.05 | 4.10 | 22 | ..... | 4.58 | 4.38 | 4.20 | 3.55 |
| 7 | ..... | 4.20 | 4.50 | 4.08 | 4.10 | 23 | ..... | 4.58 | 4.33 | 4.15 | 3.40 |
| 8 | ..... | 4.20 | 4.50 | 4.00 | 4.40 | 24 | ..... | 4.50 | 4.30 | 4.10 | 3.25 |
| 9 | ..... | 4.20 | 4.40 | 4.05 | 4.20 | 25 | ..... | 4.50 | 4.40 | 4.10 | 3.20 |
| 10 | ..... | 4.25 | 4.40 | 4.10 | 4.05 | 26 | ..... | 4.50 | 4.23 | 4.10 | 3.10 |
| 11 | ..... | 4.30 | 4.40 | 4.05 | 4.05 | 27 | ..... | 4.50 | 4.35 | 4.15 | 3.20 |
| 12 | ..... | 4.30 | 4.40 | 4.08 | 4.00 | 28 | ..... | 4.60 | 4.30 | 4.20 | 3.20 |
| 13 | ..... | 4.30 | 4.45 | 4.10 | 4.00 | 29 | ..... | 4.63 | 4.30 | 4.15 | 3.15 |
| 14 | ..... | 4.40 | 4.55 | 4.05 | 4.00 | 30 | 4.00 | 4.58 | 4.10 | 4.15 | 3.15 |
| 15 | ..... | 4.40 | 4.50 | 4.10 | 4.00 | 31 | 4.05 | ..... | 4.10 | ..... | 3.25 |
| 16 | ..... | 4.40 | 4.53 | 4.10 | 4.00 | | | | | | |

## OSWEGO RIVER AT FULTON, N. Y.

During the freshet of March, 1902, a series of observations of the depth on crest of the lower water-power dam on Oswego River at Fulton was taken by O. C. Breed, C. E. The dam has a horizontal crest 521 feet in length. The discharge has been calculated by the weir formula, using coefficients adapted to the cross section in question, selected from the United States deep waterways experiments on dams at Cornell University. On days when water wheels were running at the time of the gage height observations, the amount of water carried around the dam in headraces has been added to the flow from the spillway, the proper allowance having been determined by observations during low water of 1900. The drainage area above the dam is 4,916 square miles.

*Discharge of Oswego River at Fulton, N. Y.*

| Date. | Time. | Discharge. | Run-off. |
|---|---|---|---|
| 1902. | | *Second-feet.* | *Second-feet per square mile.* |
| March 2 | 9 a. m | [a]10,200 | 2.07 |
| Do | 5 p. m | 13,700 | 3.15 |
| March 3 | 7 a. m | 19,200 | 3.90 |
| Do | (?) p. m | 19,700 | 4.00 |
| March 9 | 9 a. m | 18,000 | 3.66 |
| March 10 | 10 a. m | 18,700 | 3.80 |
| March 13 | 12 m | 21,400 | 4.35 |
| March 16 | 10 a. m | 20,215 | 4.11 |
| March 17 | 8 a. m | 21,100 | 4.29 |
| March 23 | 10 a. m | 19,400 | 3.94 |
| March 30 | 9 a. m | 15,500 | 3.15 |

[a] Ice went off from pond above dam.

OSWEGO RIVER ABOVE MINETTO, N. Y.

This gaging station is described and daily elevation of water surface for 1900 and 1901 is given in Water-Supply Paper No. 65, pages 134 to 136. The cable way from which discharge measurements are made is situated three-fifths of a mile below Battle Island dam. The gage, from which observations are taken twice each day by H. L. Woodcock, is 2,930 feet upstream from the cable.

*Mean daily flow, in second-feet, of Oswego River above Minetto, N. Y.*

| Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|
| 1900. | | | | | 1900. | | | | |
| 1 | | 1,620 | 2,280 | 6,080 | 17 | 1,998 | 2,136 | 2,632 | 10,020 |
| 2 | | 1,620 | 2,280 | 5,819 | 18 | 1,620 | 2,040 | 2,472 | 10,748 |
| 3 | | 1,620 | 1,552 | 6,448 | 19 | 1,518 | 2,040 | 2,424 | 10,332 |
| 4 | | 1,704 | 1,552 | 6,448 | 20 | 1,662 | 2,472 | 2,968 | 10,228 |
| 5 | | 1,704 | 2,184 | 10,644 | 21 | 1,746 | 1,280 | 2,968 | 10,124 |
| 6 | | 1,704 | 2,424 | 12,477 | 22 | 1,704 | 1,830 | | 10,228 |
| 7 | | 1,280 | 2,520 | 12,477 | 23 | 1,956 | 2,328 | | 10,020 |
| 8 | | 1,348 | 2,472 | 12,477 | 24 | 1,662 | 1,704 | | 10,124 |
| 9 | | 1,914 | 2,376 | 12,150 | 25 | 1,314 | 1,704 | | 9,628 |
| 10 | | 1,704 | 2,280 | 11,714 | 26 | 1,518 | 1,746 | 2,688 | 9,814 |
| 11 | | 1,872 | 1,746 | 11,496 | 27 | 1,620 | 1,746 | 3,656 | 7,198 |
| 12 | | 1,998 | 2,688 | 11,060 | 28 | 1,586 | 1,320 | 4,586 | 6,632 |
| 13 | | 2,040 | 2,576 | 11,060 | 29 | 1,586 | 2,136 | 5,297 | 6,356 |
| 14 | 1,586 | 1,662 | 2,632 | 10,748 | 30 | 1,552 | 2,232 | 6,264 | 6,172 |
| 15 | 1,586 | 1,746 | 2,632 | 9,917 | 31 | | 2,376 | | 4,898 |
| 16 | 1,745 | 1,914 | 2,576 | 9,917 | | | | | |

*Mean daily flow, in second-feet, of Oswego River above Minetto, N. Y.*—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | 5,297 | 6,540 | 2,856 | 18,190 | 17,475 | 7,792 | 6,724 | 2,856 | 2,744 | 2,968 | 3,080 | 4,508 |
| 2 | 4,820 | 5,906 | 3,336 | 18,080 | 16,990 | 7,792 | 6,540 | 2,688 | 2,744 | 2,856 | 3,272 | 4,359 |
| 3 | 4,586 | 5,210 | 3,862 | 18,550 | 16,174 | 7,792 | 6,264 | 2,688 | 2,856 | 2,912 | 3,024 | 4,288 |
| 4 | 4,430 | 4,976 | 4,075 | 18,190 | 15,832 | 7,297 | 6,080 | 2,472 | 3,024 | 3,144 | 2,968 | 4,288 |
| 5 | 5,132 | 4,820 | 3,862 | 18,190 | 15,377 | 6,816 | 5,906 | 2,632 | 3,144 | 3,144 | 2,856 | 4,359 |
| 6 | 4,217 | 4,742 | 3,656 | 18,300 | 14,925 | 6,540 | 5,732 | 2,744 | 3,144 | 2,744 | 3,024 | 4,288 |
| 7 | 4,359 | 4,508 | 3,592 | 18,080 | 14,812 | 7,891 | 5,645 | 3,272 | 3,080 | 2,856 | 3,080 | 4,217 |
| 8 | 4,508 | 4,508 | 4,004 | 18,425 | 14,360 | 6,080 | 5,471 | 2,912 | 3,208 | 2,912 | 3,024 | 4,586 |
| 9 | 5,906 | 4,075 | 4,288 | 18,190 | 13,912 | 6,080 | 5,471 | 2,744 | 3,400 | 2,912 | 2,968 | 5,210 |
| 10 | 5,384 | 2,472 | 4,508 | 18,080 | 13,464 | 6,264 | 5,471 | 2,688 | 3,336 | 3,024 | 3,272 | 5,297 |
| 11 | 5,993 | 3,336 | 4,508 | 18,550 | 12,804 | 6,264 | 4,976 | 2,688 | 3,272 | 3,208 | 3,400 | 5,645 |
| 12 | 6,172 | 3,464 | 4,820 | 18,550 | 12,368 | 6,356 | 5,054 | 3,080 | 3,336 | 2,912 | 3,336 | 6,264 |
| 13 | 6,448 | 3,336 | 4,898 | 18,300 | 12,041 | 6,632 | 5,054 | 2,688 | 3,080 | 2,576 | 3,464 | 6,908 |
| 14 | 6,540 | 3,080 | 5,819 | 17,830 | 11,714 | 7,099 | 4,146 | 2,688 | 3,024 | 2,968 | 3,464 | 11,496 |
| 15 | 6,724 | 3,208 | 5,993 | 17,715 | 11,387 | 7,297 | 4,217 | 2,856 | 2,632 | 3,144 | 3,400 | 11,387 |
| 16 | 7,099 | 3,208 | 6,172 | 17,830 | 11,169 | 7,396 | 4,075 | 2,800 | 3,400 | 3,144 | 3,791 | 13,022 |
| 17 | 5,993 | 3,080 | 6,540 | 17,955 | 10,540 | 7,594 | 3,933 | 2,800 | 3,272 | 3,208 | 3,272 | 13,240 |
| 18 | 5,471 | 2,912 | 6,816 | 18,080 | 9,608 | 7,000 | 3,656 | 2,800 | 3,080 | 3,144 | 3,336 | 13,131 |
| 19 | 5,297 | 2,800 | 9,505 | 18,675 | 7,297 | 6,816 | 3,528 | 2,688 | 3,272 | 3,272 | 3,272 | 13,022 |
| 20 | 5,054 | 2,800 | 10,748 | 19,355 | 9,196 | 6,816 | 3,400 | 2,520 | 3,336 | 2,912 | 3,336 | 12,150 |
| 21 | 4,508 | 2,912 | 13,688 | 20,066 | 8,790 | 6,816 | 3,144 | 2,520 | 3,528 | 3,272 | 3,464 | 11,496 |
| 22 | 5,645 | 2,856 | 12,368 | 20,066 | 7,099 | 6,816 | 3,400 | 2,520 | 2,968 | 3,272 | 3,464 | 11,605 |
| 23 | 5,906 | 2,968 | 13,688 | 19,829 | 6,908 | 6,816 | 3,336 | 2,688 | 3,336 | 4,288 | 3,592 | 11,823 |
| 24 | 5,645 | 3,080 | 13,688 | 19,948 | 6,908 | 7,000 | 3,400 | 2,744 | 2,968 | 2,912 | 4,146 | 12,259 |
| 25 | 5,297 | 3,208 | 17,955 | 20,066 | 6,816 | 7,099 | 3,208 | 2,632 | 3,080 | 4,288 | 4,359 | 12,368 |
| 26 | 5,132 | 2,800 | 19,118 | 19,829 | 6,816 | 6,816 | 3,272 | 3,144 | 2,744 | 3,208 | 4,508 | 12,586 |
| 27 | 4,820 | 3,144 | 18,800 | 19,829 | 7,000 | 7,891 | 3,272 | 3,024 | 2,968 | 3,024 | 5,132 | 12,477 |
| 28 | 5,558 | 2,744 | 20,540 | 19,829 | 7,000 | 13,576 | 3,400 | 3,272 | 3,464 | 3,080 | 5,297 | 11,932 |
| 29 | 5,819 | ..... | 20,777 | 19,000 | 7,198 | 7,198 | 3,400 | 3,144 | 2,632 | 3,080 | 5,645 | 12,695 |
| 30 | 5,906 | ..... | 20,303 | 18,080 | 7,198 | 6,816 | 3,144 | 3,024 | 2,856 | 3,208 | 5,819 | 11,823 |
| 31 | 6,080 | ..... | 19,711 | ..... | 6,816 | ..... | 2,968 | 3,208 | ..... | 3,080 | ..... | 11,169 |

*Mean daily flow, in second-feet, of Oswego River above Minetto, N. Y.*—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 10,956 | 7,396 | 8,690 | 15,718 | 8,890 | 6,080 | 7,396 | 8,390 | 4,742 | 3,656 | 5,601 | 5,514 |
| 2 | 10,124 | 7,297 | 14,699 | 15,151 | 8,790 | 6,172 | 7,891 | 7,297 | 4,742 | 3,933 | 5,732 | 5,297 |
| 3 | 10,644 | 7,198 | 19,237 | 14,812 | 8,690 | 6,080 | 8,290 | 8,290 | 4,586 | 4,004 | 5,732 | 5,210 |
| 4 | 10,332 | 7,396 | 19,000 | 14,586 | 8,190 | 5,993 | 8,290 | 8,190 | 4,586 | 4,288 | 5,732 | 5,210 |
| 5 | 10,020 | 7,297 | 18,900 | 14,473 | 8,390 | 5,993 | 8,590 | 8,090 | 4,430 | 4,004 | 5,732 | 3,614 |
| 6 | 10,020 | 7,099 | 19,237 | 14,024 | 8,090 | 5,993 | 8,290 | 8,090 | 4,288 | 4,146 | 5,601 | 5,054 |
| 7 | 10,124 | 5,210 | 19,000 | 14,248 | 7,792 | 5,906 | 8,790 | 8,290 | 1,416 | 4,146 | 5,732 | 4,586 |
| 8 | 10,228 | 7,000 | 18,550 | 13,912 | 7,396 | 5,732 | 8,790 | 7,891 | 4,004 | 4,288 | 5,906 | 4,820 |
| 9 | 10,332 | 6,908 | 19,000 | 13,800 | 6,908 | 6,264 | 8,690 | 7,990 | 1,348 | 4,288 | 4,508 | 4,838 |
| 10 | 10,020 | 6,908 | 19,000 | 13,576 | 6,908 | 6,356 | 8,690 | 8,290 | 1,620 | 4,288 | 5,861 | 4,976 |
| 11 | 9,711 | 6,632 | 19,355 | 13,464 | 6,448 | 6,448 | 8,590 | 8,690 | 1,586 | 4,288 | 5,906 | 5,132 |
| 12 | 9,917 | 6,816 | 19,829 | 13,240 | 6,724 | 6,540 | 8,490 | 8,590 | 1,518 | 4,004 | 5,732 | 5,210 |
| 13 | 9,814 | 6,908 | 21,518 | 13,131 | 6,632 | 6,816 | 8,490 | 7,990 | 1,620 | 4,146 | 5,732 | 5,210 |
| 14 | 9,711 | 6,724 | 21,518 | 12,913 | 6,540 | 6,540 | 8,290 | 7,990 | 1,484 | 4,288 | 5,558 | 5,334 |
| 15 | 8,990 | 6,540 | 21,400 | 12,804 | 6,356 | 6,264 | 8,090 | 7,693 | 1,552 | 4,288 | 5,471 | 5,334 |
| 16 | 8,790 | 6,540 | 19,948 | 12,695 | 6,172 | 6,448 | 7,792 | 7,693 | 1,552 | 4,586 | 4,898 | 5,558 |
| 17 | 8,390 | 6,724 | 20,066 | 12,695 | 5,906 | 6,540 | 7,693 | 7,198 | 1,620 | 4,742 | 5,732 | 5,645 |
| 18 | 8,390 | 6,724 | 20,540 | 12,477 | 5,132 | 6,356 | 8,290 | 7,396 | 3,862 | 4,742 | 5,906 | 5,558 |
| 19 | 8,190 | 6,540 | 20,185 | 12,041 | 5,558 | 6,264 | 6,816 | 6,632 | 3,933 | 4,430 | 6,034 | 5,558 |
| 20 | 7,495 | 5,054 | 20,303 | 10,852 | 5,132 | 6,080 | 7,297 | 6,540 | 3,862 | 4,586 | 6,080 | 5,384 |
| 21 | 6,816 | 4,820 | 19,829 | 11,278 | 4,898 | 6,172 | 7,099 | 6,264 | 3,400 | 4,288 | 6,080 | 4,976 |
| 22 | 7,396 | 4,430 | 19,711 | 11,060 | 4,820 | 5,906 | 7,099 | 5,993 | 3,464 | 4,664 | 6,218 | 4,898 |
| 23 | 5,819 | 4,430 | 19,000 | 10,748 | 4,586 | 6,080 | 7,495 | 5,906 | 3,464 | 5,210 | 5,993 | 5,384 |
| 24 | 7,891 | 4,508 | 18,425 | 10,436 | 4,586 | 6,172 | 7,891 | 5,645 | 3,464 | 5,384 | 6,264 | 5,471 |
| 25 | 7,693 | 4,586 | 17,955 | 10,228 | 4,359 | 6,264 | 7,792 | 5,645 | 3,336 | 5,558 | 6,264 | 5,384 |
| 26 | 7,594 | 4,586 | 17,600 | 10,020 | 6,632 | 6,356 | 8,090 | 5,558 | 3,336 | 5,558 | 6,264 | 5,210 |
| 27 | 7,297 | 4,898 | 17,230 | 8,690 | 6,540 | 6,172 | 8,190 | 4,976 | 3,336 | 5,558 | 6,172 | 5,210 |
| 28 | 7,099 | 7,495 | 16,516 | 9,093 | 6,632 | 5,993 | 8,290 | 5,210 | 2,968 | 5,558 | 6,034 | 4,586 |
| 29 | 7,297 | ..... | 16,060 | 9,093 | 6,724 | 6,080 | 8,290 | 5,054 | 3,272 | 5,732 | 5,819 | 4,586 |
| 30 | 5,906 | ..... | 16,402 | 9,093 | 6,816 | 6,448 | 8,090 | 5,054 | 3,336 | 5,732 | 5,645 | 4,820 |
| 31 | 7,396 | ..... | 16,060 | ..... | 6,356 | ..... | 7,891 | 4,430 | ..... | 5,732 | ..... | 4,898 |

*Estimated monthly discharge of Oswego River above Minetto, N. Y.*

[Drainage area, 4,990 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1900. | *Sec.-ft.* | | |
| September | 1,644 | 0.32 | 0.36 |
| October | 1,823 | .36 | .41 |
| November | 2,797 | .56 | .62 |
| December | 9,465 | 1.89 | 2.18 |
| 1901. | | | |
| January | 5,475 | 1.09 | 1.26 |
| February | 3,667 | .73 | .76 |
| March | 9,499 | 1.90 | 2.19 |
| April | 18,721 | 3.74 | 4.17 |
| May | 10,967 | 2.19 | 2.52 |
| June | 7,215 | 1.44 | 1.61 |
| July | 4,428 | .88 | 1.01 |
| August | 2,813 | .56 | .64 |
| September | 3,097 | .62 | .69 |
| October | 3,118 | .62 | .84 |
| November | 3,668 | .73 | .81 |
| December | 9,158 | 1.83 | 2.11 |
| The year | 6,819 | 1.36 | 18.61 |
| 1902. | | | |
| January | 8,722 | 1.64 | 1.89 |
| February | 6,238 | 1.25 | 1.31 |
| March | 18,540 | 3.71 | 4.28 |
| April | 12,345 | 2.47 | 2.76 |
| May | 5,567 | 1.31 | 1.51 |
| June | 6,216 | 1.24 | 1.38 |
| July | 8,056 | 1.61 | 1.86 |
| August | 6,998 | 1.40 | 1.61 |
| September | 3,057 | .61 | .68 |
| October | 4,648 | 1.16 | 1.08 |
| November | 5,797 | .94 | 1.29 |
| December | 5,116 | 1.02 | 1.18 |
| The year | 7,608 | 1.53 | 20.83 |

*Current-meter discharge measurements of Oswego River at cable station.*

| Date. | Hydrographer. | Elevation of water surface. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Sec.-ft.* |
| August 19 | E. C. Murphy | 87.34 | 6,562 |
| Do | do | 87.44 | 6,999 |
| July 21 | R. E. Horton | 87.87 | 8,445 |
| July 9 | E. C. Murphy | 88.37 | 8,585 |
| Do | do | 88.41 | 9,019 |
| July 8 | do | 88.42 | 8,634 |
| Do | do | 88.44 | 8,601 |
| April 1 | do | 91.52 | 15,653 |
| March 31 | do | 91.77 | 15,982 |

A rating curve for the cross section at the cable station has been plotted from the above discharge measurements and those previously made and the daily discharge and run-off calculated as given in the accompanying tables. No allowance for water diverted to Oswego Canal has been made. It is the intention, however, to make a series of measurements of the flow in this canal.

March 13 at 5 p. m. the stream reached an elevation of water surface of 94.45 corresponding to a discharge of about 22,500 second-feet, or 4.5 second-feet per square mile. The ice flowed out of the level in which the cable is situated March 7.

## OSWEGO RIVER AT HIGH DAM, NEW YORK.

This gaging station is described and the mean daily discharge and run-off for 1897 to 1901, inclusive, are given in Water-Supply Paper No. 65, pages 137 to 139. Owing to the irregular and uncertain condition of flashboards on the dam it has been impossible to calculate the discharge for the year 1902 in a reliable manner, and the record is withheld until additional information can be secured. A current-meter discharge measurement of the flow in the headrace at the dam was made July 21, 1902; all water wheels were running and the measured flow was 650 second-feet, the effective head on the turbines being 13 feet.

## ST. LAWRENCE RIVER DRAINAGE BASIN.

### RAQUETTE RIVER AT HANNAWA FALLS, N. Y.

The watershed of this stream is described in Water-Supply Paper No. 65, pages 36 to 38. A gaging record at the dam of the Hannawa Falls Water Power Company has been kept, beginning September 1, 1902. The record includes the depth flowing over the crest of the dam, the number of hours run, and width of gate opening of each of the two pairs of water wheels in use. The nominal working head is 85 feet. A record of the height of the water in the forebay and also in the tailrace is kept, from which the variations in the effective head can be determined for the purpose of calculating the discharge through the turbines. The height of opening of the waste gates used for log sluicing and freshet control at the dam, and of the overflow gate at the entrance to the power canal is also recorded.

### RICHELIEU RIVER AT FORT MONTGOMERY, N. Y.

Richelieu River, the outlet of Lake Champlain, leaves the lake at Rouse Point near the international boundary between New York and Canada. A record of the daily stage of the lake at its outlet has been kept since January 1, 1875. Data for reducing the observed elevation of water surface to equivalent discharge in the outlet were obtained by the United States Board of Engineers on Deep Waterways at the Chambly dam in 1898. The resulting calculated monthly mean flow and other discharge data are to be found in Water-Supply Paper No. 65, pages 38 to 42. Through the courtesy of Capt. Harry Taylor, U. S. Army, the gage readings taken daily are reported each week to the United States Geological Survey.

The gage readings are taken by measuring with a rod the depth of water on the base of the scarp wall of the north bastion of Fort Montgomery about 3 feet from the angle with the east curtain of the fort. The elevation of this datum is 95 feet above tide. The gage readings are referred to a datum 1.5 feet lower; 1.5 feet being added to the measured depth to obtain the recorded gage height.[a] During winter, when the lake is frozen over, the gage height is measured in an open well, which does not freeze, situated within the fort inclosure.

[a] The gage zero elevation, 93.50 above mean tide at New York, is the lowest recorded stage of the lake.

*Mean daily flow, in second-feet, of Richelieu River at Fort Montgomery, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 13,240 | 11,460 | 10,610 | 37,400 | 26,440 | 22,180 | 18,660 | 14,740 | 11,630 | 9,080 | 10,270 | 10,540 |
| 2 | 13,980 | 11,460 | 12,160 | 36,700 | 26,180 | 21,700 | 18,450 | 15,120 | 11,290 | 8,570 | 10,950 | 10,100 |
| 3 | 13,240 | 11,460 | 15,880 | 36,350 | 26,440 | 21,040 | 18,660 | 14,930 | 11,290 | 8,740 | 11,290 | 10,610 |
| 4 | 13,240 | 11,460 | 19,500 | 36,000 | 26,180 | 17,820 | 18,240 | 14,360 | 10,440 | 8,400 | 10,950 | 9,760 |
| 5 | 13,600 | 11,630 | 21,260 | 35,340 | 25,920 | 21,260 | 18,030 | 14,170 | 10,270 | 8,910 | 10,950 | 9,420 |
| 6 | 13,240 | 11,460 | 22,180 | 35,010 | 25,140 | 21,040 | 17,610 | 14,550 | 10,610 | 8,570 | 11,980 | 9,930 |
| 7 | 13,240 | 11,460 | 22,660 | 34,350 | 26,700 | 21,480 | 18,450 | 14,360 | 11,290 | 9,420 | 10,850 | 10,440 |
| 8 | 12,880 | 11,290 | 22,660 | 33,360 | 25,140 | 20,160 | 17,820 | 13,980 | 10,440 | 8,570 | 10,440 | 10,100 |
| 9 | 12,880 | 11,290 | 23,140 | 31,770 | 24,100 | 20,380 | 17,400 | 14,170 | 10,950 | 8,400 | 10,610 | 9,760 |
| 10 | 12,700 | 11,290 | 23,380 | 32,390 | 23,380 | 20,380 | 16,640 | 14,170 | 10,100 | 8,400 | 10,100 | 10,950 |
| 11 | 12,520 | 11,120 | 23,620 | 32,390 | 23,620 | 20,600 | 16,260 | 14,360 | 10,780 | 9,420 | 10,270 | 9,420 |
| 12 | 12,520 | 11,120 | 23,620 | 32,080 | 23,140 | 20,160 | 17,400 | 13,790 | 10,270 | 8,060 | 12,160 | 9,420 |
| 13 | 12,700 | 10,950 | 25,140 | 32,390 | 22,660 | 20,380 | 16,450 | 13,600 | ------- | 9,080 | 10,440 | 9,420 |
| 14 | 12,340 | 10,950 | 27,860 | 32,080 | 21,700 | 19,940 | 16,070 | 13,790 | 9,930 | 8,230 | 10,100 | 9,590 |
| 15 | 12,520 | 10,950 | 29,910 | 31,770 | 21,700 | 20,820 | 15,880 | 13,420 | 10,270 | 8,910 | 10,950 | 9,420 |
| 16 | 12,340 | 10,780 | ------- | 31,150 | 21,700 | 20,380 | 15,310 | 13,420 | 10,100 | 8,060 | 10,440 | 13,790 |
| 17 | 11,980 | 10,780 | 31,460 | 30,220 | 21,040 | 21,040 | 16,070 | 13,060 | 10,100 | 8,230 | 10,440 | 10,610 |
| 18 | 12,160 | 10,780 | 34,020 | 29,910 | 20,600 | 21,260 | 15,120 | 12,880 | 12,160 | 8,570 | 11,290 | 9,590 |
| 19 | 11,630 | 10,610 | 35,010 | 29,910 | 20,380 | 21,700 | 15,310 | 12,880 | 9,930 | 8,570 | 11,120 | 9,930 |
| 20 | 11,630 | 10,610 | 35,340 | 29,310 | 19,500 | 21,040 | 15,120 | 12,700 | 9,590 | 8,400 | 10,780 | 9,590 |
| 21 | 11,460 | 10,440 | 35,340 | 28,440 | 19,720 | 21,040 | 15,500 | 13,600 | 9,930 | 7,890 | 11,120 | 10,440 |
| 22 | 11,290 | 10,270 | 36,000 | 29,020 | 19,290 | 21,040 | 15,120 | 12,880 | 10,100 | 8,570 | 11,120 | 9,930 |
| 23 | 11,630 | 10,270 | 36,700 | 28,440 | 18,870 | 20,380 | 15,310 | 12,340 | 9,930 | 7,550 | 10,270 | 10,270 |
| 24 | 11,460 | 10,270 | 37,050 | 27,860 | 18,240 | 20,380 | 15,310 | 12,160 | 9,080 | 10,100 | 11,290 | 10,610 |
| 25 | 11,460 | 10,100 | 37,050 | 27,570 | 18,660 | 19,940 | 15,500 | 11,980 | 9,250 | 7,720 | 10,100 | 11,120 |
| 26 | 11,630 | 10,100 | 36,700 | 29,020 | 18,870 | 20,160 | 15,690 | 12,340 | 9,930 | 8,570 | 10,100 | 11,290 |
| 27 | 11,630 | 10,100 | 37,400 | 27,280 | 18,870 | 19,500 | 15,690 | 11,980 | 9,420 | 9,250 | 10,950 | 11,290 |
| 28 | 11,460 | 10,100 | 37,050 | 26,700 | 19,940 | 19,080 | 15,120 | 11,800 | 9,250 | 8,060 | 10,440 | 11,290 |
| 29 | 11,630 | ------- | 36,350 | 26,700 | 21,940 | 18,870 | 14,930 | 11,980 | 8,740 | 8,570 | 10,780 | 11,460 |
| 30 | 11,460 | ------- | 36,000 | 27,570 | 21,040 | 19,080 | 14,740 | 11,800 | 8,910 | 9,760 | 10,780 | 11,290 |
| 31 | 11,460 | ------- | 37,050 | ------- | 21,700 | ------- | 14,740 | 11,460 | ------- | 9,760 | ------- | 11,290 |
| Mean | 12,295 | 10,877 | 28,700 | 31,282 | 22,212 | 20,474 | 16,338 | 13,315 | 10,206 | 8,657 | 10,777 | 10,405 |

*Estimated monthly discharge of Lake Champlain drainage basin at Chambly, Province of Quebec.*

[Drainage area, 7,750 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Second-feet.* | | |
| January | 12,295 | 1.59 | 1.83 |
| February | 10,877 | 1.40 | 1.42 |
| March | 28,700 | 3.70 | 4.27 |
| April | 31,282 | 4.04 | 4.51 |
| May | 22,212 | 2.87 | 3.31 |
| June | 20,474 | 2.64 | 2.95 |
| July | 16,338 | 2.11 | 2.43 |
| August | 13,315 | 1.72 | 1.98 |
| September | 10,206 | 1.32 | 1.47 |
| October | 8,657 | 1.12 | 1.29 |
| November | 10,777 | 1.39 | 1.55 |
| December | 10,405 | 1.34 | 1.54 |
| The year | 16,299 | 2.10 | 28.55 |

## MOHAWK RIVER DRAINAGE BASIN.

### ORISKANY CREEK NEAR ORISKANY, N. Y.

This gaging station was established at Wood road bridge, 1 mile above Oriskany village, June 25, 1901, taking the place of a station previously maintained at the New York State dam at Oriskany. Both stations are described and records given for preceding years in Water-Supply Paper No. 65, pages 145 to 149.

*Current-meter discharge measurements of Oriskany Creek at Wood road bridge.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| September 9 | C. C. Covert | 2.00 | 275 |
| March 3 | R. E. Horton | 5.12 | 2,125 |

March 1, 1902, the calculated discharge over the Waterbury dam at Oriskany was 5,200 second-feet, the gage reading at Wood road bridge being 8.26 feet. This was taken after the ice floe passed downstream.

The calculated maximum discharge of Oriskany Creek during the freshet of December 15–16, 1901, was 7,350 second-feet, or 51.4 second-feet per square mile.

*Mean daily gage height, in feet, of Oriskany Creek near Oriskany, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 3.70 | 3.20 | 8.00 | 2.60 | 1.85 | 1.80 | 2.50 | 2.50 | 1.50 | 2.50 | 2.50 | 2.30 |
| 2 | 4.40 | 3.00 | 7.00 | 2.90 | 1.80 | 1.60 | 2.10 | 2.90 | 1.95 | 2.70 | 2.35 | 2.15 |
| 3 | 4.70 | 3.00 | 6.00 | 3.10 | 2.05 | 2.15 | 2.70 | 2.40 | 2.20 | 2.05 | 2.35 | 2.45 |
| 4 | 4.45 | 3.50 | 4.80 | 2.75 | 2.40 | 3.05 | 3.30 | 2.30 | 2.75 | 1.70 | 2.35 | 2.70 |
| 5 | 4.00 | 3.40 | 3.45 | 2.70 | 1.90 | 2.50 | 4.30 | 2.00 | 2.15 | 1.70 | 2.20 | 2.30 |
| 6 | 3.90 | 3.20 | 2.95 | 2.60 | 1.90 | 2.05 | 3.60 | 3.70 | 1.70 | 2.20 | 2.55 | 2.50 |
| 7 | 3.85 | 3.05 | 2.90 | 2.50 | 1.90 | 2.00 | 3.50 | 3.10 | 1.95 | 2.30 | 2.30 | 3.40 |
| 8 | 3.80 | 3.00 | 2.70 | 2.40 | 1.80 | 2.40 | 3.20 | 3.25 | 1.65 | 2.15 | 2.00 | 3.75 |
| 9 | 3.60 | 3.00 | 2.60 | 2.55 | 1.80 | 3.10 | 2.90 | 2.40 | 1.80 | 2.00 | 2.00 | 4.65 |
| 10 | 3.40 | 2.80 | 2.75 | 3.25 | 1.75 | 3.50 | 3.75 | 2.05 | 2.20 | 1.80 | 1.90 | 4.50 |
| 11 | 3.60 | 2.80 | 3.00 | 2.70 | 1.65 | 3.10 | 2.80 | 2.45 | 1.90 | 1.65 | 2.15 | 4.60 |
| 12 | 3.15 | 3.10 | 6.10 | 2.45 | 1.60 | 2.70 | 2.40 | 2.25 | 1.70 | 1.65 | 2.30 | 4.60 |
| 13 | 2.80 | 3.10 | 6.05 | 2.70 | 1.60 | 2.20 | 2.00 | 2.00 | 1.40 | 1.80 | 2.35 | 4.60 |
| 14 | 2.60 | 3.10 | 4.90 | 2.65 | 1.60 | 2.25 | 1.80 | 2.00 | 1.40 | 1.80 | 2.20 | 4.50 |
| 15 | 2.60 | 3.10 | 3.90 | 2.40 | 1.60 | 2.25 | 2.70 | 1.80 | 1.60 | 1.65 | 2.05 | 4.50 |
| 16 | 2.60 | 3.10 | 4.15 | 2.40 | 1.20 | 2.00 | 2.60 | 1.60 | 1.60 | 1.65 | 1.95 | 4.90 |
| 17 | 3.00 | 3.10 | 5.80 | 2.40 | 1.20 | 1.90 | 2.25 | 1.75 | 1.60 | 1.60 | 2.05 | 5.70 |
| 18 | 2.70 | 3.10 | 4.70 | 2.30 | 1.40 | 1.85 | 1.90 | 2.10 | 1.70 | 1.60 | 2.25 | 5.30 |
| 19 | 2.60 | 3.10 | 4.00 | 2.20 | 1.50 | 2.00 | 2.35 | 2.50 | 1.60 | 2.25 | 2.10 | 4.80 |
| 20 | 2.60 | 3.10 | 3.05 | 2.20 | 1.85 | 1.90 | 2.50 | 2.10 | 1.40 | 2.10 | 1.80 | 4.40 |
| 21 | 2.80 | 3.15 | 3.20 | 2.20 | 1.60 | 2.00 | 4.00 | 2.10 | 1.55 | 2.20 | 1.95 | 4.15 |
| 22 | 3.70 | 3.20 | 3.15 | 2.10 | 1.40 | 1.90 | 3.90 | 2.50 | 1.60 | 1.95 | 1.80 | 4.90 |
| 23 | 3.45 | 3.20 | 3.20 | 2.00 | 1.25 | 2.00 | 3.25 | 2.70 | 1.50 | 2.20 | 1.70 | 5.95 |
| 24 | 3.20 | 3.20 | 3.25 | 1.90 | 2.00 | 2.00 | 2.80 | 2.15 | 1.60 | 2.15 | 2.05 | 3.40 |
| 25 | 3.20 | 3.40 | 3.00 | 1.90 | 1.90 | 1.80 | 2.55 | 1.90 | 1.60 | 1.90 | 2.20 | 3.90 |
| 26 | 3.25 | 3.45 | 2.80 | 1.90 | 2.90 | 2.10 | 2.25 | 1.60 | 1.90 | 1.80 | 2.30 | 3.80 |
| 27 | 3.65 | 3.90 | 2.70 | 1.90 | 2.85 | 2.00 | 1.90 | 1.45 | 1.50 | 2.00 | 2.55 | 3.90 |
| 28 | 3.60 | 5.00 | 2.70 | 1.90 | 2.75 | 1.85 | 2.60 | 1.85 | 1.60 | 5.10 | 2.80 | 3.85 |
| 29 | 3.60 | ..... | 3.05 | 1.90 | 2.80 | 1.85 | 2.70 | 1.70 | 1.95 | 3.50 | 2.45 | 4.00 |
| 30 | 3.50 | ..... | 2.90 | 2.00 | 3.20 | 2.25 | 2.35 | 1.55 | 2.20 | 2.90 | 2.20 | 3.95 |
| 31 | 3.40 | ..... | 2.70 | ..... | 2.70 | ..... | 2.30 | 1.45 | ..... | 2.90 | ..... | 3.80 |

MOHAWK RIVER AT UTICA, N. Y.

This gaging station is described in Water-Supply Paper No. 65, pages 151 to 153. March 1 and 2, 1902, a freshet occurred, accompanied by the breaking up of the winter's ice accumulation, which raised the water to elevation 407.14, the estimated discharge being 17,200 second-feet from the drainage area of 500 square miles, or 34.4 second-feet per square mile.

*Mean daily flow, in second-feet, of Mohawk River at Utica, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 536 | 283 | 11,750 | ..... | 1,972 | ..... | 1,618 | 408 | 383 | 589 | 1,585 | 870 |
| 2 | 631 | 484 | 11,150 | 1,264 | 771 | ..... | 1,972 | 1,900 | 383 | 743 | 743 | 785 |
| 3 | 617 | 420 | 10,300 | 1,652 | 562 | ..... | 2,009 | ..... | 270 | 575 | 743 | 960 |
| 4 | 484 | 420 | 6,800 | 1,295 | ..... | ..... | ..... | 433 | 270 | 484 | 673 | 2,085 |
| 5 | ..... | 445 | 4,520 | 1,110 | 617 | 1,900 | 3,542 | 1,140 | 445 | 445 | 659 | 1,486 |
| 6 | 510 | 445 | 3,840 | 1,140 | 523 | 743 | ..... | 1,295 | ..... | 510 | 645 | 687 |
| 7 | 471 | 420 | 1,990 | 1,020 | 523 | 510 | ..... | 2,200 | ..... | 945 | 1,080 | 715 |
| 8 | 471 | 420 | 1,810 | 900 | 562 | 673 | 2,688 | 1,520 | ..... | 1,233 | 743 | 900 |
| 9 | 471 | 433 | 1,653 | 900 | 370 | 1,050 | 1,619 | 1,520 | [a]35 | 729 | 575 | 813 |
| 10 | 433 | 420 | 1,155 | 2,085 | 320 | 631 | 1,828 | ..... | 1,232 | 484 | 458 | 701 |
| 11 | 433 | 701 | ..... | 1,864 | ..... | 1,775 | 1,810 | 715 | 645 | 458 | 589 | 841 |
| 12 | 395 | 420 | 3,200 | 1,186 | 270 | 1,065 | 870 | 1,536 | [a]69 | 458 | 645 | 729 |
| 13 | 345 | 420 | 5,895 | 1,110 | ..... | 1,264 | 701 | 757 | 370 | 484 | 1,050 | ..... |
| 14 | 358 | 420 | 4,700 | 1,005 | 320 | 1,080 | 645 | 617 | 345 | 471 | 757 | 549 |
| 15 | 408 | 445 | 3,542 | 870 | 295 | ..... | 930 | 523 | 715 | 471 | 631 | 617 |
| 16 | 408 | 445 | 3,060 | 729 | 295 | ..... | 1,810 | 484 | 510 | 458 | 631 | 645 |
| 17 | 283 | 433 | 4,640 | 659 | 220 | 549 | 1,586 | ..... | 484 | 383 | 562 | ..... |
| 18 | 370 | 433 | ..... | 589 | 208 | 549 | 870 | 471 | 562 | 395 | 562 | 2,661 |
| 19 | 370 | 433 | 3,025 | 497 | 308 | ..... | 701 | 484 | 562 | ..... | 589 | 2,920 |
| 20 | 370 | 433 | 2,085 | 458 | 433 | 484 | 2,085 | 523 | 562 | 1,900 | 701 | 2,850 |
| 21 | 395 | 433 | 1,295 | 484 | 283 | ..... | 2,767 | 484 | 471 | ..... | 603 | 2,066 |
| 22 | 420 | 445 | 1,390 | 433 | 245 | ..... | 3,684 | 484 | 458 | ..... | 645 | 2,280 |
| 23 | 1,050 | 445 | 1,864 | 458 | 245 | 900 | 3,200 | 484 | 484 | ..... | 975 | 3,390 |
| 24 | 1,050 | 471 | 1,705 | ..... | 585 | 549 | 1,825 | ..... | 220 | ..... | 900 | ..... |
| 25 | 562 | 471 | 1,342 | 270 | ..... | 484 | 1,005 | 484 | 220 | ..... | 799 | 2,520 |
| 26 | 673 | 538 | 1,140 | 383 | 1,520 | 960 | 813 | 395 | 245 | 562 | 617 | 1,486 |
| 27 | 729 | 1,828 | 1,050 | 536 | 2,085 | 2,180 | ..... | 471 | 245 | 631 | ..... | 1,020 |
| 28 | 729 | ..... | 1,020 | 562 | 1,035 | 1,536 | 1,687 | 420 | 320 | 3,200 | 2,085 | ..... |
| 29 | 785 | ..... | 1,342 | 270 | 1,110 | ..... | 1,653 | 383 | 1,080 | 4,100 | 1,232 | 813 |
| 30 | 673 | ..... | 2,240 | 1,520 | 1,202 | 1,569 | 715 | 383 | 743 | 3,095 | 855 | 757 |
| 31 | 510 | ..... | 1,279 | ..... | 701 | ..... | 433 | 383 | ..... | 1,586 | ..... | 799 |

[a] Below limit of rating curve.

*Current-meter discharge measurements of Mohawk River at Utica, N. Y.*

| Date. | Elevation of water surface. | Discharge. | Hydrographer. |
|---|---|---|---|
| 1902. | *Feet.* | *Sec.-ft.* | |
| March 4 | 405.96 | 11,678 | R. E. Horton. |
| July 1 | 398.63 | 2,071 | H. R. Beebe. |
| July 3 | 400.43 | 2,589 | Do. |
| July 7 | 403.11 | 4,391 | Do. |
| August 22 | 395.17 | 454 | C. C. Covert. |
| December 10 | 395.97 | [a]681 | R. E. Horton. |
| December 11 | 396.47 | [a]817 | C. C. Covert. |

[a] Measured through 6 inches of ice at Schuyler street bridge, Utica, N. Y.

*Estimated monthly discharge of Mohawk River at Utica, N. Y.*

[Drainage area, 500 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Second-feet.* | | |
| January | 531 | 1.06 | 1.22 |
| February | 496 | .99 | 1.03 |
| March | 3,475 | 6.95 | 7.99 |
| April | 902 | 1.80 | 2.01 |
| May | 651 | 1.30 | 1.50 |
| June | 1,023 | 2.04 | 2.28 |
| July | 1,669 | 3.33 | 3.84 |
| August | 774 | 1.54 | 1.78 |
| September | 457 | .91 | 1.01 |
| October | 1,016 | 2.03 | 2.34 |
| November | 805 | 1.61 | 1.80 |
| December | 1,368 | 2.74 | 3.16 |
| The year | 1,097 | 2.19 | 29.96 |

## REELS CREEK NEAR UTICA, N. Y.

Reels Creek is tributary to the Mohawk River from the north at Utica, N. Y. Its drainage basin is shown on the Utica sheet of the United States Geological Survey; the watershed is hilly. The stream receives numerous lateral tributaries, draining deep ravines and entering the main stream at short intervals in a manner conducive to the rapid carrying off of surface waters. The watershed is mostly pasture land, some timber, and a small percentage of cultivated fields. A deep soil of clay and gravel is underlain with loose shale. There is very little swamp or "spring ground." Tributaries which head in the gravel of the serrated hillsides as a rule become dry at times. Others, which have shale beds, are fed by springs of percolating water which has passed through the glacial drift to the rock horizon.

In 1900 a masonry intake dam was constructed on the stream 4 miles north of Utica by the Consolidated Water Company, of Utica. Beginning January 1, 1901, a record has been kept of the wastage at this dam, as well as the diversion for water-supply purposes whenever water has been taken. A record of the precipitation on the watershed has been kept at Deerfield reservoir, 1 mile downstream from the intake dam. The records of rainfall and stream flow have been furnished by William S. Bacot, civil engineer.

The intake dam has a spillway 119.7 feet long, 6 feet in width, and

a slope downward on the upstream side of 0.75 foot. The water falls into a masonry pool. In order to determine the low-water flow more accurately than could be done by calculation of the discharge over the rough masonry spillway crest, a standard thin-edged weir was constructed on the overflow wall of the water cushion. The weir has a crest 29.02 feet long, with two complete end contractions. The crest is of steel, set perfectly level, and readings of depth are made on a hook gage set in a stilling box 6 feet upstream from the weir.

A calculation of the discharge over the main spillway of the intake dam under low heads was made by running constant volumes of water over both the spillway and weir, corresponding to different depths on the spillway, and the data so obtained have been used in reducing the observations taken before the weir was constructed. During the period from June 1, 1901, to May 1, 1902, the gage was read as a rule only once a week. During the remainder of the record the observations have been taken daily.

There are no dams, ponds, or storage reservoirs above the point of gaging, and the stream receives very little surface contamination. The records are of interest in that they show the natural regimen of a small stream of the northern plateau, as well as the sequence of rainfall and of run-off in a torrential drainage basin.

The basin formed by the intake dam has a storage capacity of 17,000,000 gallons. It is practically always filled and exerts very little influence on the rate of discharge of storm waters. The greatest known freshet in the stream occurred in August, 1898. Data are not available for the calculation of the discharge. It is known to have greatly exceeded any freshet which has occurred while the record has been kept. It is probable that the record does not show the maximum discharge on March 1 of 1902, as the daily gage reading on that date was taken before the flood reached its highest stage. The minimum flow, since the installment of the gaging weir, occurred August 30 to September 1, 1902, inclusive, and shows a discharge of 0.4 second-foot from the drainage area of 4.5 square miles, or 0.089 second-foot per square mile. The drainage area of the stream above its confluence with Mohawk River is 8.4 square miles.

Measurements of the flow of Reels Creek at a point 200 feet upstream from the intake dam, made during 1902, gave the following results:

*Discharge measurements of Reels Creek.*

| Date. | Time. | Discharge. |
|---|---|---|
| 1902. | | *Second-feet.* |
| April 26 | P. M. | 2.4 |
| May 5 | P. M. | 9.7 |
| May 14 | A. M. | 1.2 |

Surface floats were used, and owing to the low velocity and small volume of discharge, they were run through a short section (35 feet.)

In this connection may be given the data relative to certain other small watersheds.

The maximum discharge of Ballou Creek, which enters Mohawk River at Utica from the south, is calculated from the observed depth on the spillway and waste gate of the No. 4 reservoir of the Utica Waterworks Company, at 181 second-feet or 130 second-feet per square mile from the tributary drainage of 1.4 square miles above point of gaging. This freshet was caused by a very heavy thunder storm, which raised the water in the reservoir several feet in an hour.

*Mean daily flow, in second-feet, of Reels Creek near Utica, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | 1.75 | 1.75 | 1.30 | 1.75 | 1.75 | 128.40 | | | | | | |
| 2 | 1.75 | 1.75 | 1.30 | 15.30 | 1.75 | | | | | | 1.30 | |
| 3 | 1.75 | 1.75 | 1.30 | 35.50 | 1.75 | | | 6.00 | | | | |
| 4 | 1.75 | 1.30 | 1.30 | 38.00 | 1.30 | | | | | | | |
| 5 | 1.75 | 1.30 | 1.30 | 27.00 | 1.30 | | | | | 1.75 | | |
| 6 | 1.75 | 1.30 | 1.30 | 6.69 | 1.30 | | 37.50 | | | | | |
| 7 | 1.75 | 1.30 | 1.30 | 19.50 | 1.30 | | | | 32.00 | | | 1.75 |
| 8 | 1.75 | 1.30 | 1.30 | 44.59 | 1.30 | 209.10 | | | | | | |
| 9 | 102.50 | 1.30 | 3.12 | 22.31 | 1.30 | | | | | | 30.50 | |
| 10 | 62.00 | 1.30 | 4.38 | 15.30 | 2.48 | | | 15.30 | | | | |
| 11 | 1.75 | 1.30 | 1.75 | 12.00 | 6.83 | | | | | | | 3.44 |
| 12 | 1.75 | 1.30 | 1.75 | 12.00 | 62.68 | | | | | 1.30 | | 2.81 |
| 13 | 1.75 | 1.30 | 1.75 | 4.50 | 34.72 | | 9.00 | | | | | 2.19 |
| 14 | 1.75 | 1.30 | 1.75 | 2.48 | 6.70 | | | | 1.75 | | | 124.50 |
| 15 | 1.75 | 1.30 | 1.75 | 2.48 | 4.41 | 9.00 | | | | | | |
| 16 | 1.75 | 1.30 | 3.41 | 2.48 | 1.75 | | | | | | 1.75 | |
| 17 | 1.75 | 1.30 | 2.50 | 2.48 | 1.30 | | | 4.50 | | | | |
| 18 | 1.75 | (a) | 3.12 | 2.48 | 55.80 | | | | | | | |
| 19 | 1.75 | | 3.44 | 5.45 | 3.40 | | | | | 15.30 | | |
| 20 | 1.75 | | 4.06 | 4.87 | 2.48 | | 1.75 | | | | | |
| 21 | 1.75 | | 49.90 | 1.75 | 2.48 | | | | 1.30 | | | 2.48 |
| 22 | 1.75 | | 22.80 | 2.48 | 1.75 | 2.48 | | | | | | |
| 23 | 1.75 | | 12.00 | 6.00 | 15.30 | | | | | | 1.30 | |
| 24 | 1.30 | | 15.25 | 2.48 | 1.75 | | | 132.40 | | | | |
| 25 | 1.30 | | 14.62 | 55.80 | 1.75 | | | | | 1.30 | | |
| 26 | 1.30 | | 10.88 | 1.75 | 1.75 | | | | | | | |
| 27 | 1.30 | | 43.55 | 1.75 | 2.48 | | 1.30 | | | | | |
| 28 | 1.30 | | 24.50 | 1.75 | 2.48 | | | | 1.30 | | | 1.30 |
| 29 | 1.30 | | 7.70 | 1.75 | 15.30 | 1.75 | | | | | | 4.69 |
| 30 | 1.30 | | 2.48 | 1.75 | 15.30 | | | | | | 1.30 | 5.00 |
| 31 | 1.30 | | 1.75 | | 9.00 | | | 62.00 | | | | |
| Mean | 6.83 | 1.38 | 8.02 | 11.81 | 8.55 | 70.15 | 12.39 | 44.04 | 9.09 | 4.91 | 7.23 | 16.46 |

(a) Record interrupted.

*Mean daily flow, in second-feet, of Reels Creek near Utica, N. Y.*—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | ..... | 1.30 | 254.70 | ..... | 4.50 | 10.3 | 42.5 | .9 | .4 | 9.10 | 3.90 | 3.90 |
| 2 | ..... | ..... | 167.00 | ..... | 1.30 | 1.6 | 2.0 | .8 | 2.2 | 9.10 | 2.90 | 5.40 |
| 3 | ..... | ..... | 92.00 | ..... | 13.60 | 103.0 | 128.5 | 1.5 | 1.2 | 7.80 | 2.60 | 6.00 |
| 4 | 1.30 | ..... | ..... | ..... | 9.00 | 42.5 | 20.6 | 1.4 | 2.4 | 2.90 | 2.20 | 3.90 |
| 5 | ..... | ..... | ..... | 30.50 | 13.60 | 8.4 | 206.7 | 1.2 | 1.5 | 1.80 | 2.20 | 2.20 |
| 6 | ..... | ..... | ..... | ..... | 12.00 | 1.1 | 86.8 | 5.4 | .9 | 28.50 | 3.90 | 2.20 |
| 7 | ..... | ..... | ..... | 2.48 | 9.00 | 0.9 | 30.6 | 9.1 | 15.4 | 3.90 | 2.20 | 2.40 |
| 8 | ..... | 1.75 | 4.50 | ..... | 4.50 | 26.1 | 15.4 | 21.6 | 2.2 | 28.50 | 2.20 | 5.40 |
| 9 | ..... | ..... | ..... | ..... | 1.75 | 4 5 | 2.2 | 2.2 | 1.5 | 9.40 | 1.80 | 5.40 |
| 10 | ..... | ..... | ..... | ..... | 1.30 | 3.1 | 42.5 | 1.5 | 71.2 | 11.30 | 1.50 | 5.40 |
| 11 | 1.30 | ..... | ..... | ..... | 1.30 | 9.1 | 2.2 | 2.8 | 15.4 | 2.20 | 1.10 | 4.40 |
| 12 | ..... | ..... | 126.74 | 12.00 | 1.30 | 42.5 | 1.5 | 2.8 | 2.2 | 1.50 | 5.40 | 4.40 |
| 13 | ..... | ..... | 209.90 | ..... | 1.30 | 9.1 | .9 | 2.3 | 1.5 | 1.50 | 7.20 | 4.40 |
| 14 | ..... | ..... | 94.50 | ..... | 1.30 | 4.3 | .8 | 2.0 | 1.2 | 2.20 | 2.60 | 4.40 |
| 15 | ..... | 1.30 | 9.98 | ..... | 1.30 | 8.4 | .8 | 1.9 | 1.1 | 1.50 | ..... | 4.40 |
| 16 | ..... | ..... | 128.30 | ..... | 1.11 | 4.5 | 32.8 | 2.0 | .9 | 1.10 | ..... | 19.50 |
| 17 | ..... | ..... | 63.30 | ..... | 1.11 | 2.2 | 20.6 | 2.2 | .8 | 29.10 | 1.80 | 7.80 |
| 18 | 1.30 | ..... | 19.50 | ..... | 1.11 | 2.1 | 2.0 | 2.0 | .8 | .90 | 2.90 | 7.80 |
| 19 | ..... | ..... | 9.51 | 1.30 | 1.30 | 2.7 | 1.5 | 5.1 | .7 | 120.80 | 3.90 | 10.50 |
| 20 | ..... | ..... | ..... | ..... | 1.30 | 1.5 | 42.5 | 3.1 | .4 | 9.10 | 2.60 | 10.50 |
| 21 | ..... | ..... | ..... | 1.30 | 1.30 | 7.8 | 149.5 | 3.2 | 1.1 | 3.90 | 2.20 | 10.50 |
| 22 | 4.69 | 1.30 | 2.48 | ..... | 1.11 | 2.4 | 42.5 | 2.2 | 1.1 | 2.90 | 2.20 | 12.00 |
| 23 | 5.00 | ..... | ..... | ..... | (a) | 1.7 | 5.4 | .9 | .8 | 6.90 | 5.40 | 7.80 |
| 24 | ..... | ..... | ..... | 1.30 | ..... | 2.7 | 2.2 | .8 | .8 | 4.90 | 4.90 | 6.60 |
| 25 | 1.30 | ..... | ..... | 1.30 | ..... | 1.4 | 2.0 | .7 | .7 | 1.90 | 3.90 | 5.40 |
| 26 | ..... | ..... | ..... | 2.48 | ..... | 42.5 | 1.5 | .7 | 3.8 | 1.10 | 4.90 | 5.40 |
| 27 | ..... | ..... | ..... | 30.50 | ..... | 2.0 | 20.6 | .7 | 1.5 | 5.40 | 4.30 | 5.40 |
| 28 | ..... | 4.69 | ..... | 3.40 | ..... | 1.5 | 9.0 | .5 | 1.1 | 38.20 | 7.00 | 5.40 |
| 29 | ..... | ..... | 61.11 | 1.30 | ..... | 2.4 | 5.1 | .5 | 7.7 | 6.00 | 4.90 | 4.90 |
| 30 | ..... | ..... | 12.00 | 42.40 | ..... | 42.5 | 2.2 | .4 | 9.0 | 6.00 | 3.90 | 4.90 |
| 31 | ..... | ..... | 8.00 | ..... | ..... | ..... | 1.0 | .4 | ..... | 6.00 | ..... | 4.90 |
| Mean | 2.48 | 2.07 | 78.9 | 10.85 | 3.83 | 13.1 | 29.8 | 2.6 | 5.0 | 11.78 | 3.21 | 6.27 |

[a] Waste gate opened. Setting weir.

*Precipitation, in inches, at Deerfield reservoir, New York.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | 0.03 | | | | | 0.57 | | | 0.58 | | | |
| 2 | | | | | 0.04 | | | | | | | |
| 3 | | | | 0.45 | | | | 0.05 | .53 | 0.45 | | |
| 4 | | 0.42 | | .34 | | .27 | 0.73 | | | .15 | | |
| 5 | .10 | | 0.31 | | | | 1.48 | | | | | |
| 6 | | | | .04 | | | .09 | .55 | | | | |
| 7 | .19 | | | 1.04 | | 1.16 | .80 | | | | | |
| 8 | | | 1.00 | | | 1.07 | | .10 | | | 0.22 | |
| 9 | .50 | | | .17 | | .17 | | .60 | | | .05 | 1.10 |
| 10 | | .28 | .35 | | .10 | | | | | .30 | | |
| 11 | .95 | | | | .95 | | | .07 | .70 | .03 | | |
| 12 | .82 | | .07 | | .62 | | | | | | .96 | |
| 13 | | | .12 | | .32 | | | | .42 | | 1.10 | |
| 14 | | | .21 | | | | | | .32 | .72 | | |
| 15 | .23 | | .05 | | | | | .73 | .60 | | .05 | |
| 16 | | .49 | | | | | | | .61 | | .02 | |
| 17 | | .10 | | | | | .40 | | .34 | .20 | | |
| 18 | | | .12 | | .98 | | | | | .50 | | |
| 19 | | | .02 | .17 | | .28 | | | | | | 2.12 |
| 20 | | | | | | | | | | | | |
| 21 | | .50 | .77 | .14 | | 1.14 | | | | | | |
| 22 | .18 | | | | | 1.07 | | | | | | |
| 23 | | | .07 | .56 | .57 | | | | | | | |
| 24 | | | | | | | | .40 | | | .03 | |
| 25 | | | | .50 | | | | | | | | |
| 26 | | | | | | | .10 | | | | | |
| 27 | | | | | .22 | | | | | | | .85 |
| 28 | | | | | | | | | | | | |
| 29 | | | | | .45 | | .24 | | .30 | | .03 | .75 |
| 30 | | | | .17 | .10 | | | .18 | .10 | | | |
| 31 | .12 | | | | .18 | | .03 | | | | | |
| Total | 3.12 | 1.79 | 3.09 | 3.58 | 4.57 | 5.73 | 3.87 | 2.68 | 4.50 | 2.35 | 2.46 | 4.82 |

*Precipitation, in inches, at Deerfield reservoir, New York*—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | | | 1.15 | 0.12 | 0.03 | | | | | 0.44 | | |
| 2 | | 0.05 | 1.12 | .18 | | | | 0.41 | 0.20 | .25 | | |
| 3 | | 1.25 | .03 | .03 | .44 | | 1.75 | | | | | |
| 4 | | | | | | 0.35 | | | .62 | .02 | | 0.50 |
| 5 | | | 1.12 | | .20 | .72 | 1.43 | | | .03 | | |
| 6 | | | | | | | .35 | 1.42 | | .35 | 0.10 | |
| 7 | | .03 | | | .29 | | .03 | | .65 | | | .15 |
| 8 | | | | | | .75 | .11 | .56 | | .40 | | |
| 9 | | .25 | .03 | .60 | | | | | | | | |
| 10 | | .03 | | | | .68 | .42 | .05 | 1.05 | | | |
| 11 | 0.03 | .02 | .65 | | | | | .71 | | | | |
| 12 | .05 | | | .10 | | .32 | | | | | .23 | .80 |
| 13 | .03 | .03 | .75 | | | .31 | .22 | | .17 | | | |
| 14 | | | | | | | .30 | | | .20 | | |
| 15 | | | | | | .54 | .31 | | | | .20 | |
| 16 | | | .85 | | | .14 | | .10 | | | | 1.30 |
| 17 | .05 | | | | | | | .10 | | | | .15 |
| 18 | | .25 | | | | | | | | | .08 | .05 |
| 19 | .05 | | | | .65 | .32 | .60 | .46 | | 1.23 | .15 | |
| 20 | | | | | | | .80 | | | .16 | | |
| 21 | .25 | | | .07 | | .52 | | .48 | .24 | | | .40 |
| 22 | | | | | | .09 | 1.60 | .28 | | | | .75 |
| 23 | | | | | .02 | .02 | | | | .16 | .45 | |
| 24 | | | | | .50 | .32 | .15 | | .03 | .07 | | .05 |
| 25 | | .03 | | | .30 | | | | | .05 | .02 | |
| 26 | .02 | | | .21 | .43 | .76 | | | .75 | | .36 | .08 |
| 27 | .55 | | | .05 | | .09 | .62 | .10 | | .51 | .45 | .11 |
| 28 | | 1.00 | .30 | | .35 | .34 | .43 | | | 1.70 | .05 | |
| 29 | | | .12 | | | .68 | | | 1.40 | .11 | | |
| 30 | .03 | | .10 | .77 | .72 | | | | .70 | | .02 | |
| 31 | | | .02 | | | | .03 | | | .25 | | |
| Total | 1.06 | 2.94 | 6.24 | 2.13 | 3.93 | 6.95 | 9.15 | 4.67 | 5.81 | 5.93 | 2.11 | 4.34 |

## WEST CANADA CREEK AT TWIN ROCK BRIDGE, NEW YORK.

The gaging station at this point was established September 7, 1900. The readings are furnished by the Utica Gas and Electric Company, and are taken twice each day by George Rood. The station is described in Water-Supply Paper No. 65, pages 153 to 155. The record at Twin Rock Bridge replaces one formerly kept at Middleville on the same stream. The record at Middleville from 1898 to 1901 is given in Water-Supply Paper No. 65, pages 155 to 157.

*Current-meter discharge measurements of West Canada Creek at Twin Rock Bridge.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Sec.-feet.* |
| August 25 | C. C. Covert | 1.25 | 455 |
| June 17 | H. R. Beebe | 2.34 | 1,142 |
| Do | do | 2.39 | 1,187 |
| October 10 | R. E. Horton | 2.74 | 1,534 |
| June 16 | do | 2.93 | 1,615 |
| June 28 | do | 3.02 | 1,812 |
| Do | H. R. Beebe | 3.45 | 2,131 |
| June 27 | do | 4.12 | 3,114 |
| Do | do | 4.52 | 3,402 |

*Mean daily gage height, in feet, of West Canada Creek at Twin Rock Bridge.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2.00 | 1.90 | 4.90 | 4.75 | 5.20 | 2.15 | 3.10 | 1.55 | 1.00 | 2.30 | 3.10 | 1.60 |
| 2 | 2.00 | 1.90 | 6.80 | 3.90 | 3.95 | 2.10 | 3.35 | 1.50 | .90 | 1.35 | 2.25 | 1.58 |
| 3 | 2.00 | 2.00 | 7.65 | 3.15 | 3.05 | 1.90 | 4.90 | 1.50 | .78 | 1.35 | 2.35 | 2.65 |
| 4 | 2.00 | 2.00 | 6.40 | 2.40 | 3.15 | 3.25 | 7.05 | 1.43 | .70 | 1.20 | 1.45 | 4.55 |
| 5 | 2.00 | 2.00 | 5.40 | 2.43 | 3.50 | 2.65 | 4.45 | 1.28 | .90 | 1.25 | 1.50 | 3.90 |
| 6 | 2.00 | 2.00 | 4.25 | 2.30 | 2.65 | 1.95 | 3.60 | 1.80 | 1.10 | 1.23 | 1.85 | 3.85 |
| 7 | 2.00 | 2.00 | 3.75 | 2.35 | 2.75 | 2.45 | 2.55 | 2.50 | 1.10 | 1.23 | 2.25 | 4.55 |
| 8 | 2.00 | 2.00 | 3.30 | 2.38 | 2.30 | 2.10 | 2.55 | 2.33 | 1.45 | 3.00 | 2.05 | 1.95 |
| 9 | 2.00 | 2.00 | 3.40 | 5.45 | 2.10 | 1.70 | 2.42 | 2.70 | 1.80 | 3.30 | 1.90 | 1.70 |
| 10 | 2.00 | 2.00 | 3.10 | 5.25 | 2.10 | 2.10 | 2.35 | 2.65 | 1.70 | 2.70 | 1.65 | 1.73 |
| 11 | 2.00 | 2.00 | 3.08 | 3.65 | 1.85 | 3.13 | 2.10 | 2.40 | 1.55 | 1.63 | 1.50 | 2.45 |
| 12 | 2.00 | 2.00 | 3.50 | 3.43 | 1.70 | 2.80 | 1.53 | 3.15 | 1.05 | 1.40 | 1.65 | 2.45 |
| 13 | 2.00 | 2.00 | 5.10 | 3.45 | 1.45 | 2.45 | 1.30 | 2.40 | 1.00 | 1.30 | 3.00 | 2.20 |
| 14 | 2.00 | 2.00 | 6.85 | 3.65 | 1.28 | 2.25 | 1.23 | 1.95 | 1.15 | 1.28 | 3.20 | 2.05 |
| 15 | 2.00 | 2.00 | 5.05 | 2.75 | 1.00 | 2.95 | 1.80 | 1.70 | 1.03 | 1.20 | 2.20 | 2.10 |
| 16 | 2.00 | 1.90 | 5.70 | 2.50 | 1.00 | 2.90 | 4.00 | 1.45 | .90 | 1.23 | 2.10 | 2.65 |
| 17 | 2.00 | 1.90 | 8.25 | 2.60 | 1.15 | 2.50 | 2.40 | 1.40 | .90 | 1.00 | 2.35 | 6.00 |
| 18 | 2.00 | 1.85 | 7.00 | 2.45 | 1.33 | 1.90 | 2.18 | 1.30 | .75 | .75 | 2.13 | 5.65 |
| 19 | 2.00 | 1.68 | 7.25 | 2.35 | 1.33 | 1.63 | 1.90 | 1.55 | .60 | 2.25 | 1.75 | 3.50 |
| 20 | 2.00 | 1.60 | 6.88 | 2.50 | 1.45 | 1.75 | 2.80 | 1.48 | .50 | 3.70 | 1.63 | 2.80 |
| 21 | 2.00 | 1.53 | 3.50 | 2.25 | 1.43 | 1.80 | 4.13 | 1.60 | .65 | 4.25 | 1.70 | 2.40 |
| 22 | 1.90 | 1.50 | 3.20 | 3.20 | 1.38 | 3.65 | 5.10 | 1.70 | .60 | 3.80 | 1.85 | 6.10 |
| 23 | 1.80 | 1.90 | 3.80 | 2.75 | 1.30 | 2.95 | 4.28 | 1.68 | .60 | 3.25 | 2.10 | 6.35 |
| 24 | 1.80 | 1.60 | 3.70 | 2.50 | 2.70 | 2.40 | 2.95 | 1.48 | .60 | 3.23 | 1.45 | 5.20 |
| 25 | 1.90 | 1.53 | 3.43 | 2.55 | 3.50 | 1.90 | 2.50 | 1.30 | .63 | 2.20 | 1.63 | 4.15 |
| 26 | 1.90 | 1.63 | 3.23 | 2.35 | 3.23 | 3.40 | 1.70 | 1.13 | .73 | 2.50 | 1.50 | 3.53 |
| 27 | 1.90 | 1.38 | 3.05 | 3.10 | 2.85 | 4.30 | 1.43 | 1.00 | 1.00 | 3.00 | 1.63 | 3.35 |
| 28 | 1.90 | 1.85 | 3.40 | 3.30 | 2.60 | 3.15 | 1.75 | .85 | 1.20 | 5.20 | 2.20 | 3.20 |
| 29 | 1.90 | ..... | 6.30 | 2.43 | 2.50 | 2.55 | 1.95 | .80 | 2.50 | 6.50 | 2.10 | 4.00 |
| 30 | 1.90 | ..... | 8.00 | 4.15 | 2.80 | 3.70 | 1.65 | .73 | 3.45 | 4.30 | 1.75 | 4.00 |
| 31 | 1.90 | ..... | 6.00 | ..... | 3.10 | ..... | 1.45 | 1.10 | ..... | 4.65 | ..... | 3.90 |

## EAST CANADA CREEK AT DOLGEVILLE, N. Y.

This gaging station was established September 23, 1898. A description of the drainage basin and recorded run-off for preceding years may be found in Water-Supply Paper No. 65, pages 158 to 161. The depth on the crest of the dam and readings of the gate opening of turbines are taken twice daily by John M. Kelley.

November 4 to 14 inclusive, 1901, a series of readings at one-half hour intervals from 6 a. m. to 6 p. m. was taken for the purpose of checking the discharge as calculated from the readings taken in the usual manner twice daily.

*Discharge measurements of East Canada Creek.*

| Date. | Mean flow estimated from one-half hour observations. | Maximum daily flow. | Minimum daily flow. |
|---|---|---|---|
| 1901. | *Sec.-ft.* | *Sec.-ft.* | *Sec.-ft.* |
| November 4 | [a] 83.5 | 87.5 | 78 |
| November 5 | 134.2 | 192.0 | 94 |
| November 6 | 173.4 | 191.0 | 149 |
| November 7 | 164.3 | 191.0 | 98 |
| November 8 | 185.4 | 192.0 | 169 |
| November 9 | 200.8 | 235.0 | 145 |
| November 11 | 136.1 | 236.0 | 69 |
| November 12 | 393.4 | 895.0 | 153 |
| November 13 | 1,222.0 | 1,288.0 | 1,185 |
| November 14 | 844.2 | 918.0 | 809 |

[a] Pond refilling, November 4, during several hours, reducing average outflow for day.

*Mean daily flow, in second-feet, of East Canada Creek at Dolgeville, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 241 | 236 | 2,541 | 1,721 | 1,333 | a 373 | 916 | 339 | ------ | 639 | 1,033 | 497 |
| 2 | 241 | a 190 | a2,620 | 1,322 | 881 | 216 | 796 | 334 | 74 | 558 | a 827 | 473 |
| 3 | 254 | 236 | 2,370 | 1,102 | 883 | 187 | 1,364 | a 139 | 105 | 502 | 673 | 466 |
| 4 | 239 | 231 | 1,954 | 774 | a 756 | 86 | 2,037 | 209 | 103 | 436 | 592 | 892 |
| 5 | a 180 | 236 | 1,429 | 572 | 693 | 1,032 | 1,562 | 264 | 115 | a 396 | 575 | 748 |
| 6 | 211 | 236 | 1,200 | a 532 | 549 | 579 | a1,143 | 330 | 117 | 499 | 593 | 849 |
| 7 | 166 | 236 | 791 | 583 | 522 | 437 | 869 | 436 | a 106 | 578 | 601 | a 665 |
| 8 | 166 | 236 | 638 | 581 | 418 | a 376 | 635 | 246 | 187 | 711 | 578 | 880 |
| 9 | 171 | a 175 | a 482 | 682 | 362 | 381 | 435 | 337 | 151 | 619 | a 570 | 638 |
| 10 | 159 | 211 | 483 | 2,363 | 296 | 341 | 813 | a 264 | 355 | 477 | 476 | 646 |
| 11 | 159 | 196 | 467 | 1,689 | a 264 | 621 | 538 | 319 | 297 | 401 | 434 | 1,228 |
| 12 | a 100 | 181 | 1,101 | 1,329 | 281 | 524 | 402 | 241 | 154 | a 29 | 508 | 956 |
| 13 | 121 | 156 | 1,633 | a1,281 | 192 | 458 | a 232 | 160 | 132 | 412 | 687 | 629 |
| 14 | 129 | 81 | 1,798 | 1,109 | 192 | 669 | 205 | 127 | a 100 | 545 | 688 | a 607 |
| 15 | 136 | 81 | 1,645 | 736 | 171 | a 738 | 245 | 121 | 135 | 497 | 684 | 1,332 |
| 16 | 136 | a 40 | a1,886 | 620 | 139 | 581 | 394 | 107 | 293 | 420 | a 665 | 1,320 |
| 17 | 136 | 81 | 4,307 | 622 | 133 | 420 | 302 | a 64 | 251 | 417 | 561 | 2,033 |
| 18 | 133 | 81 | 2,796 | 620 | a 110 | 349 | 231 | 166 | 201 | 411 | 549 | 1,954 |
| 19 | a 95 | 81 | 1,574 | 539 | 221 | 298 | 196 | 160 | 201 | a1,971 | 596 | 1,333 |
| 20 | 136 | 81 | 1,200 | a 539 | 327 | 365 | a 994 | 219 | 221 | 1,732 | 561 | 1,092 |
| 21 | 159 | 81 | 1,046 | 539 | 249 | 857 | 1,349 | 209 | a 10 | 1,283 | 505 | a1,148 |
| 22 | 216 | 81 | 1,167 | 542 | 192 | a 956 | 2,131 | 193 | 101 | 856 | 549 | 2,516 |
| 23 | 451 | a 40 | a1,236 | 434 | 135 | 619 | 1,381 | 160 | 165 | 750 | a 492 | 1,921 |
| 24 | 526 | 81 | 1,429 | 422 | 460 | 363 | 769 | (a) | 218 | 681 | 422 | 1,495 |
| 25 | 781 | 81 | 1,489 | 331 | a 954 | 297 | 1,029 | 67 | 172 | 760 | 381 | 1,675 |
| 26 | a 530 | 81 | 1,200 | 332 | 708 | 1,219 | 709 | 67 | 662 | a 628 | 436 | 864 |
| 27 | 486 | 511 | 1,079 | a 290 | 499 | 1,143 | a 617 | 67 | 507 | 648 | 532 | 822 |
| 28 | 481 | 736 | 1,046 | 342 | 340 | 827 | 1,029 | 64 | a 418 | 865 | 626 | a 708 |
| 29 | 456 | ------ | 2,631 | 344 | 327 | a 739 | 714 | 64 | 973 | 3,572 | 563 | 770 |
| 30 | 331 | ------ | a3,855 | 1,510 | 410 | 801 | 508 | 163 | 853 | 2,834 | a 609 | 720 |
| 31 | 231 | ------ | 3,276 | ------ | 435 | ------ | 383 | (a) | ------ | 1,656 | ------ | 638 |
| Mean | 257 | 178 | 1,689 | 813 | 101 | 565 | 804 | 194 | 246 | 864 | 585 | 1,049 |

a Sunday.

*Estimated monthly discharge of East Canada Creek at Dolgeville, N. Y.*

[Drainage area, 256 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Sec.-ft.* | | |
| January | 257 | 1.00 | 1.15 |
| February | 178 | .69 | .72 |
| March | 1,689 | 6.59 | 7.35 |
| April | 813 | 3.17 | 3.65 |
| May | 101 | .39 | .45 |
| June | 565 | 2.59 | 2.99 |
| July | 804 | 3.14 | 3.50 |
| August | 194 | .76 | .84 |
| September | 246 | .96 | 1.07 |
| October | 864 | 3.36 | 3.87 |
| November | 585 | 2.28 | 2.54 |
| December | 1,049 | 4.10 | 4.71 |
| The year | 612 | 2.42 | 32.84 |

EAST CANADA CREEK NEAR EASTCREEK, N. Y.

A series of current-meter measurements from boat and cable were made at a point about 2 miles above Eastcreek, N. Y., October 20 to November 6, 1900. The discharge measurements were made by Joseph Kemper, civil engineer, for the city of Little Falls. A current-meter measurement of the discharge was made each day during the continuation of the gage readings. The accompanying table shows the results of current-meter measurements and the corresponding daily gage readings. The velocity was measured at intervals of 5 feet across the stream by the six-tenths depth method. Meter No. 89 of the United States Geological Survey was used. The object of the measurements was to determine the effect of diversion from Spruce Creek and Beaver Brook, two tributaries of East Canada Creek entering above Dolgeville, and serving as sources of public water supply for Little Falls. Contemporaneous measurements of Spruce Creek, the results of which are given elsewhere, were also made. During the continuation of the measurements no water was drawn from Spruce Creek; the entire supply was taken from Beaver Brook, and there was no inflow from East Canada Creek to Beaver Brook, with the exception of the period from October 30 to November 2, inclusive. During this period the total flow of Beaver Brook, together with that

from Spruce Creek, entered East Canada Creek. The drainage area above the point of measurement is 280 square miles.

*Measured discharge of East Canada Creak near Eastcreek, N. Y.*

| Date. | Gage height. | Discharge. | Run-off. |
|---|---|---|---|
| 1901. | *Feet.* | *Second-feet.* | *Second-feet per square mile* |
| October 20 | 1.41 | 301.33 | 1.07 |
| October 21 | 1.40 | 289.92 | 1.04 |
| October 22 | 1.28 | 238.66 | .85 |
| October 23 | 1.29 | 228.55 | .82 |
| October 24 | 1.40 | 313.43 | 1.12 |
| October 25 | 1.20 | 220.76 | .79 |
| October 26 | 1.19 | 201.47 | .72 |
| October 27 | 1.17 | 175.69 | .63 |
| October 28 | 1.04 | 182.64 | .65 |
| October 29 | 1.15 | 176.24 | .63 |
| October 30 | 1.17 | [a]214.78 | .77 |
| October 31 | 1.25 | [a]228.76 | .82 |
| November 1 | 1.19 | [a]221.50 | .79 |
| November 2 | 1.22 | [a]218.60 | .78 |
| November 3 | 1.11 | 177.48 | .63 |
| November 4 | 1.12 | 172.84 | .62 |
| November 5 | 1.14 | 173.76 | .62 |
| November 6 | 1.18 | 188.56 | .67 |

[a] Including Beaver Brook.

MOHAWK RIVER AT LITTLE FALLS, N. Y.

This gaging station was established September 23, 1898, and is described in Water-Supply Paper No. 65, pages 162 to 165, where the monthly mean run-off for preceding years may be found. The gaging station is situated at the dam and mills of the Gilbert Knitting Company and the Little Falls Paper Company, where records of the depth wasted over the dam and of the run of the water wheels are kept.

The spring freshet of March 1 and 2, 1902, caused a discharge in Mohawk River at Little Falls estimated at 27,000 second-feet, or 20.7 second-feet per square mile.

*Mean daily flow, in second-feet, of Mohawk River at Little Falls, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 1,332 | 1,519 | 13,024 | 6,791 | 6,306 | a3,163 | 4,725 | 1,777 | 1,084 | 2,587 | 4,122 | 2,399 |
| 2 | 1,373 | a1,107 | a27,505 | 5,334 | 4,506 | 2,297 | 4,889 | 3,863 | 1,069 | 1,806 | a2,829 | 1,178 |
| 3 | 1,410 | 1,163 | 22,173 | 5,099 | 3,752 | 2,141 | 5,821 | a2,641 | 1,110 | 1,437 | 2,414 | 2,693 |
| 4 | 1,296 | 889 | 15,793 | 4,268 | a3,650 | 2,176 | 1,232 | 1,875 | 1,110 | 1,447 | 2,297 | 3,436 |
| 5 | a1,103 | 1,039 | 10,117 | 3,610 | 3,201 | 4,646 | 9,320 | 1,631 | 1,026 | a1,563 | 2,141 | 5,952 |
| 6 | 1,368 | 1,119 | 7,680 | a3,287 | 3,139 | 3,141 | a8,486 | 2,077 | 956 | 1,760 | 2,028 | 2,259 |
| 7 | 1,369 | 1,119 | 5,951 | 3,310 | 3,528 | 2,162 | 6,800 | 5,001 | a1,454 | 2,255 | 1,737 | a1,957 |
| 8 | 1,369 | 924 | 4,989 | 3,003 | 2,584 | a2,283 | 6,040 | 4,931 | 1,568 | 3,205 | 2,599 | 1,839 |
| 9 | 1,326 | a939 | a4,087 | 3,318 | 1,938 | 3,305 | 5,262 | 4,920 | 1,649 | 2,997 | a1,856 | 1,646 |
| 10 | 1,286 | 956 | 3,850 | 7,759 | 1,710 | 2,456 | 5,088 | a3,403 | 2,761 | 2,247 | 1,957 | 1,536 |
| 11 | 1,256 | 956 | 3,847 | 7,135 | a1,660 | 4,351 | 4,272 | 2,478 | 2,466 | 2,113 | 1,737 | 1,762 |
| 12 | a963 | 1,039 | 8,669 | 5,145 | 1,223 | 4,263 | 3,548 | 3,644 | 1,601 | a1,623 | 2,245 | 1,813 |
| 13 | 1,115 | 1,039 | 14,508 | a3,870 | 1,340 | 4,057 | a2,082 | 3,179 | 1,348 | 1,613 | 3,310 | 1,616 |
| 14 | 1,115 | 1,039 | 14,866 | 4,002 | 1,383 | 3,273 | 1,878 | 2,230 | a1,141 | 1,613 | 3,577 | a1,635 |
| 15 | 1,155 | 1,018 | 11,881 | 3,256 | 1,210 | a3,152 | 2,012 | 1,779 | 1,435 | 1,567 | 2,715 | 1,877 |
| 16 | 1,160 | a770 | a14,465 | 3,003 | 1,167 | 4,473 | 5,718 | 1,510 | 1,250 | 1,472 | a2,261 | 2,004 |
| 17 | 1,120 | 956 | 13,886 | 2,287 | 1,215 | 3,426 | 4,498 | a1,642 | 1,290 | 1,305 | 1,998 | 5,565 |
| 18 | 1,093 | 699 | 15,440 | 2,692 | a857 | 3,119 | 2,878 | 1,065 | 922 | 1,191 | 2,519 | 5,797 |
| 19 | a936 | 9[illegible]6 | 9,744 | 1,437 | 1,603 | 1,783 | 2,602 | 1,778 | 951 | 4,628 | 2,028 | 5,958 |
| 20 | 1,551 | 956 | 7,177 | a1,988 | 1,603 | 1,830 | a4,740 | 1,870 | 954 | a5,631 | 1,930 | 5,177 |
| 21 | 952 | 921 | 5,176 | 2,404 | 1,559 | 1,649 | 7,299 | 1,616 | a828 | 4,070 | 1,838 | a4,817 |
| 22 | 1,155 | 893 | 4,684 | 2,015 | 1,112 | a3,782 | 8,699 | 1,616 | 798 | 2,526 | 1,852 | 6,665 |
| 23 | 2,458 | a2,404 | a5,150 | 2,128 | 1,111 | 2,959 | 7,306 | 1,844 | 943 | 2,517 | a2,214 | 7,890 |
| 24 | 2,341 | 1,039 | 5,572 | 2,336 | 1,691 | 2,287 | 6,114 | a1,664 | 812 | 2,933 | 2,589 | 6,082 |
| 25 | 2,237 | 1,039 | 5,255 | 2,014 | a4,322 | 1,831 | 4,261 | 1,480 | 481 | 2,316 | 2,354 | 5,301 |
| 26 | a1,436 | 1,211 | 4,632 | 1,933 | 4,494 | 3,291 | 3,158 | 1,328 | 871 | 2,951 | 1,892 | 4,576 |
| 27 | 1,729 | 1,689 | 4,352 | a2,733 | 5,020 | 6,027 | a4,073 | 1,197 | 996 | a2,558 | 3,315 | 3,275 |
| 28 | 2,133 | 3,449 | 4,195 | 2,773 | 4,132 | 4,977 | 4,701 | 1,284 | a924 | 10,758 | 4,650 | a2,825 |
| 29 | 1,971 | ..... | 5,849 | 2,355 | 3,309 | a3,326 | 3,429 | 1,018 | 3,249 | 11,311 | 3,748 | 2,574 |
| 30 | 1,786 | ..... | a9,329 | 4,093 | 3,718 | 3,503 | 2,462 | 986 | 3,511 | 8,373 | a2,476 | 2,295 |
| 31 | 1,637 | ..... | 9,336 | ..... | 4,812 | ..... | 2,086 | (a) | ..... | 7,235 | ..... | 2,464 |
| Mean | 1,433.2 | 1,173.1 | 9,457.5 | 3,512.6 | 2,640.5 | 3,170.9 | 4,984.2 | 2,244.9 | 1,351.9 | 3,283.8 | 2,508 | 3,448 |

a Sunday.

*Estimated monthly discharge of Mohawk River at Little Falls, N. Y.*

[Drainage area, 1,306 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Sec. feet.* | | |
| January | 1,433 | 1.10 | 1.27 |
| February | 1,173 | .90 | .94 |
| March | 9,457 | 7.25 | 8.34 |
| April | 3,513 | 2.69 | 3.00 |
| May | 2,641 | 2.02 | 2.33 |
| June | 3,171 | 2.43 | 2.71 |
| July | 4,984 | 3.82 | 4.40 |
| August | 2,200 | 1.68 | 1.94 |
| September | 1,352 | 1.03 | 1.15 |
| October | 3,284 | 2.51 | 2.89 |
| November | 2,508 | 1.94 | 2.21 |
| December | 3,448 | 2.64 | 2.95 |
| The year | 3,264 | 2.50 | 34.13 |

SCHOHARIE CREEK AT MILLPOINT, N. Y.

The record at this station, which is maintained to replace temporarily the record at Schoharie Falls dam on the same stream, has been continued throughout the present year. No discharge measurements were made during 1902. A description of this station and the results of records kept on Schoharie Creek at Fort Hunter and Schoharie Falls may be found in Water-Supply Paper No. 65, pages 167 to 172.

*Daily gage height, in feet, of Schoharie Creek at Millpoint, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2.90 | 1.45 | 9.85 | 4.00 | 2.55 | 1.25 | 2.00 | 2.30 | 0.85 | 4.15 | 2.45 | 1.55 |
| 2 | 2.50 | 1.45 | 7.60 | 3.70 | 2.35 | 1.15 | 2.00 | 3.20 | .80 | 3.50 | 2.20 | 1.50 |
| 3 | 1.85 | 1.45 | 6.70 | 3.50 | 2.15 | 1.10 | 1.95 | 2.90 | .75 | 2.75 | 2.15 | 1.45 |
| 4 | 1.70 | 1.45 | 4.80 | 2.90 | 1.90 | 1.50 | 1.95 | 2.45 | .70 | 2.70 | 2.10 | 1.60 |
| 5 | 1.60 | 1.40 | 4.20 | 2.50 | 2.00 | 1.45 | 2.00 | 2.95 | .65 | 2.70 | 2.00 | 1.65 |
| 6 | 1.60 | 1.40 | 3.60 | 2.10 | 1.85 | 1.35 | 2.05 | 1.70 | .65 | 2.35 | 1.90 | 1.75 |
| 7 | 1.55 | 1.35 | 2.85 | 2.05 | 1.70 | 1.25 | 2.05 | 1.60 | .60 | 2.20 | 1.80 | 1.80 |
| 8 | 1.50 | 1.35 | 2.25 | 2.05 | 1.65 | 1.25 | 2.10 | 1.40 | .60 | 2.05 | 1.75 | 1.90 |
| 9 | 1.50 | 1.35 | 2.15 | 7.25 | 1.60 | 1.20 | 2.00 | 1.20 | .60 | 1.95 | 1.60 | 2.30 |
| 10 | 1.50 | 1.40 | 3.10 | 6.90 | 1.50 | 1.20 | 1.85 | 1.40 | .55 | 1.70 | 1.55 | 3.00 |
| 11 | 1.45 | 1.50 | 3.70 | 4.10 | 1.45 | 1.15 | 1.65 | 1.50 | 1.60 | 1.65 | 1.55 | 3.10 |
| 12 | 1.45 | 1.55 | 5.95 | 3.80 | 1.40 | 1.30 | 1.55 | 1.50 | 1.55 | 1.80 | 1.50 | 3.05 |
| 13 | 1.45 | 1.50 | 6.87 | 3.60 | 1.40 | 1.25 | 1.40 | 1.45 | 1.55 | 2.50 | 1.50 | 2.95 |
| 14 | 1.45 | 1.50 | 5.20 | 3.50 | 1.35 | 1.25 | 1.25 | 1.35 | 1.50 | 2.25 | 1.45 | 2.90 |
| 15 | 1.40 | 1.50 | 4.00 | 3.00 | 1.35 | 1.20 | 1.15 | 1.25 | 1.45 | 2.10 | 1.40 | 2.90 |
| 16 | 1.35 | 1.45 | 6.85 | 3.00 | 1.30 | 1.20 | 1.10 | 1.15 | 1.35 | 1.90 | 1.40 | 2.95 |
| 17 | 1.35 | 1.45 | 4.80 | 2.80 | 1.25 | 1.20 | 1.05 | 1.10 | 1.30 | 1.75 | 1.35 | 4.90 |
| 18 | 1.30 | 1.40 | 4.75 | 2.50 | 1.20 | 1.15 | 1.00 | 1.05 | 1.90 | 1.70 | 1.30 | 3.60 |
| 19 | 1.30 | 1.40 | 3.75 | 2.00 | 1.20 | 1.15 | .95 | 1.90 | 1.25 | 1.70 | 1.30 | 3.50 |
| 20 | 1.30 | 1.40 | 2.40 | 2.05 | 1.15 | 1.10 | 1.67 | 1.85 | 1.60 | 1.65 | 1.30 | 3.45 |
| 21 | 1.35 | 1.45 | 2.30 | 2.00 | 1.10 | 1.20 | 6.47 | 1.50 | 1.60 | 1.60 | 1.30 | 3.40 |
| 22 | 1.50 | 1.50 | 2.80 | 1.95 | 1.05 | 1.20 | 5.10 | 1.30 | 1.35 | 1.55 | 1.25 | 6.65 |
| 23 | 4.30 | 1.50 | 2.95 | 1.95 | 1.00 | 1.25 | 4.50 | 1.15 | 1.20 | 1.50 | 1.25 | 6.00 |
| 24 | 3.15 | 1.50 | 2.95 | 1.90 | .95 | 1.25 | 4.20 | 1.05 | 1.15 | 1.45 | 1.25 | 3.10 |
| 25 | 2.30 | 1.50 | 2.90 | 1.90 | .95 | 1.20 | 4.10 | 1.00 | 1.10 | 1.40 | 1.25 | 2.75 |
| 26 | 2.15 | 1.55 | 3.15 | 1.85 | .95 | 1.20 | 3.10 | .90 | 1.20 | 1.35 | 1.20 | 2.50 |
| 27 | 2.20 | 1.55 | 3.25 | 1.80 | 1.00 | 1.15 | 2.80 | .80 | 1.80 | 1.30 | 1.20 | 2.40 |
| 28 | 2.00 | 1.60 | 3.50 | 1.80 | 1.10 | 1.10 | 2.60 | .85 | 4.02 | 4.12 | 1.70 | 2.35 |
| 29 | 1.85 | ..... | 3.80 | 1.75 | 1.20 | 1.10 | 2.50 | .90 | 5.85 | 4.20 | 1.65 | 2.15 |
| 30 | 1.75 | ..... | 4.00 | 2.10 | 1.35 | 1.10 | 2.30 | .90 | 4.80 | 2.90 | 1.55 | 2.10 |
| 31 | 1.60 | ..... | 4.10 | ..... | 1.30 | ..... | 2.30 | .85 | ..... | 2.70 | ..... | 2.15 |

SCHOHARIE CREEK AT PRATTSVILLE, GREENE COUNTY, N. Y.

Schoharie Creek above Prattsville drains a rugged mountainous area almost entirely wooded. The drainage basin, embracing an area 243 square miles, lies wholly within Greene County. The basin is sursounded by continuous mountain ranges, and intervening ridges divide the main stream from its principal tributaries, Batavia Kill, East Kill, and West Kill.

A gaging station was established at the highway bridge in Prattsville village November 7, 1902, by C. C. Covert; the gage datum is referred to the United States Geological Survey bench mark, a circle marked on a bowlder on right-hand end of bridge on the downstream side; elevation 1,151 feet. A 15-foot weight and wire gage, having a boxed horizontal scale, is attached to the steel floor beams of the bridge on the upstream side. The elevation of the water surface

when the gage reads zero is 1,130.03. The bridge has a single span of 185 feet. Measurements are made on the downstream side. Bridge is divided into 10-foot intervals, beginning at top of left-hand abutment.

The river stage is observed at 7 to 8 a. m. and 4 to 5 p. m. each day by James Brennam. A current-meter measurement by C. C. Covert November 7, 1902, showed a flow of 342 second-feet, the gage height being 5.565. A measurement by F. H. Tillinghast December 4, 1902, gage height 5.60, showed a discharge of 345 second-feet.

*Mean daily gage height, in feet, of Schoharie Creek at Prattsville, N. Y.*

| Day. | Nov. | Dec. | Day. | Nov. | Dec. | Day. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|
| 1902. | | | 1902. | | | 1902. | | |
| 1 | | 5.20 | 12 | 5.40 | 5.30 | 23 | 5.10 | 7.30 |
| 2 | | 5.20 | 13 | 5.35 | 5.20 | 24 | 5.10 | 6.43 |
| 3 | | 5.50 | 14 | 5.30 | 5.20 | 25 | 5.35 | 6.15 |
| 4 | | 5.60 | 15 | 5.30 | 5.20 | 26 | 5.15 | 6.05 |
| 5 | | 5.53 | 16 | 5.30 | 5.20 | 27 | 5.40 | 5.90 |
| 6 | | 5.50 | 17 | 5.30 | 7.55 | 28 | 5.55 | 5.85 |
| 7 | | 5.50 | 18 | 5.30 | 7.20 | 29 | 5.30 | 5.83 |
| 8 | | 5.50 | 19 | 5.20 | 6.18 | 30 | 5.30 | 5.73 |
| 9 | 5.40 | 5.45 | 20 | 5.20 | 6.00 | 31 | | 5.73 |
| 10 | 5.40 | 5.40 | 21 | 5.20 | 5.95 | | | |
| 11 | 5.40 | 5.25 | 22 | 5.20 | 9.30 | | | |

## MOHAWK RIVER AT DUNSBACH FERRY, N. Y.

This station is located at the dam of the West Troy Water Company, 9 miles from the mouth of Mohawk River. The station was established March 12, 1898, and a record has been maintained since that date with the exception of the period April, 1899, to August, 1900.

Records were formerly maintained on Mohawk River at the New York State dam at Rexford Flats and at Freeman's bridge, Schenectady, about 4 and 8 miles above Dunsbach Ferry, respectively. Owing to the practical duplication of these records at Dunsbach Ferry gaging station, the Rexford Flats and Freeman's bridge stations were discontinued January 1, 1902. Description of the gaging station at Dunsbach Ferry, as well as the others mentioned, may be found in Water-Supply Paper No. 65, pages 172 to 183, where the results of gagings are also given.

The left wing of the Dunsbach Ferry dam was injured during high water of 1902, necessitating a slight change in the discharge calculation. Owing to roughness of the injured portion of the crest, the data are considered somewhat less precise than formerly. Repairs are in progress. During the year 1902 a 66-inch old pattern American turbine in the adjoining pumping station has been replaced by a 54-inch Victor turbine. A record of the effective head of the water wheels

and of the extent to which the wheels are run is kept, from which the discharge through the turbines is calculated and added to the flow over the dam to obtain the total flow of the stream.

*Mean daily flow, in second-feet, of Mohawk River at Dunsbach Ferry, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 5,120 | 3,320 | (a) | 15,700 | 5,840 | 2,950 | 5,450 | 3,825 | 1,250 | 12,050 | 9,950 | 6,300 |
| 2 | 3,151 | 3,151 | (a) | 12,325 | 9,100 | 2,650 | 6,500 | 4,125 | 1,250 | 8,400 | 6,975 | 5,870 |
| 3 | 3,151 | 2,644 | ..... | 9,600 | 8,475 | 2,350 | 7,850 | 3,825 | 1,200 | 6,500 | 5,675 | 5,870 |
| 4 | 3,320 | 2,644 | 45,550 | 8,375 | 6,750 | 3,500 | 8,375 | 4,125 | 1,250 | 4,850 | 4,700 | 7,670 |
| 5 | 2,982 | 2,544 | 25,150 | 6,500 | 6,925 | 3,500 | 9,100 | 3,225 | 1,200 | 4,300 | 4,525 | 12,100 |
| 6 | 2,813 | 2,206 | 17,550 | 5,650 | 6,925 | 2,925 | 9,100 | 2,500 | 1,200 | 3,675 | 4,025 | 10,200 |
| 7 | 2,644 | 2,106 | 12,350 | 5,200 | 4,850 | 2,925 | 12,750 | 3,825 | 1,200 | 3,300 | 3,875 | 7,200 |
| 8 | 2,475 | 2,106 | 7,150 | 4,470 | 4,470 | 2,350 | 9,900 | 5,840 | 1,225 | 3,400 | 3,725 | 5,100 |
| 9 | 2,644 | 2,037 | 6,250 | 8,100 | 3,950 | 3,050 | 7,150 | 5,225 | 1,275 | 3,250 | 3,725 | 3,880 |
| 10 | 2,644 | 1,768 | 6,250 | 16,425 | 3,350 | 2,925 | 5,225 | 4,470 | 1,545 | 3,725 | 3,575 | 3,100 |
| 11 | 2,306 | 1,599 | 6,700 | 23,200 | 3,050 | 3,225 | 4,470 | 3,975 | 2,350 | 3,550 | 3,070 | 3,730 |
| 12 | 2,475 | 1,868 | 9,900 | 20,300 | 2,925 | 4,300 | 3,975 | 4,125 | 2,950 | 3,550 | 3,070 | 4,120 |
| 13 | 2,475 | 1,699 | 34,000 | 13,800 | 2,650 | 5,450 | 3,500 | 3,025 | 2,950 | 4,025 | 4,025 | 4,300 |
| 14 | 2,137 | 1,530 | 34,000 | 9,625 | 2,100 | 4,650 | 2,925 | 2,800 | 2,650 | 3,900 | 5,475 | 4,530 |
| 15 | 1,968 | 1,429 | 23,450 | 7,625 | 2,100 | 5,025 | 3,050 | 1,825 | 2,500 | 3,550 | 6,300 | 4,900 |
| 16 | 1,799 | 1,630 | 20,700 | 5,225 | 1,950 | 6,050 | 2,925 | 1,545 | 2,250 | 3,400 | 5,100 | 5,280 |
| 17 | 1,799 | 1,429 | 28,450 | 5,040 | 1,675 | 6,500 | 2,650 | 1,475 | 1,950 | 3,250 | 4,175 | 9,150 |
| 18 | 1,429 | 1,429 | 32,350 | 4,470 | 1,545 | 4,850 | 2,925 | 1,350 | 1,545 | 2,850 | 4,025 | 19,700 |
| 19 | 1,630 | 1,429 | 23,260 | 3,825 | 1,475 | 4,125 | 2,925 | 1,400 | 1,400 | 4,520 | 4,025 | 16,710 |
| 20 | 1,429 | 1,429 | 14,105 | 3,200 | 1,400 | 3,200 | 6,500 | 1,450 | 1,325 | 8,930 | 4,175 | 14,530 |
| 21 | 1,630 | 1,429 | 10,400 | 3,200 | 1,545 | 1,725 | 15,700 | 1,475 | 1,250 | 1,495 | 3,725 | 12,950 |
| 22 | 2,136 | 1,429 | 9,350 | 2,780 | 2,350 | 2,225 | 21,775 | 1,950 | 1,200 | 9,950 | 3,725 | 16,450 |
| 23 | 6,022 | (a) | 11,050 | 2,650 | 1,675 | 1,825 | 19,200 | 1,825 | 1,200 | 5,275 | 3,400 | 29,350 |
| 24 | 7,923 | ..... | 12,650 | 2,780 | 1,825 | 1,825 | 14,700 | 1,675 | 1,200 | 4,900 | 3,250 | 22,950 |
| 25 | 6,022 | ..... | 11,500 | 3,675 | 2,800 | 3,050 | 14,125 | 1,475 | 1,200 | 5,700 | 3,100 | 11,200 |
| 26 | 3,720 | ..... | 10,150 | 3,050 | 3,825 | 2,800 | 9,100 | 1,400 | 1,200 | 5,275 | 4,010 | 7,150 |
| 27 | 4,520 | ..... | 9,100 | 3,050 | 5,450 | 3,250 | 7,850 | 1,350 | 1,350 | 6,000 | 4,900 | 7,150 |
| 28 | 4,520 | ..... | 7,850 | 3,050 | 7,150 | 4,850 | 6,925 | 1,350 | 2,650 | 15,750 | 7,200 | 5,100 |
| 29 | 4,720 | ..... | 9,650 | 3,825 | 5,250 | 4,350 | 6,500 | 1,300 | 8,475 | 28,150 | 8,650 | 3,750 |
| 30 | 4,320 | ..... | 17,100 | 4,125 | 4,300 | 4,125 | 4,850 | 1,300 | 17,400 | 18,200 | 7,000 | 4,730 |
| 31 | 3,920 | ..... | 19,650 | ..... | 3,400 | ..... | 3,825 | 1,300 | ..... | 14,775 | ..... | 5,100 |

a No record from February 23 to March 3.

*Estimated monthly discharge of Mohawk River at West Troy Company's Dam, at Dunsbach Ferry, N. Y.*

[Drainage area, 3,440 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Sec.-feet.* | | |
| January | 3,253 | .95 | 1.09 |
| February 1 to 22 | [a]1,948 | [a].57 | [a].59 |
| March 4 to 31 | [a]16,986 | [a]4.94 | [a]5.68 |
| April | 7,361 | 2.14 | 2.39 |
| May | 3,906 | 1.14 | 1.31 |
| June | 3,554 | 1.03 | 1.15 |
| July | 4,251 | 1.24 | 1.43 |
| August | 2,592 | .75 | .86 |
| September | 2,386 | .69 | .77 |
| October | 6,466 | 1.88 | 2.17 |
| November | 4,771 | 1.39 | 1.55 |
| December | 9,036 | 2.63 | 3.03 |
| The year | 5,542 | 1.61 | 22.02 |

[a] Partial month. Record for days of high flood not obtainable. Due to break in dam.

## UPPER HUDSON DRAINAGE BASIN.

### INDIAN RIVER AT INDIAN LAKE DAM, HAMILTON COUNTY, N. Y.

This record includes the stage of water in and amount of draught from Indian Lake storage reservoir. The reservoir was built for the purpose of ameliorating the water-power deficiency to mills on Hudson River during low water. The dam is of masonry and forms a lake having a surface area of 7.87 square miles or 5.54 per cent of the drainage area of 142 square miles.

*Stage of water in Indian Lake reservoir at Indian Lake, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 20.08 | 18.79 | 15.00 | 29.92 | 36.17 | 35.54 | 36.25 | 34.88 | 31.92 | 28.92 | 29.08 | 25.58 |
| 2 | 20.17 | 18.75 | 15.42 | 30.33 | 36.17 | 35.54 | 36.29 | 34.79 | 31.75 | 28.75 | 28.83 | 25.67 |
| 3 | 20.21 | 18.71 | 16.17 | 30.58 | 36.17 | 35.58 | 36.33 | 34.75 | 31.58 | 28.58 | 28.58 | 25.79 |
| 4 | 20.21 | 18.67 | 16.67 | 30.83 | 36.13 | 35.58 | 36.46 | 34.67 | 31.38 | 28.42 | 28.33 | 25.92 |
| 5 | 20.25 | 18.63 | 17.08 | 31.08 | 36.08 | 35.58 | 36.42 | 34.58 | 31.17 | 28.33 | 28.08 | 26.00 |
| 6 | 20.29 | 18.58 | 17.42 | 31.25 | 36.00 | 35.58 | 36.29 | 34.67 | 31.00 | 28.50 | 27.92 | 26.00 |
| 7 | 20.33 | 18.54 | 17.75 | 31,42 | 35.79 | 35.63 | 36.13 | 34.75 | 30.83 | 28.17 | 27.75 | 25.83 |
| 8 | 20.33 | 18.50 | 18.00 | 31.58 | 35.63 | 35.67 | 36.00 | 34.83 | 30.71 | 28.17 | 27.67 | 25.67 |
| 9 | 20.37 | 18.46 | 18.17 | 32.08 | 35.50 | 35.67 | 35.88 | 34.83 | 30.75 | 28.21 | 27.75 | 25.50 |
| 10 | 20.42 | 18.42 | 18.33 | 33.00 | 35.42 | 35.67 | 35.79 | 34.75 | 30.88 | 28.25 | 27.83 | 25.33 |
| 11 | 20.42 | 18.37 | 18.50 | 33.50 | 35.33 | 35.67 | 35.63 | 34.75 | 30.79 | 28.33 | 27.92 | 25.17 |
| 12 | 20.33 | 18.33 | 18.83 | 33.75 | 35.17 | 35.67 | 35.50 | 34.67 | 30.54 | 28.37 | 28.00 | 25.08 |
| 13 | 20.25 | 18.29 | 19.17 | 34.00 | 35.00 | 55.67 | 35.42 | 34.58 | 30.29 | 28.42 | 28.17 | 25.00 |
| 14 | 20.12 | 18.25 | 19.75 | 34.25 | 34.92 | 35.71 | 35.42 | 34.54 | 30.33 | 28.50 | 28.37 | 25.08 |
| 15 | 20.08 | 18.17 | 20.25 | 34.42 | 34.83 | 35.75 | 35.50 | 34.46 | 30.33 | 28.50 | 28.21 | 25.17 |
| 16 | 19.00 | 17.92 | 20.67 | 34.58 | 34.75 | 35.75 | 35.67 | 34.38 | 30.33 | 28.46 | 28.04 | 25.33 |
| 17 | 19.92 | 17.58 | 21.83 | 34.71 | 34.63 | 35.75 | 35.63 | 34.33 | 30.38 | 28.42 | 27.83 | 25.50 |
| 18 | 19.79 | 17.21 | 22.92 | 34.83 | 34.50 | 35.75 | 35.54 | 34.25 | 30.42 | 28.42 | 27.67 | 25.67 |
| 19 | 19.67 | 16.92 | 23.58 | 35.00 | 34.42 | 35.79 | 35.50 | 34.17 | 30.46 | 28.42 | 27.50 | 25.83 |
| 20 | 19.58 | 16.67 | 24.00 | 35.00 | 34.38 | 35.79 | 35.58 | 34.00 | 30.50 | 28.42 | 27.33 | 25.83 |
| 21 | 19.50 | 16.42 | 24.33 | 34.96 | 34.33 | 35.83 | 35.75 | 33.83 | 30.54 | 28.42 | 27.17 | 25.83 |
| 22 | 19.50 | 16.25 | 24.58 | 34.92 | 34.25 | 35.83 | 35.92 | 33.71 | 30.54 | 28.46 | 27.00 | 25.92 |
| 23 | 19.50 | 16.00 | 24.83 | 34.92 | 34.33 | 35.83 | 35.92 | 33.58 | 30.42 | 28.50 | 26.83 | 26.00 |
| 24 | 19.42 | 15.75 | 25.17 | 34.96 | 34.54 | 35.88 | 35.75 | 33.42 | 30.17 | 28.58 | 26.67 | 26.00 |
| 25 | 19.33 | 15.50 | 25.42 | 35.00 | 34.67 | 35.92 | 35.58 | 33.21 | 29.88 | 28.75 | 26.50 | 26.00 |
| 26 | 19.25 | 15.25 | 25.67 | 35.25 | 34.92 | 35.96 | 35.42 | 33.00 | 29.67 | 28.92 | 26.33 | 25.92 |
| 27 | 19.17 | 15.00 | 26.00 | 35.42 | 35.08 | 36.08 | 35.38 | 32.83 | 29.50 | 29.08 | 26.17 | 25.75 |
| 28 | 19.08 | 14.83 | 26.50 | 35.50 | 35.25 | 36.17 | 35.25 | 32.67 | 29.33 | 29.30 | 26.00 | 25.63 |
| 29 | 19.00 | ..... | 17.33 | 35.50 | 35.33 | 36.17 | 35.17 | 32.50 | 29.17 | 29.42 | 25.83 | 25.42 |
| 30 | 18.92 | ..... | 28.50 | 36.00 | 35.38 | 36.17 | 35.08 | 32.25 | 29.04 | 29.42 | 25.67 | 25.29 |
| 31 | 18.83 | ..... | 29.25 | ..... | 35.50 | ..... | 34.96 | 32.08 | ..... | 29.37 | ..... | 25.17 |

SCHROON RIVER NEAR WARRENSBURG, N. Y.

The record at this station, which is situated at the dam and mill of the Schroon River Pulp Company near the mouth of Schroon River, a tributary of Upper Hudson River, was established November, 1895. A record of the run-off for preceding years together with a description of the drainage area may be found in Water-Supply Paper No. 65, pages 45 to 47. The high water of March 21, 1902, resulted in a discharge of 7,042 second-feet at this dam or 12.51 second-feet per square mile from the tributary drainage area of 563 square miles. The record has been maintained in cooperation with the officials of the Schroon River Pulp Company. The record for the first three months of 1902 is given herewith. Owing to change in management of company, the data for the remaining months of the year are not available at present.

*Mean daily flow, in second-feet, of Schroon River below Warrensburg, N. Y.*

| Day. | Jan. | Feb. | Mar. | Day. | Jan. | Feb. | Mar. | Day. | Jan. | Feb. | Mar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | 1902. | | | | 1902. | | | |
| 1 | 761 | 612 | 740 | 12 | (a) | 535 | 4,462 | 23 | 612 | (a) | (a) |
| 2 | 761 | (a) | (a) | 13 | 574 | 535 | 4,652 | 24 | 612 | 477 | 3,732 |
| 3 | 761 | 574 | 2,957 | 14 | 574 | 535 | 5,087 | 25 | 612 | 477 | 3,352 |
| 4 | 761 | 574 | 3,052 | 15 | 574 | 535 | 5,397 | 26 | (a) | 477 | 3,152 |
| 5 | (a) | 574 | 3,287 | 16 | 574 | (a) | (a) | 27 | 612 | 535 | 2,902 |
| 6 | 761 | 574 | 3,392 | 17 | 574 | 574 | 5,497 | 28 | 612 | 535 | 2,792 |
| 7 | 761 | 574 | 3,482 | 18 | 574 | 477 | 5,647 | 29 | 612 | ------ | 2,712 |
| 8 | 806 | 574 | 3,287 | 19 | (a) | 477 | 5,647 | 30 | 612 | ------ | (a) |
| 9 | 806 | (a) | (a) | 20 | 612 | 477 | 5,497 | 31 | 612 | ------ | 3,052 |
| 10 | 806 | 574 | 2,582 | 21 | 612 | 477 | 7,042 | | | | |
| 11 | 768 | 535 | 2,377 | 22 | 612 | 477 | 4,342 | | | | |

a Sunday.

*Estimated monthly discharge of Schroon River below Warrensburg, N. Y.*

[Drainage area, 563 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Sec.-feet.* | | |
| January | 664 | 1.18 | 1.36 |
| February | 532 | 0.95 | 0.99 |
| March | 3,850 | 6.85 | 7.88 |

## HUDSON RIVER AT FORT EDWARD, N. Y.

This station was established by George W. Rafter in connection with the Upper Hudson storage surveys in 1895. The record preceding the year 1899 has not been published. The station is described and the results as to run-off are given in Water-Supply Paper No. 65, pages 48 to 50.

*Mean daily flow, in second-feet, of Hudson River at Fort Edward, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2,751 | 1,366 | 2,491 | 14,307 | 7,600 | a4,865 | 5,192 | 5,288 | 2,231 | 4,763 | 8,894 | 3,888 |
| 2 | 2,166 | a2,237 | a8,140 | 12,870 | 10,259 | 6,738 | 5,192 | 5,197 | 2,715 | 5,031 | a10,460 | 3,475 |
| 3 | 2,478 | 2,963 | 17,818 | 9,155 | 4,817 | 4,626 | 14,597 | a7,255 | 2,449 | 2,624 | 9,317 | 3,491 |
| 4 | 1,128 | 2,193 | 20,450 | 8,479 | a7,255 | 4,626 | 15,310 | 8,254 | 2,276 | 2,085 | 7,335 | 4,357 |
| 5 | a2,231 | 2,193 | 19,985 | 4,498 | 9,661 | 5,192 | 15,244 | 6,081 | 2,105 | a2,530 | 6,315 | 4,420 |
| 6 | 2,647 | 2,219 | 15,099 | a4,135 | 7,176 | 5,192 | a10,460 | 5,134 | 1,104 | 4,053 | 5,611 | 1,898 |
| 7 | 2,247 | 2,593 | 15,241 | 5,213 | 8,829 | 2,776 | 10,149 | 7,286 | a3,155 | 4,219 | 5,396 | a2,834 |
| 8 | 2,647 | 1,248 | 13,110 | 4,902 | 6,351 | a4,135 | 7,926 | 7,286 | 3,823 | 4,312 | 2,804 | 3,619 |
| 9 | 2,942 | a2,231 | a13,670 | 4,642 | 6,022 | 6,684 | 6,081 | 5,256 | 3,200 | 4,312 | a4,865 | 3,483 |
| 10 | 2,674 | 2,447 | 8,169 | 10,335 | 2,776 | 4,626 | 5,821 | a7,255 | 2,924 | 4,053 | 5,035 | 3,211 |
| 11 | 1,144 | 2,447 | 7,821 | 15,170 | a4,135 | 4,626 | 5,821 | 8,272 | 3,481 | 1,546 | 3,900 | 3,634 |
| 12 | a2,231 | 2,193 | 8,000 | 11,997 | 4,829 | 5,195 | 2,916 | 5,992 | 3,220 | a1,950 | 3,740 | 3,718 |
| 13 | 2,767 | 2,193 | 7,976 | a12,030 | 4,568 | 1,578 | a4,135 | 6,042 | 1,896 | 3,225 | 4,025 | 1,558 |
| 14 | 2,507 | 2,193 | 15,178 | 10,487 | 4,569 | 4,135 | 4,594 | 5,461 | a2,814 | 2,835 | 4,310 | a3,474 |
| 15 | 2,247 | 1,155 | 15,754 | 7,625 | 4,254 | a6,235 | 2,949 | 5,036 | 3,504 | 3,135 | 2,804 | 2,329 |
| 16 | 2,647 | a1,950 | a15,310 | 7,086 | 4,281 | 6,685 | 4,743 | 2,906 | 2,452 | 3,628 | a6,035 | 2,827 |
| 17 | 2,507 | 2,162 | 29,707 | 6,240 | 1,958 | 4,886 | 5,192 | a4,135 | 2,107 | 4,053 | 7,287 | 4,401 |
| 18 | 1,144 | 2,334 | 25,031 | 5,554 | a115 | 5,031 | 4,886 | 3,968 | 1,723 | 1,899 | 5,396 | 6,632 |
| 19 | a1,950 | 2,221 | 21,577 | 2,822 | 3,894 | 5,192 | 2,389 | 3,876 | 1,983 | a4,135 | 5,031 | 5,590 |
| 20 | 2,108 | 2,478 | 18,306 | a4,135 | 5,821 | 6,683 | a5,645 | 3,791 | 897 | 6,684 | 5,192 | 3,217 |
| 21 | 1,966 | 2,479 | 12,977 | 6,931 | 4,025 | 5,198 | 7,556 | 3,791 | a1,680 | 5,611 | 5,396 | a5,654 |
| 22 | 1,765 | 1,273 | 10,483 | 5,135 | 3,483 | a6,235 | 7,235 | 3,791 | 1,699 | 5,396 | 3,277 | 8,263 |
| 23 | 2,369 | a1,950 | a13,130 | 4,028 | 3,482 | 8,742 | 9,368 | 1,718 | 1,547 | 4,886 | a4,135 | 10,037 |
| 24 | 3,145 | 2,479 | 10,421 | 4,028 | 1,728 | 5,399 | 9,712 | a2,231 | 1,459 | 4,363 | 4,364 | 10,037 |
| 25 | 1,740 | 2,339 | 10,539 | 3,769 | a30 | 4,886 | 9,266 | 4,676 | 1,579 | 4,159 | 4,364 | 7,680 |
| 26 | a3,155 | 2,447 | 8,431 | 1,992 | 4,421 | 4,686 | 6,147 | 3,506 | 2,047 | a4,135 | 4,310 | 9,550 |
| 27 | 3,785 | 2,858 | 9,155 | a5,645 | 4,420 | 5,192 | a6,835 | 3,248 | 872 | 4,421 | 4,310 | 6,126 |
| 28 | 3,360 | 3,262 | 7,823 | 6,576 | 4,421 | 2,850 | 7,658 | 2,963 | a3,474 | 4,369 | 4,310 | a6,835 |
| 29 | 2,969 | ------- | 5,386 | 6,575 | 3,822 | a7,255 | 7,556 | 3,802 | 4,857 | 10,588 | 1,982 | 6,632 |
| 30 | 2,711 | ------- | a11,500 | 5,439 | 4,440 | 8,639 | 6,931 | 1,294 | 4,712 | 14,074 | a5,654 | 5,590 |
| 31 | 2,969 | ------- | 14,127 | ------- | 2,005 | ------- | 5,830 | a2,231 | ------- | 15,014 | ------- | 5,348 |

a Sundays.

*Estimated monthly discharge of Hudson River at Hudson Paper Mill Company's mill at Fort Edward, N. Y.*

[Drainage area, 2,800 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Sec.-feet.* | | |
| January | 2,422 | 0.86 | 0.99 |
| February | 2,218 | .79 | .82 |
| March | 13,316 | 4.75 | 5.47 |
| April | 7,060 | 2.52 | 2.81 |
| May | 4,692 | 1.67 | 1.93 |
| June | 5,293 | 1.53 | 1.71 |
| July | 7,204 | 2.57 | 2.96 |
| August | 4,743 | 1.69 | 1.95 |
| September | 2,466 | .88 | .98 |
| October | 4,841 | 1.73 | 1.98 |
| November | 5,191 | 1.87 | 2.09 |
| December | 4,961 | 1.76 | 2.03 |
| The year | 5,367 | 1.88 | 25.72 |

## HUDSON RIVER AT MECHANICVILLE, N. Y.

This gaging record, which has been maintained since 1888 by the Duncan Company at their dam and paper mill, is furnished by R. P. Bloss, C. E., engineer of the company. The station is described in Water-Supply Paper No. 65, pages 50 to 53, and the run-off data for the years 1898 to 1901 are given. The run-off for earlier years may be found in the annual reports of the United States Geological Survey on Progress of Stream Measurements.

*Mean daily flow, in second-feet, of Hudson River at Mechanicville, N. Y.*

| Day. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | |
| 1 | 5,019 | 37,064 | 28,287 | 18,099 | 6,444 | 6,524 | 6,812 | 2,621 | 6,823 | a14,276 | a6,180 |
| 2 | 5,050 | 27,300 | 24,412 | 18,886 | 7,611 | 6,524 | 8,193 | 4,245 | 6,233 | a11,253 | a4,928 |
| 3 | 5,697 | 41,362 | 20,724 | 15,881 | 6,174 | 6,976 | 7,986 | a3,201 | 6,547 | a12,350 | a4,849 |
| 4 | 4,160 | 32,881 | 17,576 | 14,365 | 6,883 | 10 275 | 9,530 | a2,972 | 5,504 | a10,094 | a4,995 |
| 5 | 3,754 | 29,491 | 14,989 | 16,173 | 6,635 | 14,487 | 8,555 | a3,071 | 4,431 | a8,822 | a6,241 |
| 6 | 3,625 | 21,893 | ------- | 14,315 | 6,810 | 12,225 | 6,933 | a3,178 | 6,319 | a8,044 | a5,775 |
| 7 | 3,658 | 21,145 | 12,778 | 14,820 | 6,361 | 11,698 | 8,393 | a1,789 | 5,023 | a7,592 | a3,331 |
| 8 | 3,358 | 19,256 | 10,843 | 11,988 | 5,050 | 9,523 | 9,168 | a5,021 | 5,637 | a7,362 | a5,524 |
| 9 | 3,925 | 15,848 | 11,848 | 11,192 | 7,398 | 8,335 | 9,289 | a4,216 | 5,795 | a6,087 | a5,007 |
| 10 | 4,313 | 16,575 | 22,112 | 10,843 | 5,985 | 8,148 | 8,174 | a4,181 | 5,477 | a7,328 | a4,186 |
| 11 | 3,509 | 14,541 | 26,913 | 9,360 | 6,436 | 7,748 | 9,593 | a4,441 | 5,020 | a5,688 | a5,411 |
| 12 | 3,889 | 17,686 | 25,250 | 8,923 | 6,086 | 6,607 | 8,955 | a4,718 | 3,471 | a5,279 | a5,548 |
| 13 | 4,034 | 23,312 | 24,323 | 7,645 | 5,836 | 4,775 | 8 630 | a4,718 | 6,033 | a5,229 | a5,105 |
| 14 | 3,964 | 26,187 | 21,012 | 7,848 | 5,437 | 6,111 | 7,628 | a3,735 | 4,557 | a5,442 | a6,725 |
| 15 | 3,818 | 25,211 | 16,448 | 7,070 | 4,009 | 4,940 | 8,140 | a5,613 | 4,502 | a6,644 | a6,896 |
| 16 | 3,944 | ------- | 13,603 | 6,210 | 6,529 | 5,755 | 6,118 | a3,944 | 4,812 | a6,726 | a5,507 |
| 17 | 5,353 | 33,274 | 13,060 | 6,463 | 7,173 | 6,242 | 4,569 | a3,348 | 4,871 | a8,536 | a15,846 |
| 18 | 4,103 | 42,940 | 11,755 | 5,756 | 6,798 | 6,567 | 5,842 | a3,025 | 4,855 | a7,085 | a13,714 |
| 19 | 4,778 | 37,036 | 10,743 | 4,102 | 6,798 | 5,407 | 4,837 | a2,737 | 3,831 | a6,720 | a11,962 |
| 20 | 5,038 | 30,551 | 8,895 | 5,662 | 6,086 | 5,375 | 4,489 | a2,712 | 7,669 | a6,273 | a10,219 |
| 21 | 5,126 | 26,048 | 11,539 | 6,012 | 5,812 | 14,311 | 4,477 | 1,707 | 7,574 | a6,931 | a8,858 |
| 22 | 5,308 | 24,000 | 10,071 | 6,632 | 5,250 | 13,391 | 4,677 | 4,114 | 7,174 | a6,181 | 21,649 |
| 23 | 5,788 | 21,698 | 9,348 | 4,965 | 6,848 | 12,334 | 4,552 | 3,134 | 6,635 | a4,504 | 21,787 |
| 24 | 6,212 | 22,387 | 9,959 | 4,620 | 6,886 | 11,231 | 3,350 | 2,940 | 5,971 | a6,724 | 16,410 |
| 25 | 4,337 | 19,648 | 8,446 | 4,100 | 6,140 | 12,346 | 5,419 | 2,835 | 5,457 | a5,639 | 12,697 |
| 26 | 4,488 | 18,311 | 8,396 | 7,748 | 5,600 | 11,376 | 4,270 | 2,597 | 3,907 | a5,206 | 13,808 |
| 27 | 7,353 | 16,723 | 9,110 | 8,760 | 6,074 | 9,315 | 4,109 | 2,793 | 6,442 | a5,239 | 12,514 |
| 28 | 9,160 | 16,035 | 13,298 | 13,899 | 6,988 | 11,501 | 3,722 | 2,818 | 10,658 | a5,775 | 10,172 |
| 29 | ------- | 19,815 | 12,098 | 9,398 | 5,876 | 10,049 | 3,586 | 6,125 | a17,901 | a5,410 | 10,939 |
| 30 | ------- | 23,220 | 13,672 | 9,973 | 7,461 | 8,948 | 3,294 | 6,741 | a17,631 | a3,840 | 8,881 |
| 31 | ------- | 29,487 | ------- | 10,521 | ------- | 7,936 | 1,539 | ------- | a16,951 | ------- | 8,393 |

a Flashboards irregular; results approximate.

NOTE.—Record not available for January.

*Estimated monthly discharge of Hudson River at Mechanicville, N. Y.*

[Drainage area, 4,500 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1902. | *Sec.-feet.* | | |
| February | 4,741 | 1.52 | 1.58 |
| March | 25,130 | 5.53 | 6.36 |
| April | 15,222 | 2.38 | 3.77 |
| May | 7,949 | 1.76 | 2.03 |
| June | 6,315 | 1.40 | 1.56 |
| July | 8,934 | 1.98 | 2.28 |
| August | 6,286 | 1.40 | 1.61 |
| September | 3,643 | .81 | .90 |
| October | 6,894 | 1.53 | 1.76 |
| November | 7,076 | 1.41 | 1.58 |
| December | 9,162 | 1.83 | 2.11 |

## QUACKENKILL CREEK AT QUACKENKILL VILLAGE, N. Y.

The headwaters of Quackenkill Creek lie in a series of storage ponds in central Rensselaer County. These ponds, four in number, have a combined water-surface area of 0.15 square mile. They are situated at an average elevation of 1,485 feet above tide. Quackenkill is tributary to Poestenkill, and the ponds are utilized by mills at Troy to equalize the extremes of flow and increase the low-water discharge of the latter stream. The drainage area of the Quackenkill is for the most part cleared and precipitous.

A gaging record was maintained on the Quackenkill, below the lower highway bridge in Quackenkill village, during 1894. A weir having a crest 8 feet in length was erected across the stream, and observations of the depth on the weir at a stake a short distance upstream were taken daily. The discharge was calculated by the Francis formula. The drainage area above the point of gaging is 18.5 square miles, and above the junction of the stream with the Poestenkill is 30.5 square miles.

The record has been furnished by William G. Raymond, consulting engineer of department of water supply of Troy.

*Mean daily flow, in second-feet, of Quackenkill Creek at Quackenkill village, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1894. | | | | | | | | | | | | |
| 1 | 23.9 | 13.8 | 8.9 | 29.4 | 15.7 | 31.8 | 1.2 | 8.7 | 10.2 | 1.3 | 34.3 | 14.6 |
| 2 | 27.7 | 14.6 | 14.7 | 27.2 | 14.4 | 50.1 | .9 | 8.7 | 8.6 | 1.3 | 36.0 | 11.7 |
| 3 | 31.6 | 13.3 | 23.9 | 17.4 | 14.3 | 41.1 | .5 | 10.8 | 8.5 | 1.3 | 68.9 | 9.2 |
| 4 | 36.2 | 11.9 | 31.7 | 32.3 | 12.5 | 25.0 | 2.1 | 10.6 | 7.6 | 2.1 | 75.8 | 12.9 |
| 5 | 75.2 | 12.2 | 55.5 | 76.6 | 12.3 | 23.5 | 3.2 | 8.7 | 6.0 | 3.6 | 59.8 | 11.7 |
| 6 | 73.2 | 10.4 | 269.6 | 53.5 | 9.8 | 16.2 | 6.4 | 8.5 | 9.6 | 6.0 | 94.2 | 10.9 |
| 7 | 51.7 | 10.6 | 426.4 | 40.4 | 68.8 | 12.3 | 13.2 | 9.3 | 8.8 | 6.1 | 55.1 | 13.8 |
| 8 | 35.2 | 11.0 | 189.2 | 39.0 | 41.9 | 11.1 | 11.7 | 8.9 | 8.1 | 4.8 | 77.4 | 9.3 |
| 9 | 31.7 | 11.5 | 114.4 | 44.3 | 26.6 | 12.2 | 11.9 | 8.3 | 8.3 | 9.6 | 56.9 | 10.2 |
| 10 | 22.9 | 11.8 | 111.7 | 42.8 | 17.4 | 9.2 | 9.8 | 7.0 | 8.2 | 34.7 | 54.3 | 11.8 |
| 11 | 27.8 | 11.0 | 145.3 | 33.5 | 14.9 | 8.2 | 8.3 | 7.3 | 8.9 | 46.7 | 39.3 | 13.8 |
| 12 | 20.3 | 11.0 | 164.8 | 28.9 | 13.2 | 5.3 | 10.7 | 7.3 | 6.5 | 42.9 | 29.6 | 125.9 |
| 13 | 18.9 | 10.2 | 99.3 | 26.9 | 8.7 | 4.2 | 8.2 | 7.8 | 8.5 | 28.3 | 29.4 | 257.9 |
| 14 | 18.5 | 11.0 | 83.7 | 22.6 | 9.0 | 4.8 | 12.1 | 7.1 | 7.8 | 32.0 | 34.1 | 141.4 |
| 15 | 19.1 | 10.8 | 50.6 | 20.2 | 6.8 | 3.6 | 9.4 | 7.3 | 6.3 | 23.1 | 31.9 | 90.4 |
| 16 | 47.7 | 11.5 | 60.5 | 19.3 | 5.2 | 2.3 | 11.2 | 6.9 | 6.5 | 17.3 | 52.1 | 63.4 |
| 17 | 33.4 | 10.2 | 33.2 | 15.7 | 4.1 | 2.1 | 11.1 | 6.6 | 6.6 | 9.7 | 72.5 | 93.3 |
| 18 | 27.0 | 12.4 | 45.1 | 14.6 | 4.2 | 2.1 | 10.1 | 7.4 | 5.1 | 9.0 | 51.1 | 67.7 |
| 19 | 30.0 | 19.6 | 84.5 | 12.2 | 5.5 | 2.0 | 10.1 | 8.7 | 5.5 | 11.9 | 51.8 | 53.8 |
| 20 | 17.4 | 19.8 | 65.4 | 14.0 | 5.6 | 5.3 | 12.0 | 12.2 | 10.1 | 7.0 | 23.7 | 34.4 |
| 21 | 14.2 | 17.1 | 52.9 | 74.1 | 4.1 | 11.1 | 9.5 | 13.5 | 12.2 | 6.2 | 25.6 | 29.8 |
| 22 | 14.8 | 15.1 | 50.4 | 109.3 | 3.9 | 9.3 | 12.8 | 12.6 | 9.5 | 7.4 | 26.8 | 30.2 |
| 23 | 20.7 | 14.3 | 173.5 | 109.7 | 3.7 | 5.1 | 11.9 | 13.6 | 3.8 | 5.5 | 22.8 | 15.1 |
| 24 | 27.4 | 13.5 | 107.8 | 115.0 | 3.9 | 6.0 | 10.3 | 13.4 | 5.3 | 4.3 | 34.3 | 13.4 |
| 25 | 57.0 | 10.7 | 70.3 | 72.7 | 12.8 | 2.8 | 5.7 | 11.0 | 4.3 | 5.2 | 31.9 | 12.3 |
| 26 | 30.7 | 9.9 | 58.3 | 53.2 | 174.1 | 1.8 | 6.0 | 10.2 | 3.5 | 5.3 | 24.6 | 11.3 |
| 27 | 26.5 | 9.2 | 42.8 | 33.9 | 12.8 | 1.8 | 4.1 | 10.2 | 4.0 | 4.1 | 24.3 | 9.9 |
| 28 | 20.0 | 8.7 | 35.5 | 26.1 | 12.9 | 1.8 | 9.9 | 10.2 | 2.6 | 4.7 | 19.4 | 10.4 |
| 29 | 17.6 | ..... | 29.7 | 25.9 | 37.0 | 1.7 | 9.4 | 10.2 | 1.7 | 5.9 | 15.2 | 12.3 |
| 30 | 16.8 | ..... | 22.4 | 21.7 | 24.3 | 1.7 | 9.4 | 10.2 | 1.7 | 3.7 | 12.8 | 11.2 |
| 31 | 17.0 | ..... | 22.8 | ..... | 21.5 | ..... | 9.5 | 9.7 | ..... | 4.0 | ..... | 10.2 |

*Estimated monthly discharge of Quackenkill Creek at Quackenkill village, N. Y.*

[Drainage area, 18.5 square miles.]

| Month. | Mean discharge. | Run-off. | |
|---|---|---|---|
| | | Second-feet per square mile. | Depth in inches. |
| 1894. | *Sec.-feet.* | | |
| January | 30.0 | 1.62 | 1.87 |
| February | 12.3 | .66 | .69 |
| March | 88.5 | 4.56 | 5.24 |
| April | 41.7 | 2.25 | 2.51 |
| May | 19.7 | 1.65 | 1.90 |
| June | 10.5 | .56 | .62 |
| July | 8.4 | .43 | .49 |
| August | 9.4 | .51 | .59 |
| September | 6.8 | .37 | .41 |
| October | 11.4 | .62 | .71 |
| November | 42.5 | 2.29 | 2.55 |
| December | 39.4 | 2.13 | 2.45 |
| The year | 26.7 | 1.47 | 20.03 |

## STREAMS PROPOSED AS SOURCES OF PUBLIC WATER SUPPLY FOR NEW YORK CITY.

In July, 1901, gaging stations were established and a series of discharge measurements undertaken on streams in the Catskill Mountain region and vicinity in cooperation with the department of water supply of New York City. In the following table the drainage area of the several streams are given:

*Drainage area of streams proposed as sources of water supply for New York City.*

| Stream. | Location of gaging station. | Drainage area. | | |
|---|---|---|---|---|
| | | Above proposed reservoir. | Above gaging station. | Above mouth. |
| | | *Sq. miles.* | *Sq. miles.* | *Sq. miles.* |
| Tenmile River | Dover Plains, N. Y | 200 | 195 | 195 |
| Housatonic River | Gaylordsville, Conn | 1,020 | 1,020 | 1,580 |
| Catskill Creek | South Cairo, N. Y | 140 | 260 | 394 |
| Esopus Creek | Kingston, N. Y | 242 | 312 | 417 |
| Wallkill River | Newpaltz, N. Y | 464 | 735 | 779 |
| Rondout Creek | Rosendale, N. Y | 184 | 365 | [a]369 |
| Fishkill Creek | Glenham, N. Y | 158 | 198 | 204 |

[a] Above junction with Wallkill River.

A gaging station on Housatonic River at Gaylordsville, Conn., established October 23, 1900, by the United States Geological Survey is also included.

ESOPUS CREEK AT KINGSTON, N. Y.

This gaging station is located at the Washington avenue bridge in Kingston, and was established July 5, 1901. The drainage basin is described and results of discharge measurements and gage readings for 1901 are given in Water-Supply Paper No. 65, pages 63 to 66. The maximum observed gage heights have been as follows:

*Gage heights of Esopus Creek at Kingston.*

| Date. | A. M. | M. | P. M. |
|---|---|---|---|
| 1901. | | | |
| December 15 | 20.0 | ..... | 22.75 |
| December 16 | 17.0 | ..... | 13.4 |
| 1902. | | | |
| January 22 | ..... | ..... | 16.15 |
| March 1 | 20.45 | ..... | 19.75 |
| March 2 | 16.1 | ..... | 17.52 |
| March 3 | 17.25 | ..... | ..... |
| March 17 | 18.3 | 20.15 | 18.22 |
| September 29 | 20.75 | ..... | 24.1 |
| September 30 | 18.8 | ..... | 15.9 |
| December 17 | 16.8 | ..... | ..... |

The following table gives a list of the discharge measurements made on Esopus Creek at Kingston, N. Y., during 1902:

*Discharge measurements of Esopus Creek at Kingston, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| June 16 | W. W. Schlecht | 4.48 | 135.8 |
| September 4 | H. K. Barrows | 4.49 | 133.0 |
| August 21 | do | 4.94 | 191.0 |
| June 26 | W. W. Schlecht | 5.02 | 225.0 |
| June 5 | do | 5.03 | 234.5 |
| July 16 | H. K. Barrows | 5.13 | 268.8 |
| November 22 | F. H. Tillinghast | 5.45 | 272.0 |
| July 9 | Barrows and Schlecht | 5.81 | 450.4 |
| May 14 | W. W. Schlecht | 5.83 | 422.0 |
| September 23 | P. M. Churchill | 5.87 | 449.0 |
| November 11 | F. H. Tillinghast | 6.00 | 416.0 |
| August 12 | H. K. Barrows | 6.28 | 550.0 |
| May 24 | W. W. Schlecht | 6.38 | [a]274.0 |
| June 5 | do | 6.41 | [a]272.0 |
| November 5 | F. H. Tillinghast | 6.55 | 594.0 |
| April 23 | W. W. Schlecht | 6.94 | 828.3 |
| May 14 | do | 7.14 | [a]508.0 |
| July 30 | H. K. Barrows | 7.65 | 1,155.0 |
| July 24 | do | 8.11 | 1,348.0 |
| October 4 | P. M. Churchill | 9.32 | 1,890.0 |
| March 12 | Horton and Schlecht | 9.90 | 2,843.0 |
| April 30 | W. W. Schlecht | 10.28 | 2,813.0 |
| December 18 | F. H. Tillinghast | 13.00 | 3,416.0 |
| April 10 | W. W. Schlecht | 13.37 | 5,021.0 |
| December 22 | F. H. Tillinghast | 16.00 | 8,594.0 |
| March 1 | W. W. Schlecht | 20.38 | [b]12,620.0 |

[a] Measured at Glasgow Bridge, Glenerie.
[b] Large quantities of floating ice in the stream. Surface velocities used.

The following measurements were also made during the period of ice obstruction, by W. W. Schlecht:

February 20: Gage height, 5.38; discharge, 245 second-feet; river partly frozen over.

February 15: Gage height, 5.60; discharge, 337 second-feet; river mostly frozen over.

February 7: Gage height, 6.83; discharge, 530 second-feet; river partly frozen.

September 29, 1.30 p. m.: The stream attained a flood stage, giving a reading of 25.25 on the gage.

*Mean daily gage height, in feet, of Esopus Creek at Kingston, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 8.20 | 7.25 | 20.10 | 9.35 | 8.95 | 4.85 | 6.38 | 7.09 | 4.45 | 13.38 | 7.28 | 5.9 |
| 2 | 10.35 | 7.45 | 16.82 | 8.69 | 8.18 | 4.83 | 6.19 | 7.95 | 4.48 | 11.68 | 6.75 | 5.7 |
| 3 | 9.95 | 9.35 | 15.75 | 8.05 | 7.78 | 4.76 | 6.00 | 7.10 | 4.43 | 10.10 | 5.83 | 6.19 |
| 4 | 8.40 | 7.72 | 11.07 | 7.64 | 7.70 | 4.83 | 6.40 | 6.90 | 4.33 | 9.50 | 6.55 | 6.43 |
| 5 | 7.65 | 7.52 | 9.45 | 7.33 | 7.43 | 4.70 | 5.99 | 6.53 | 4.38 | 8 60 | 6.55 | 6.33 |
| 6 | 7.30 | 7.16 | 8.95 | 7.03 | 7.11 | 4.73 | 6.19 | 7.08 | 4.33 | 9.64 | 6.25 | 6.18 |
| 7 | 6.95 | 6.70 | 7.90 | 7.18 | 6.98 | 4.55 | 6.16 | 6.90 | 4.38 | 8.68 | 6.47 | 6.35 |
| 8 | 6.65 | 6.47 | 7.68 | 7.28 | 6.74 | 4.63 | 6.03 | 3.43 | 4.38 | 8.18 | 6.35 | 6.6 |
| 9 | 6.50 | 6.14 | 8.85 | 13.10 | 6.55 | 4.63 | 5.80 | 6.18 | 4.38 | 7.85 | 6.13 | 6.45 |
| 10 | 6.40 | 6.25 | 9.20 | 13.86 | 6.40 | 4.68 | 5.58 | 5.88 | 7.68 | 7.40 | 6.08 | 6.00 |
| 11 | 6.35 | 5.94 | 9.05 | 11.60 | 6.23 | 4.58 | 5.50 | 5.83 | 6.00 | 7.15 | 7.85 | 6.35 |
| 12 | 5.88 | 5.88 | 9.80 | 10.22 | 6.10 | 4.45 | 5.34 | 6.25 | 5.49 | 9.10 | 5.95 | 6.55 |
| 13 | 6.00 | 5.77 | 11.85 | 9.41 | 5.96 | 4.53 | 5.15 | 5.73 | 5.53 | 8.47 | 5.85 | 6.35 |
| 14 | 5.93 | 5.60 | 11.82 | 8.78 | 5.88 | 4.58 | 5.05 | 5.58 | 6.18 | 8.00 | 5.78 | 6.4 |
| 15 | 5.60 | 5.58 | 9.98 | 8.25 | 5.70 | 4.40 | 4.98 | 5.38 | 5.85 | 7.60 | 5.73 | 6.43 |
| 16 | 5.58 | 5.53 | 9.33 | 7.90 | 5.70 | 4.46 | 4.99 | 5.30 | 5.53 | 7.33 | 5.63 | 6.65 |
| 17 | 5.59 | 5.63 | [a]18.28 | 7.58 | 5.50 | 4.78 | 4.89 | 5.08 | 5.30 | 7.15 | 5.60 | 16.20 |
| 18 | 5.30 | 5.39 | 13.10 | 7.35 | 5.33 | 4.94 | 4.80 | 5.10 | 5.13 | 6.95 | 5.60 | 12.86 |
| 19 | 5.50 | 5.45 | 10.13 | 7.10 | 5.38 | 4.63 | 4.78 | 4.98 | 5.08 | 6.75 | 5.54 | 11.00 |
| 20 | 5.86 | 5.30 | 9.20 | 6.93 | 5.40 | 4.60 | 6.37 | 4.98 | 5.30 | 6.73 | 5.46 | 9.95 |
| 21 | 4.95 | 5.35 | 8.62 | 6.80 | 5.28 | 4.81 | 10.00 | 4.88 | 6.88 | 6.47 | 5.45 | 8.55 |
| 22 | 12.73 | 5.36 | 8.25 | 6.78 | 5.13 | 5.55 | 9.50 | 4.85 | 6.28 | 6.30 | 5.38 | 15.6 |
| 23 | 10.88 | 5.30 | 8.20 | 6.93 | 5.03 | 5.13 | 9.28 | 4.78 | 5.88 | 6.20 | 5.36 | 12.80 |
| 24 | 8.88 | 5.36 | 7.87 | 6.88 | 5.00 | 4.93 | 8.38 | 4.65 | 5.68 | 6.13 | 5.36 | 10.40 |
| 25 | 8.00 | 5.39 | 7.63 | 6.58 | 4.88 | 4.81 | 8.58 | 4.70 | 5.68 | 6.30 | 5.2 | 9.35 |
| 26 | 7.53 | 6.45 | 7.43 | 6.36 | 5.20 | 4.93 | 8.68 | 4.65 | 7.00 | 5.87 | 5.3 | 8.7 |
| 27 | 8.63 | 9.30 | 7.28 | 6.35 | 5.20 | 5.15 | 8.01 | 4.55 | 10.35 | 5.78 | 6.0 | 8.28 |
| 28 | 8.08 | 9.37 | 7.19 | 6.20 | 5.58 | 4.84 | 7.75 | 4.65 | 9.48 | 7.83 | 6.6 | 8.75 |
| 29 | 7.72 | ..... | 11.65 | 5.98 | 5.25 | 4.81 | 7.19 | 4.70 | [b]22.43 | 8.35 | 6.1 | 9.10 |
| 30 | 7.82 | ..... | 12.55 | 9.81 | 5.03 | 7.10 | 7.68 | 4.60 | 17.35 | 7.75 | 5.88 | 8.97 |
| 31 | 7.48 | ..... | 10.45 | ..... | 5.03 | ..... | 7.35 | 4.63 | ..... | 7.50 | ..... | 8.05 |

[a] Highest water at 1.30 p. m., 18.30.

[b] Highest water at 1.30 p. m., 25.25.

## CATSKILL CREEK AT SOUTH CAIRO, N. Y.

This stream is described and the results of current-meter measurements, together with daily gage heights of 1901, are given in Water-Supply Paper No. 65, pages 61 to 63. In relation to the supply available for storage in the proposed reservoirs, the maximum discharge of these streams is of interest. The following table shows a number of the maximum gage readings of 1901, also of 1902. This, in connection

with the accompanying table of discharge measurements, will serve to illustrate the freshet flow of this stream:

*Gage heights of Catskill Creek, in feet, at South Cairo, N. Y., during freshets.*

| Date. | A. M. | P. M. |
|---|---|---|
| 1901. | | |
| December 15 | 15.0 | 10.6 |
| 1902. | | |
| February 28 | | 12.2 |
| March 1 | 11.5 | 11.7 |
| April 9 | 11.7 | 11.6 |

The following table gives a list of the discharge measurements made on Catskill Creek at South Cairo, N. Y., during 1902:

*Discharge measurements of Catskill Creek at South Cairo, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Sec.-feet.* |
| June 13 | W. W. Schlecht | 2.69 | 40.6 |
| June 24 | do | 2.70 | 43.5 |
| August 27 | H. K. Barrows | 2.74 | 39.4 |
| September 5 | do | 2.79 | 50.0 |
| June 3 | W. W. Schlecht | 2.82 | 49.5 |
| May 23 | do | 2.83 | 51.1 |
| September 22 | P. M. Churchill | 3.32 | 121.0 |
| July 9 | H. K. Barrows | 3.365 | 113.5 |
| May 10 | W. W. Schlecht | 3.47 | 133 |
| August 13 | H. K. Barrows | 3.49 | 135 |
| November 7 | F. H. Tillinghast | 3.80 | 235 |
| December 3 | do | 3.90 | 275 |
| October 10 | P. M. Churchill | 3.92 | 242 |
| April 22 | W. W. Schlecht | 4.06 | 320.2 |
| August 2 | H. K. Barrows | 5.36 | 1,005 |
| December 18 | F. H. Tillinghast | 5.45 | 1,054 |
| July 23 | H. K. Barrows | 6.11 | 1,602 |
| April 11 | W. W. Schlecht | 6.86 | 2,312 |
| March 13 | Horton and Schlecht | 8.66 | 5,483 |

A measurement made February 27, 1902, with the stream obstructed by ice, showed the discharge to be 363 second-feet, gage height 4.72. The stream was frozen from bank to bank, to a depth of 6 to 18 inches.

*Mean daily gage height, in feet, of Catskill Creek at South Cairo, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | ..... | 4.30 | 11.70 | 5.35 | 4.10 | 2.95 | 3.48 | 4.50 | 2.90 | 6.18 | 4.30 | 3.6 |
| 2 | ..... | 5.05 | 9.68 | 5.88 | 3.95 | 2.88 | 3.28 | 5.58 | 2.83 | 5.63 | 4.15 | 3.63 |
| 3 | ..... | 5.20 | 6.70 | 4.95 | 3.93 | 2.80 | 3.13 | 4.38 | 2.75 | 5.20 | 4.05 | 3.8 |
| 4 | ..... | 4.45 | 6.80 | 4.88 | 3.88 | 2.83 | 3.10 | 4.13 | 2.73 | 4.80 | 3.95 | 4.18 |
| 5 | 4.40 | 4.40 | 6.35 | 4.90 | 3.83 | 2.88 | 3.08 | 3.85 | 2.73 | 4.60 | 3.90 | 4.0 |
| 6 | 4.20 | 4.40 | 5.40 | 4.65 | 3.78 | 2.88 | 4.45 | 4.45 | 2.70 | 4.53 | 3.83 | 4.0 |
| 7 | 4.05 | 4.30 | 4.10 | 4.40 | 3.73 | 2.85 | 4.20 | 4.20 | 2.73 | 4.40 | 3.77 | 3.93 |
| 8 | 4.80 | 4.25 | 4.10 | 4.60 | 3.70 | 2.90 | 3.48 | 3.93 | 2.78 | 4.23 | 3.73 | 3.8 |
| 9 | 3.70 | 4.20 | 4.30 | 11.65 | 3.60 | 2.80 | 3.80 | 3.80 | 2.90 | 4.05 | 3.65 | 3.7 |
| 10 | 3.55 | 4.25 | 5.20 | 8.25 | 3.50 | 2.75 | 3.65 | 3.65 | 3.68 | 3.90 | 3.55 | 4.05 |
| 11 | 3.40 | 4.40 | 5.75 | 6.98 | 3.40 | 2.70 | 3.60 | 3.55 | 3.55 | 3.93 | 3.5 | 4.4 |
| 12 | 3.30 | 4.50 | 9.10 | 6.48 | 3.30 | 2.65 | 3.55 | 3.55 | 3.28 | 5.08 | 3.55 | 4.13 |
| 13 | 3.30 | 4.70 | 9.20 | 5.50 | 3.28 | 2.78 | 2.95 | 3.45 | 3.40 | 4.60 | 3.63 | 4.0 |
| 14 | 3.30 | 4.95 | 7.50 | 4.95 | 3.23 | 2.75 | 2.80 | 3.15 | 3.53 | 4.25 | 3.53 | 4.0 |
| 15 | 3.20 | 3.10 | 5.45 | 4.78 | 3.20 | 2.70 | 2.80 | 3.20 | 3.35 | 4.15 | 3.5 | 3.95 |
| 16 | 3.30 | 3.20 | 7.40 | 4.58 | 3.05 | 2.75 | 2.75 | 3.15 | 3.18 | 4.25 | 3.4 | 4.53 |
| 17 | 3.20 | 3.40 | 9.43 | 4.35 | 3.00 | 2.90 | 2.70 | 3.05 | 3.05 | 3.93 | 3.4 | 6.35 |
| 18 | 3.00 | 3.50 | 6.85 | 4.25 | 2.95 | 2.88 | 2.65 | 2.93 | 2.95 | 3.83 | 3.33 | 5.43 |
| 19 | 2.90 | 3.60 | 4.15 | 4.20 | 2.90 | 2.78 | 2.70 | 3.05 | 2.98 | 3.80 | 3.3 | 5.0 |
| 20 | 2.90 | 3.80 | 4.50 | 4.20 | 2.95 | 2.85 | 4.40 | 3.10 | 3.25 | 3.83 | 3.28 | 4.80 |
| 21 | 3.10 | 3.80 | 4.00 | 4.13 | 2.95 | 2.80 | 7.25 | 3.03 | 3.48 | 3.73 | 3.30 | 6.65 |
| 22 | 9.85 | 3.80 | 4.55 | 4.10 | 2.83 | 2.80 | 6.50 | 2.98 | 3.58 | 3.73 | 3.2 | 8.48 |
| 23 | 5.90 | 3.50 | 5.58 | 4.03 | 2.78 | 2.80 | 6.53 | 2.93 | 3.18 | 3.60 | 3.2 | 6.7 |
| 24 | 4.80 | 3.20 | 5.48 | 3.95 | 2.90 | 2.78 | 6.18 | 2.83 | 3.10 | 3.63 | 3.15 | 5.13 |
| 25 | 4.40 | 3.40 | 5.05 | 3.90 | 2.95 | 2.70 | 7.08 | 2.75 | 3.25 | 3.60 | 3.2 | 4.85 |
| 26 | 4.03 | 3.50 | 4.93 | 3.80 | 2.85 | 2.68 | ..... | 2.70 | 3.58 | 3.50 | 3.3 | 6.65 |
| 27 | 3.85 | 4.83 | 4.83 | 3.83 | 3.10 | 2.65 | 4.05 | 2.70 | 4.35 | 3.55 | 3.85 | 4.35 |
| 28 | 3.58 | 9.15 | 5.03 | 3.73 | 3.33 | 2.60 | 4.20 | 2.73 | [a]4.70 | 5.90 | 4.13 | 4.20 |
| 29 | 3.70 | ..... | 5.73 | 3.95 | 3.25 | 2.80 | 4.40 | 2.85 | 9.95 | 5.30 | 3.8 | 4.13 |
| 30 | 4.25 | ..... | 5.93 | 4.10 | 3.13 | 3.88 | 4.38 | 2.98 | 7.20 | 4.70 | 3.63 | 3.95 |
| 31 | 4.30 | ..... | 5.43 | ..... | 3.00 | ..... | 4.25 | 3.08 | ..... | 4.45 | ..... | 3.85 |

[a] Gage height at 12 p. m.=16.1 feet.

## RONDOUT CREEK AT ROSENDALE, N. Y.

This station was established at the highway bridge in Rosendale, 3 miles above the junction of Rondout Creek and Wallkill River, July 6, 1901. The station is described and results of gagings for 1901 are given in Water-Supply Paper No. 65, pages 66 to 68. Gage readings taken during the extreme freshets of December 15, 1901, and March 1, 1902, are as follows:

*Gage heights of Rondout Creek at Rosendale, N. Y., during freshets of December 15, 1901, and March 1, 1902.*

| Date. | A. M. | M. | P. M. |
|---|---|---|---|
| 1901. | | | |
| December 15 | 15.75 | 16.7 | 17.8 |
| 1902. | | | |
| March 1 | 17.4 | ..... | 17 |

The following table gives the discharge measurements made on Rondout Creek at Rosendale, N. Y., during 1902:

*Discharge measurements of Rondout Creek at Rosendale, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| September 25 | P. M. Churchill | 6.31 | 167.0 |
| July 15 | H. K. Barrows | 6.33 | 141.9 |
| July 18 | do | 6.33 | 137.2 |
| August 29 | do | 6.33 | 145.0 |
| June 6 | W. W. Schlecht | 6.38 | 163.0 |
| June 20 | do | 6.42 | 166.0 |
| November 21 | F. H Tillinghast | 6.55 | 283.4 |
| December 2 | do | 6.70 | 367.0 |
| April 28 | W. W. Schlecht | 6.83 | 382.0 |
| May 12 | do | 6.85 | 421.0 |
| November 4 | F. H. Tillinghast | 7.00 | 570.0 |
| August 7 | H. K. Barrows | 7.39 | 838.0 |
| July 29 | do | 7.40 | 888.0 |
| March 21 | W. W. Schlecht | 8.07 | 1,529.0 |
| March 1 | do | 17.60 | 13,956.0 |
| April 11 | do | 11.78 | 5,665.0 |
| December 17 | F. H. Tillinghast | 12.80 | 7,928.0 |

Additional measurements were made by W. W. Schlecht while the river was frozen over, as follows:

February 18: Gage height, 7.70; discharge, 342 second-feet. The river was frozen over from bank to bank and slush had collected below the ice.

February 26: Gage height, 8.13; discharge, 543 second-feet. Slush below the ice made an unsatisfactory record.

February 26: Gage height, 8.43; discharge, 684 second-feet. Ice covered the river from bank to bank and slush had collected underneath.

*Mean daily gage height, in feet, of Rondout Creek at Rosendale, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 8.73 | 8.98 | 17.20 | 8.18 | 8.25 | 6.58 | 7.08 | 7.70 | 6.25 | 10.03 | 7.25 | 6.73 |
| 2 | 7.90 | 8.95 | 14.23 | 7.85 | 7.70 | 6.48 | 6.90 | 8.35 | 6.20 | 9.28 | 7.05 | 6.70 |
| 3 | 7.90 | 9.75 | 12.53 | 7.58 | 7.70 | 6.55 | 6.98 | 7.60 | 6.13 | 8.43 | 7.03 | 6.90 |
| 4 | 7.90 | 9.35 | 9.75 | 7.58 | 7.75 | 6.63 | 7.70 | 7.28 | 6.15 | 7.90 | 7.00 | 7.20 |
| 5 | 7.90 | 9.70 | 8.70 | 7.35 | 7.50 | 6.48 | 7.23 | 7.08 | 6.10 | 7.80 | 6.90 | 6.88 |
| 6 | 7.83 | 9.25 | 8.05 | 7.25 | 7.33 | 6.40 | 7.13 | 7.25 | 6.18 | 8.78 | 6.87 | 6.80 |
| 7 | 7.58 | 9.00 | 7.95 | 7.60 | 7.28 | 6.48 | 7.00 | 7.33 | 6.20 | 8.00 | 6.95 | 6.95 |
| 8 | 7.28 | 8.83 | 7.65 | 8.10 | 7.15 | 6.45 | 6.88 | 7.03 | 6.20 | 7.65 | 6.85 | 6.98 |
| 9 | 7.13 | 8.58 | 9.40 | 12.28 | 7.03 | 6.48 | 6.85 | 6.93 | 6.23 | 7.38 | 6.80 | 6.88 |
| 10 | 7.08 | 8.05 | 9.70 | 11.40 | 6.93 | 6.38 | 6.68 | 6.83 | 7.00 | 7.18 | 6.78 | 7.10 |
| 11 | 7.10 | 8.18 | 9.30 | 9.75 | 6.88 | 6.30 | 6.58 | 6.80 | 6.58 | 6.95 | 6.73 | 7.08 |
| 12 | 7.35 | 8.05 | 9.70 | 9.15 | 6.88 | 6.35 | 6.53 | 6.90 | 6.40 | 9.75 | 6.73 | 7.00 |
| 13 | 6.95 | 7.98 | 11.05 | 8.63 | 6.83 | 6.35 | 6.50 | 6.80 | 6.45 | 8.65 | 6.73 | 6.95 |
| 14 | 6.73 | 7.88 | 10.15 | 8.15 | 6.68 | 6.38 | 6.45 | 6.70 | 6.68 | 8.00 | 6.70 | 7.15 |
| 15 | 6.83 | 7.80 | 9.15 | 7.85 | 6.63 | 6.35 | 6.35 | 6.55 | 6.48 | 7.57 | 6.70 | 7.50 |
| 16 | 6.90 | 7.65 | 8.80 | 7.65 | 6.70 | 6.35 | 6.40 | 6.58 | 6.35 | 7.35 | 6.70 | 8.35 |
| 17 | 6.78 | 7.53 | 13.10 | 7.50 | 6.60 | 6.50 | 6.33 | 6.50 | 6.25 | 7.23 | 6.65 | 12.95 |
| 18 | 6.70 | 7.60 | 9.95 | 7.38 | 6.63 | 6.45 | 6.30 | 6.45 | 6.20 | 7.07 | 6.65 | 10.00 |
| 19 | 6.78 | 7.35 | 8.65 | 7.25 | 6.60 | 6.30 | 6.33 | 6.40 | 6.18 | 7.07 | 6.68 | 8.80 |
| 20 | 6.70 | 7.43 | 8.25 | 7.18 | 6.60 | 6.43 | 7.53 | 6.40 | 6.25 | 7.00 | 6.65 | 8.30 |
| 21 | 6.73 | 7.43 | 8.08 | 7.10 | 6.58 | 6.43 | 8.93 | 6.38 | 6.50 | 6.95 | 6.65 | 8.35 |
| 22 | 14.68 | 7.40 | 8.00 | 7.05 | 6.50 | 7.10 | 9.18 | 6.48 | 6.40 | 6.90 | 6.65 | 13.45 |
| 23 | 9.83 | 7.43 | 7.88 | 7.00 | 6.48 | 6.70 | 8.38 | 6.40 | 6.23 | 6.80 | 6.60 | 10.58 |
| 24 | 8.35 | 7.48 | 7.80 | 6.90 | 6.45 | 6.50 | [a]9.94 | 6.40 | 6.25 | 6.80 | 6.60 | 9.55 |
| 25 | 7.85 | 7.55 | 7.63 | 6.88 | 6.40 | 6.40 | 10.34 | 6.33 | 6.45 | 6.80 | 6.55 | 8.50 |
| 26 | 7.68 | 8.23 | 7.45 | 6.98 | 6.80 | 6.43 | 8.95 | 6.30 | 9.40 | 6.73 | 6.70 | 8.10 |
| 27 | 8.95 | 10.68 | 7.38 | 6.95 | 6.88 | 6.50 | 8.23 | 6.28 | 9.75 | 6.63 | 6.75 | 8.87 |
| 28 | 7.75 | 12.10 | 7.33 | 6.83 | 7.20 | 6.43 | 7.80 | 6.25 | 8.68 | 9.38 | 6.90 | 7.45 |
| 29 | 8.00 | ..... | 9.85 | 6.78 | 6.85 | 6.45 | 7.38 | 6.33 | [b]14.90 | 8.60 | 6.88 | 7.27 |
| 30 | 8.18 | ..... | 9.53 | 9.38 | 6.60 | 7.70 | 7.80 | 6.30 | 10.78 | 7.83 | 6.80 | 7.20 |
| 31 | 8.60 | ..... | 8.63 | ..... | 6.63 | ..... | 7.33 | 6.30 | ..... | 7.45 | ..... | 7.20 |

[a] Highest water, 12.65, at 7 p. m. [b] Highest water, 15.6, at 3 p. m.

## DELAWARE AND HUDSON CANAL AT CREEKLOCKS, N. Y.

The Delaware and Hudson Canal runs parallel to Rondout Creek from the feeder dam below High Falls to tide water at Eddyville. The canal receives its entire water supply from Rondout Creek. The section from High Falls to Eddyville is the only portion of the canal remaining in operation in New York State. At Rosendale the canal carries a portion of the yield of Rondout Creek past the gaging station. In order to determine the run-off from Rondout Creek drainage basin, gagings of the flow in the Delaware and Hudson Canal at the foot of the Rosendale level have been undertaken. The diversion to the canal added to the measured discharge of Rondout gaging station represents the total flow from the drainage basin. The gaging station at Creeklocks is described in Water-Supply Paper No. 65, pages 68 to 69. The accompanying table shows the estimated daily and mean monthly diversion during 1902.

*Estimated diversion, in second-feet, from Rondout Creek to Delaware and Hudson Canal, Rosendale, N. Y.*

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | |
| 1 | ..... | 15.5 | 22.6 | ..... | 24.2 | 26.0 | ..... | 22.6 | 22.5 | 24.5 |
| 2 | ..... | 17.7 | 15.0 | 25.2 | 23.8 | 25.6 | 25.3 | 22.4 | ..... | 20.8 |
| 3 | ..... | 21.5 | 24.6 | 20.8 | 23.1 | ..... | 22.5 | 26.1 | 21.0 | 22.3 |
| 4 | ..... | 22.0 | ..... | 11.6 | ..... | 23.8 | 24.3 | 25.8 | 23.5 | 21.5 |
| 5 | ..... | 17.9 | 27.6 | 25.3 | 24.1 | 24.5 | 25.3 | ..... | 21.5 | 22.7 |
| 6 | ..... | ..... | 23.1 | 19.5 | ..... | 22.5 | 25.8 | 22.2 | 23.3 | [a]19.0 |
| 7 | ..... | 20.4 | 24.8 | 21.8 | 23.1 | 24.5 | ..... | 23.1 | 24.2 | ..... |
| 8 | ..... | 20.2 | 24.3 | ..... | 22.7 | 23.8 | 25.0 | 22.4 | 24.8 | ..... |
| 9 | ..... | 18.4 | 24.6 | 23.8 | 24.3 | 24.0 | 23.5 | 21.9 | ..... | ..... |
| 10 | ..... | 14.3 | 24.5 | 35.9 | 25.3 | ..... | 24.3 | 22.8 | 22.8 | ..... |
| 11 | ..... | 20.7 | ..... | 24.9 | 26.1 | 24.0 | 24.3 | 22.1 | 21.7 | ..... |
| 12 | ..... | 19.2 | 24.3 | 33.8 | 21.8 | 24.5 | 25.1 | ..... | ..... | ..... |
| 13 | ..... | ..... | 24.1 | 27.5 | ..... | 24.6 | 22.2 | 20.4 | 21.2 | ..... |
| 14 | ..... | 25.4 | 25.0 | 23.6 | 25.3 | 26.0 | ..... | 20.6 | 23.0 | ..... |
| 15 | ..... | 25.7 | 24.1 | ..... | 25.3 | 24.8 | 26.5 | 20.5 | 23.3 | ..... |
| 16 | ..... | 24.2 | 24.5 | 22.3 | 24.2 | 24.5 | 25.6 | 19.5 | ..... | ..... |
| 17 | ..... | 25.1 | 22.8 | 22.6 | 26.0 | ..... | 25.8 | 19.5 | 21.6 | ..... |
| 18 | ..... | 26.1 | ..... | 24.3 | 25.1 | 25.5 | 23.3 | 19.7 | 24.8 | ..... |
| 19 | ..... | 25.6 | 24.3 | 23.8 | 22.7 | 24.3 | 24.8 | ..... | 23.8 | ..... |
| 20 | ..... | ..... | 24.6 | 23.9 | ..... | 23.8 | 22.0 | 21.3 | 20.4 | ..... |
| 21 | ..... | 25.9 | 23.1 | 24.4 | 23.8 | 25.1 | ..... | 23.5 | 26.0 | ..... |
| 22 | ..... | 26.7 | 23.6 | ..... | 25.6 | 25.6 | 24.3 | 21.0 | 21.8 | ..... |
| 23 | 15.8 | 24.1 | 25.6 | 22.1 | 22.8 | 24.3 | 23.8 | 21.2 | ..... | ..... |
| 24 | 11.4 | 23.3 | 24.3 | 20.1 | 20.6 | ..... | 24.0 | 23.0 | 23.0 | ..... |
| 25 | 12.3 | 23.4 | ..... | 22.6 | 19.0 | 22.8 | 25.1 | 20.4 | 21.2 | ..... |
| 26 | 15.3 | 22.8 | 21.1 | 22.8 | 22.8 | 22.2 | 22.8 | ..... | 20.7 | ..... |
| 27 | 16.9 | ..... | 28.0 | 19.8 | ..... | 25.1 | 22.6 | 22.8 | 22.7 | ..... |
| 28 | 16.4 | 27.1 | 26.5 | 22.6 | 25.6 | 22.5 | ..... | 23.8 | 24.8 | ..... |
| 29 | ..... | 25.2 | 26.3 | ..... | 21.6 | 25.8 | 20.3 | 24.3 | 22.5 | ..... |
| 30 | ..... | 25.8 | 20.7 | 26.7 | 23.6 | 23.0 | 22.1 | 23.0 | ..... | ..... |
| 31 | 21.8 | ..... | 24.1 | ..... | 26.4 | ..... | ..... | 25.0 | ..... | ..... |
| Mean | ..... | 22.5 | 24.0 | 23.7 | 23.8 | 24.3 | 24.0 | 22.2 | ..... | ..... |

[a] Close of navigation.

## RONDOUT CREEK AT HONK FALLS, N. Y.

This gaging station is described in Water-Supply Paper No. 65, pages 69 to 70. Automatic recording gages have been erected at the dam and power house. The gages furnish continuous graphical charts, showing the depth wasted over the dam and the flow over a weir situated in the tailrace of the power house of the Honk Falls Light and Power Company. The discharge has not been estimated.

## WALLKILL RIVER AT NEWPALTZ, N. Y.

Wallkill River rises in the northern highlands of New Jersey. The greater portion of its course lies through New York State, and it is tributary to the Hudson River through Rondout Creek. The gaging station at Newpaltz, which was established July 7, 1901, is described in Water-Supply Paper No. 65, pages 71 to 74. The drainage basin is less precipitous than that of other streams in southeastern New York. Wallkill River, however, closely resembles Catskill and Esopus

creeks in the torrential character of its run-off, being subject to sudden and extreme variations in flow. The maximum gage readings have been as follows:

*Maximum gage heights of Wallkill River at Newpaltz.*

| Date. | A. M. | P. M. |
|---|---|---|
| 1901. | *Feet.* | *Feet.* |
| December 15 | 13.5 | 13.1 |
| December 30 | 18.0 | 20.5 |
| December 31 | 19.7 | 18.7 |
| 1902. | | |
| March 1 | 22.4 | 24.65 |
| March 2 | 23.6 | 24.0 |
| March 3 | 24.8 | 24.5 |
| December 22 | 17.4 | 20.6 |
| December 23 | 20.6 | 18.7 |

The following table gives a list of the discharge measurements made on the Wallkill River at Newpaltz, N. Y., during 1902:

*Discharge measurements of Wallkill River at Newpaltz, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| July 17 | H. K. Barrows | 5.70 | 124.3 |
| August 28 | do | 5.86 | 169.0 |
| September 18 | Barrows and Churchill | 5.96 | 209.5 |
| June 19 | W. W. Schlecht | 6.18 | 295.0 |
| May 21 | do | 6.33 | 344.0 |
| June 6 | do | 6.40 | 381.0 |
| November 18 | F. H. Tillinghast | 6.62 | 550.0 |
| May 13 | W. W. Schlecht | 6.68 | 506.0 |
| August 15 | H. K. Barrows | 6.72 | 518.0 |
| December 2 | F. H. Tillinghast | 6.80 | 626.0 |
| April 26 | W. W. Schlecht | 6.92 | 680.0 |
| February 24 | do | 7.33 | [a]288.0 |
| July 29 | H. K. Barrows | 7.49 | 942.0 |
| April 21 | W. W. Schlecht | 7.57 | 1,028.0 |
| February 10 | do | 7.78 | [b]597.0 |
| November 4 | F. H. Tillinghast | 7.95 | 1,165.0 |
| August 6 | H. K. Barrows | 7.98 | 1,150.0 |
| May 1 | W. W. Schlecht | 10.264 | 2,623.0 |
| April 9 | do | 13.21 | 5,354.0 |
| March 11 | do | 15.93 | 7,140.0 |

[a] Measured through ice 1 foot and 6 inches to 2 feet and 6 inches in thickness.
[b] Measured through ice 1 foot to 2 feet in thickness.

*Mean daily gage height, in feet, of Wallkill River at Newpaltz, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 15.15 | 8.75 | 23.53 | 9.35 | 10.25 | 7.50 | 7.25 | 9.50 | 6.10 | 10.25 | 8.65 | 6.8 |
| 2 | 13.10 | 8.75 | 23.80 | 8.95 | 8.95 | 7.25 | 7.15 | 9.10 | 6.05 | 10.85 | 8.35 | 6.7 |
| 3 | 12.95 | 10.65 | [a]24.65 | 8.65 | 9.15 | 7.05 | 7.80 | 8.75 | 6.00 | 10.15 | 8.15 | 7.5 |
| 4 | 12.10 | 9.70 | 22.75 | 8.20 | 8.85 | 6.90 | 7.58 | 8.60 | 5.88 | 9.65 | 7.95 | 7.95 |
| 5 | 10.45 | 9.75 | 20.25 | 8.00 | 8.35 | 6.55 | 7.08 | 8.30 | 5.78 | 9.60 | 7.65 | 8.1 |
| 6 | 10.70 | 8.90 | 15.20 | 9.70 | 7.95 | 6.35 | 6.78 | 7.95 | 5.70 | 10.10 | 7.50 | 8.55 |
| 7 | 10.20 | 8.15 | 13.20 | 7.70 | 7.50 | 6.30 | 6.53 | 7.85 | 5.60 | 9.45 | 7.50 | 8.10 |
| 8 | 9.70 | 7.85 | 12.70 | 8.40 | 7.45 | 6.25 | 6.35 | 7.65 | 5.50 | 9.00 | 7.65 | 7.70 |
| 9 | 9.15 | 7.78 | 14.95 | [b]13.65 | 7.35 | 6.30 | 6.23 | 7.30 | 5.50 | 8.55 | 7.15 | 7.70 |
| 10 | 8.85 | 7.70 | 16.45 | 13.50 | 7.10 | 6.50 | 6.32 | 7.05 | 6.10 | 8.40 | 6.95 | 7.65 |
| 11 | 8.75 | 7.55 | 15.90 | 12.20 | 6.80 | 6.35 | 6.00 | 6.90 | 6.45 | 8.25 | 6.75 | 7.60 |
| 12 | 8.20 | 7.55 | 16.10 | 11.65 | 6.65 | 6.30 | 6.00 | 6.80 | 6.30 | 12.45 | 6.7 | 7.60 |
| 13 | 8.05 | 7.40 | 17.05 | 10.65 | 6.60 | 6.20 | 5.90 | 6.75 | 6.35 | 11.90 | 6.6 | 7.55 |
| 14 | 8.05 | 7.35 | 16.50 | 9.80 | 6.55 | 6.15 | 5.78 | 6.68 | 6.45 | 10.50 | 6.6 | 7.5 |
| 15 | 8.00 | 7.15 | 15.00 | 9.35 | 6.50 | 6.10 | 5.70 | 6.60 | 6.25 | 9.70 | 6.6 | 7.5 |
| 16 | 8.00 | 7.10 | 14.65 | 8.65 | 6.45 | 6.20 | 5.70 | 6.53 | 6.15 | 9.35 | 6.5 | 7.5 |
| 17 | 7.70 | 7.20 | 15.40 | 8.20 | 6.45 | 6.25 | 5.73 | 6.43 | 6.05 | 9.00 | 6.5 | 12.2 |
| 18 | 7.55 | 7.15 | 13.75 | 8.00 | 6.30 | 6.15 | 5.58 | 6.38 | 5.95 | 8.60 | 6.5 | 12.25 |
| 19 | 7.50 | 7.08 | 11.75 | 7.85 | 6.30 | 6.13 | 5.55 | 6.28 | 5.80 | 8.60 | 6.5 | 12.3 |
| 20 | 7.20 | 7.00 | 10.50 | 7.60 | 6.30 | 6.10 | 6.10 | 6.20 | 5.90 | 8.15 | 6.5 | 12.3 |
| 21 | 7.20 | 7.05 | 10.30 | 7.45 | 6.30 | 6.13 | 7.50 | 6.30 | 5.90 | 7.95 | 6.4 | 12.95 |
| 22 | 18.50 | 7.05 | 10.20 | 7.35 | 6.30 | 6.33 | 8.65 | 6.10 | 5.90 | 7.65 | 6.4 | 19.0 |
| 23 | 17.65 | 7.10 | 9.75 | 7.15 | 6.25 | 6.40 | 7.40 | 6.05 | 5.90 | 7.47 | 6.65 | 19.65 |
| 24 | 13.55 | 7.25 | 9.60 | 7.10 | 6.20 | 6.35 | [c]10.70 | 6.10 | 5.90 | 7.37 | 6.3 | 17.20 |
| 25 | 13.15 | 7.30 | 9.45 | 6.95 | 6.20 | 6.20 | [d]14.00 | 6.05 | 6.15 | 7.15 | 6.3 | 16.25 |
| 26 | 12.20 | 7.75 | 9.00 | 6.85 | 6.45 | 6.20 | 9.10 | 6.00 | 9.65 | 6.95 | 6.35 | 15.30 |
| 27 | 12.85 | 11.40 | 8.50 | 7.00 | 8.30 | 6.10 | 8.50 | 6.00 | 12.00 | 6.85 | 6.35 | 14.20 |
| 28 | 12.65 | 12.75 | 8.20 | 6.45 | 9.20 | 6.25 | 7.80 | 5.95 | 11.90 | 11.65 | 6.35 | 14.20 |
| 29 | 11.06 | ..... | 10.20 | 6.65 | 8.40 | 6.35 | 7.45 | 8.25 | 13.45 | 11.25 | 7.1 | 13.80 |
| 30 | 9.50 | ..... | 11.05 | [e]11.75 | 8.30 | 7.00 | 7.45 | 7.25 | 10.35 | 9.45 | 6.95 | 12.30 |
| 31 | 9.25 | ..... | 9.90 | ..... | 7.90 | ..... | 8.45 | 6.40 | ..... | 8.95 | ..... | 11.75 |

[a] Highest water 24.80 at (?) p. m.
[b] Highest water 14.6 at (?) p. m.
[c] Highest water 15.4 at 8 p. m.
[d] Highest water 16.6 at 9 p. m.
[e] Highest water 12.6 at p. m.

## FISHKILL CREEK AT GLENHAM, N. Y.

The gaging station is located at the Newburg, Dutchess and Connecticut Railroad bridge in Glenham. It was established July 8, 1901, and is described in Water-Supply Paper No. 65, pages 74 to 76, where discharge measurements and gage heights for 1901 may be found.

The following table gives a list of the discharge measurements made on the Fishkill Creek at Glenham, N. Y., during 1902:

*Discharge measurements of Fishkill Creek at Glenham, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Sec. feet.* |
| August 26 | H. K. Barrows | 3.04 | 48.5 |
| July 14 | do | 3.18 | 64.4 |
| August 11 | do | 3.51 | 115.0 |
| November 25 | F. H. Tillinghast | 3.65 | 146.0 |
| October 11 | P. M. Churchill | 3.71 | 155.0 |
| June 2 | W. W. Schlecht | 3.785 | 132.3 |
| July 28 | H. K. Barrows | 3.90 | 200.0 |
| June 17 | W. W. Schlecht | 4.00 | 212.5 |
| November 8 | F. H. Tillinghast | 4.00 | 233.0 |
| April 25 | W. W. Schlecht | 4.03 | [a] 152.4 |
| May 6 | do | 4.46 | 349.5 |
| February 11 | do | 4.87 | [b] 202.5 |
| October 30 | C. C. Covert | 4.97 | 697.7 |
| April 12 | W. W. Schlecht | 5.30 | 772.6 |
| March 5 | do | 5.79 | 1,129.0 |

[a] Probably incorrect.

[b] Ice along banks at gaging station, frozen from bank to bank 90 yards below station, 2 to 9 nches thick.

*Mean daily gage height, in feet, of Fishkill Creek at Glenham, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 6.05 | 5.00 | 13.00 | 4.90 | 5.48 | 3.83 | 3.70 | 3.80 | 2.90 | 4.25 | 4.40 | 3.7 |
| 2 | 5.65 | 4.75 | 10.00 | 4.78 | 4.93 | 3.70 | 3.53 | 3.70 | 2.80 | 4.20 | 4.33 | 3.73 |
| 3 | 5.50 | 5.63 | 8.78 | 4.68 | 4.70 | 3.60 | 3.45 | 3.60 | 2.95 | 4.00 | 4.20 | 3.88 |
| 4 | 5.30 | 5.55 | 6.70 | 4.60 | 4.73 | 3.70 | 3.85 | 3.60 | 2.73 | 3.83 | 4.15 | 4.03 |
| 5 | 5.18 | 5.58 | 5.80 | 4.53 | 4.63 | 3.70 | 3.60 | 3.50 | 2.90 | 3.83 | 4.05 | 3.98 |
| 6 | 4.95 | 5.28 | 4.95 | 4.45 | 4.45 | 3.55 | 3.70 | 3.43 | 2.95 | 4.20 | 4.03 | 3.7 |
| 7 | 4.80 | 5.25 | 5.05 | 4.53 | 4.35 | 3.50 | 3.70 | 3.48 | 2.90 | 4.20 | 4.00 | 3.7 |
| 8 | 4.70 | 5.00 | 5.15 | 4.63 | 4.30 | 3.85 | 3.55 | 3.40 | 2.95 | 3.93 | 4.00 | 3.8 |
| 9 | 4.65 | 5.18 | 5.90 | 5.13 | 4.20 | 3.85 | 3.45 | 3.40 | 3.00 | 3.85 | 3.93 | 3.98 |
| 10 | 4.63 | 5.05 | 7.75 | 5.65 | 4.10 | 3.75 | 3.38 | 3.30 | 3.33 | 3.78 | 3.9 | 4.05 |
| 11 | 4.60 | 4.75 | 6.95 | 5.53 | 3.90 | 3.60 | 3.40 | 3.50 | 3.25 | 3.70 | 3.88 | 3.85 |
| 12 | 4.58 | 4.80 | 6.50 | 5.28 | 3.98 | 3.50 | 3.30 | 3.85 | 3.08 | 4.95 | 3.88 | 3.9 |
| 13 | 4.75 | 4.60 | 6.70 | 5.05 | 3.95 | 3.40 | 3.23 | 3.65 | 3.30 | 5.03 | 3.88 | 4.05 |
| 14 | 5.00 | 4.40 | 6.63 | 4.90 | 3.90 | 3.43 | 3.20 | 3.48 | 3.23 | 4.08 | 3.88 | 4.1 |
| 15 | 4.70 | 4.33 | 5.98 | 4.80 | 3.90 | 3.50 | 3.13 | 3.40 | 3.20 | 4.35 | 3.8 | 4.3 |
| 16 | 4.35 | 4.25 | 5.65 | 4.70 | 3.90 | 3.50 | 3.13 | 3.35 | 3.15 | 4.20 | 3.83 | 4.4 |
| 17 | 4.28 | 4.48 | 6.73 | 4.60 | 3.80 | 3.95 | 3.10 | 3.28 | 3.15 | 4.80 | 3.8 | 6.65 |
| 18 | 4.25 | 4.38 | 6.45 | 4.58 | 3.70 | 3.70 | 3.10 | 3.20 | 3.18 | 4.00 | 3.7 | 7.55 |
| 19 | 4.25 | 4.33 | 5.70 | 4.50 | 3.75 | 3.50 | 3.08 | 3.20 | 3.00 | 4.00 | 3.7 | 6.5 |
| 20 | 4.18 | 4.35 | 5.20 | 4.40 | 3.80 | 3.53 | 3.20 | 3.15 | 3.05 | 3.95 | 3.68 | 5.98 |
| 21 | 4.18 | 4.38 | 5.30 | 4.35 | 3.83 | 3.50 | 4.15 | 3.10 | 3.03 | 3.90 | 3.63 | 5.50 |
| 22 | 5.88 | 4.85 | 5.23 | 4.30 | 3.68 | 3.75 | 4.70 | 3.15 | 3.15 | 3.80 | 3.6 | 7.75 |
| 23 | 6.55 | 4.85 | 5.13 | 4.23 | 3.68 | 3.60 | 4.65 | 3.10 | 3.08 | 3.80 | 3.6 | 8.05 |
| 24 | 5.15 | 4.90 | 5.00 | 4.15 | 3.60 | 3.50 | 4.10 | 3.10 | 3.13 | 3.70 | 3.63 | 7.0 |
| 25 | 4.75 | 4.70 | 4.85 | 4.05 | 3.60 | 3.40 | 4.18 | 3.15 | 2.95 | 3.75 | 3.63 | 5.95 |
| 26 | 4.63 | 4.85 | 4.75 | 4.05 | 4.20 | 3.50 | 4.10 | 3.05 | 3.48 | 3.73 | 3.68 | 5.6 |
| 27 | 5.00 | 5.88 | 4.70 | 4.13 | 4.15 | 3.40 | 4.05 | 3.00 | 3.60 | 3.70 | 3.95 | 5.4 |
| 28 | 5.00 | 7.10 | 4.55 | 4.08 | 4.58 | 3.30 | 3.90 | 3.00 | 3.60 | 4.65 | 3.88 | 5.05 |
| 29 | 4.95 | ..... | 4.85 | 4.00 | 4.23 | 3.35 | 3.80 | 2.95 | 4.80 | 5.43 | 3.8 | 4.93 |
| 30 | 5.05 | ..... | 5.40 | 4.83 | 4.03 | 4.08 | 4.20 | 2.95 | 4.75 | 4.93 | 3.7 | 4.90 |
| 31 | 4.95 | ..... | 5.05 | ..... | 3.90 | ..... | 3.95 | 2.90 | ..... | 4.55 | ..... | 4.77 |

The freshet of March 1, 1902, exceeded all previous high-water records.

*Height of Fishkill Creek during freshet of March 1, 1902.*

| | |
|---|---|
| 7.45 a. m | 13.6 |
| 11 a. m | 14.5 |
| 4.45 p. m | 12.4 |

The following table of discharge has been calculated from high-water marks observed for a number of years at the Groveville dam. The dam is of masonry, plank faced, has a straight horizontal crest 4 feet wide and 134 feet long. The discharge has been calculated by means of coefficients for the weir formula derived from Cornell experiment No. 11:

*Flood discharge of Fishkill Creek above Groveville dam.*

| Date. | Year. | Depth on plank crest. | Discharge. | Run-off per square mile. |
|---|---|---|---|---|
| | | *Feet.* | *Second-feet.* | *Second-feet.* |
| September 24 | 1882 | 6.33 | 7,700 | 38.5 |
| March 22 | 1888 | 5.0 | 5,200 | 26.0 |
| December 18 | 1888 | 4.5 | 4,400 | 22.0 |
| January 12 | 1891 | 6.33 | 7,700 | 38.5 |
| January 13 | 1891 | 4.0 | 3,650 | 18.25 |
| January 22 | 1891 | 4.0 | 3,650 | 18.25 |
| January 23 | 1891 | 6.92 | 8,800 | 44.00 |
| March 10 | 1893 | 5.0 | 5,200 | 26.0 |
| March 11 | 1893 | 4.25 | 4,000 | 20.0 |
| March 12 | 1893 | 5.5 | 6,100 | 30.5 |
| March 13 | 1893 | 5.0 | 5,200 | 26.0 |
| March 14 | 1893 | 4.0 | 3,650 | 18.25 |
| February 7 | 1896 | 6.67 | 8,300 | 41.5 |
| March 1 | 1896 | 4.5 | 4,400 | 22.0 |
| March 20 | 1896 | 6.67 | 8,300 | 41.5 |
| March 1 | 1902 | 9.5 | 13,700 | 68.5 |

The drainage area above the Groveville dam is 200 square miles. The intensity of the freshet of March 1, 1902, on lower Fishkill Creek was probably increased by the formation and later tearing away of an ice blockade on the flood plain opposite Fishkill village.

A measurement of the low-water flow of Clove Creek, the largest tributary of Fishkill Creek, entering near Fishkill village, was made near the mouth of the stream September 24, 1902. The discharge was 3.5 second-feet from a drainage area of 20 square miles, or 0.18 second-foot per square mile.

## TENMILE RIVER NEAR DOVER PLAINS, N. Y.

The gaging station is located at Tabor's bridge, 2 miles below Dover Plains village. It was established September 16, 1901, and is described in Water-Supply Paper No. 65, pages 85 to 87, where the results of discharge measurements and daily gage heights for 1901 are given. The stream is tributary to Housatonic River near Gaylordsville, Conn.

The following table gives a list of the discharge measurements made on the Tenmile River at Dover Plains, N. Y., during 1902:

*Discharge measurements of Tenmile River at Dover Plains, N. Y.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| September 2 | H. K. Barrows | 3.95 | 63.0 |
| August 19 | do | 4.28 | 100.0 |
| June 10 | W. W. Schlecht | 4.45 | 158.0 |
| February 13 | do | 4.67 | [a] 179.0 |
| August 4 | H. K. Barrows | 4.69 | 184.8 |
| November 28 | F. H. Tillinghast | 4.80 | 211.0 |
| November 14 | do | 4.87 | 211.0 |
| May 15 | W. W. Schlecht | 4.88 | 230.0 |
| June 30 | do | 4.92 | 249.0 |
| May 28 | do | 5.50 | 380.0 |
| October 2 | P. M. Churchill | 5.80 | 443.0 |
| April 15 | W. W. Schlecht | 6.13 | 526.0 |
| April 7 | do | 6.18 | 558.0 |
| May 2 | do | 6.46 | 640.0 |
| July 21 | H. K. Barrows | 7.18 | 821.0 |
| December 19 | F. H. Tillinghast | 8.28 | 1,330.0 |
| March 3 | W. W. Schlecht | 10.41 | 2,386.0 |

[a] River nearly covered with ice from bank to bank and 1½ to 2½ inches thick.

*Mean daily gage height, in feet, of Tenmile River at Dover Plains, N. Y.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 7.70 | 5.40 | 14.15 | 6.60 | 6.95 | 4.55 | 4.45 | 5.10 | 3.90 | 5.78 | 5.75 | 4.45 |
| 2 | 7.00 | 6.10 | 14.10 | 6.45 | 6.95 | 4.50 | 4.25 | 4.88 | 3.83 | 5.85 | 5.50 | 4.48 |
| 3 | 6.95 | 6.95 | [a]11.43 | 6.25 | 6.50 | 4.40 | 4.35 | 4.65 | 3.80 | 5.43 | 5.43 | 4.8 |
| 4 | 6.10 | 6.08 | 8.35 | 5.98 | 6.20 | 4.55 | 5.53 | 4.63 | 5.90 | 5.10 | 5.33 | 4.90 |
| 5 | 6.08 | 5.50 | 6.95 | 5.80 | 6.05 | 4.48 | 4.38 | 4.53 | 3.83 | 5.30 | 5.30 | 4.73 |
| 6 | 6.15 | 5.35 | 5.90 | 5.90 | 5.90 | 4.35 | 4.60 | 4.43 | 3.80 | 5.85 | 5.25 | 4.78 |
| 7 | 6.10 | 5.10 | 6.25 | 6.13 | 5.75 | 4.25 | 4.63 | 4.65 | 3.85 | 5.38 | 5.10 | 4.8 |
| 8 | 5.80 | 5.10 | 6.25 | 6.40 | 5.55 | 4.48 | 4.33 | 4.60 | 3.88 | 5.13 | 5.08 | 4.85 |
| 9 | 5.65 | 4.95 | 8.90 | 6.80 | 5.35 | 4.55 | 4.38 | 4.45 | 3.95 | 4.90 | 5.0 | 5.13 |
| 10 | 5.55 | 4.90 | 10.60 | 7.60 | 5.23 | 4.48 | 4.23 | 4.43 | 4.23 | 4.83 | 4.93 | 5.08 |
| 11 | 5.60 | 5.10 | 9.15 | 7.10 | 4.95 | 4.30 | 4.20 | 5.68 | 3.95 | 5.00 | 4.83 | 4.85 |
| 12 | 5.55 | 5.10 | 8.70 | 6.60 | 4.85 | 4.20 | 4.10 | 5.03 | 3.90 | 6.10 | 4.78 | 4.8 |
| 13 | 5.38 | 4.80 | 9.10 | 6.30 | 4.85 | 4.75 | 4.15 | 4.95 | 4.10 | 6.83 | 4.83 | 4.8 |
| 14 | 5.25 | 6.75 | 8.40 | 6.15 | 4.80 | 4.70 | 3.90 | 4.78 | 4.23 | 5.87 | 4.8 | 4.93 |
| 15 | 5.25 | 5.25 | 7.70 | 6.10 | 4.80 | 4.35 | 3.88 | 4.68 | 4.13 | 5.63 | 4.83 | 5.08 |
| 16 | 4.93 | 5.15 | 7.30 | 5.90 | 4.75 | 4.45 | 4.30 | 4.23 | 4.03 | 5.43 | 4.73 | 6.15 |
| 17 | 4.65 | 5.05 | 8.15 | 5.88 | 4.65 | 4.65 | 4.18 | 4.18 | 3.88 | 5.25 | 4.65 | 10.47 |
| 18 | 5.05 | 5.05 | 7.60 | 5.68 | 4.60 | 4.45 | 3.88 | 4.15 | 3.88 | 5.15 | ------ | 9.13 |
| 19 | 5.10 | 5.00 | 6.55 | 5.58 | 4.65 | 4.28 | 4.03 | 4.15 | 4.03 | 5.27 | 4.6 | 8.28 |
| 20 | 5.05 | 4.85 | 6.13 | 5.45 | 4.68 | 4.15 | 4.65 | 4.18 | 4.28 | 5.20 | 4.53 | 7.7 |
| 21 | 5.05 | 4.75 | 6.10 | 5.35 | 4.58 | 4.40 | 6.98 | 4.25 | 4.33 | 4.90 | 4.55 | 7.74 |
| 22 | 11.95 | 4.68 | 6.15 | 5.23 | 4.50 | 4.60 | 7.15 | 4.23 | 4.13 | 4.80 | 4.58 | 11.5 |
| 23 | 8.10 | 4.40 | 6.20 | 5.13 | 4.40 | 4.38 | 6.35 | 4.10 | 4.15 | 4.75 | 4.55 | 10.65 |
| 24 | 6.35 | 4.50 | 6.25 | 5.03 | 4.30 | 4.33 | 5.75 | 4.08 | 4.08 | 4.73 | 4.53 | 8.58 |
| 25 | 5.80 | 4.65 | 6.05 | 4.95 | 4.30 | 4.15 | 5.68 | 4.08 | 4.05 | 4.65 | 4.58 | 7.95 |
| 26 | 5.70 | 5.83 | 5.90 | 4.95 | 5.05 | 4.10 | 5.50 | 3.98 | 4.08 | 4.55 | 4.7 | 7.48 |
| 27 | 7.80 | 8.45 | 5.85 | 5.30 | 5.90 | 4.05 | 5.30 | 3.93 | 4.65 | 4.60 | 4.93 | 7.05 |
| 28 | 7.45 | 9.73 | 7.43 | 5.25 | 5.50 | 4.05 | 5.40 | 3.85 | 6.50 | 7.05 | 4.78 | 6.63 |
| 29 | 6.55 | ------ | 7.60 | 5.30 | 5.18 | 4.10 | 5.25 | 3.83 | 7.75 | 7.10 | 4.65 | 6.50 |
| 30 | 6.25 | ------ | 7.30 | 7.00 | 4.80 | 4.70 | 5.65 | 3.80 | 5.98 | 6.37 | 4.53 | 6.55 |
| 31 | 5.50 | ------ | 6.90 | ------ | 4.70 | ------ | 5.25 | 3.85 | ------ | 6.00 | ------ | 6.55 |

[a] Readings on new gage. From this date datum 0.33 above former gage-zero.

## HOUSATONIC RIVER AT GAYLORDSVILLE, CONN.

This gaging station was established October 24, 1900, and is situated on the Housatonic about 2 miles below the point of inflow of Tenmile River. Discharge measurements are made from a cableway of 200 feet span placed across the stream 1¼ miles below the gage. The station is described and the results of gagings for preceding years are given in Water-Supply Paper No. 65, pages 87 to 90.

The following is a list of the discharge measurements made on the Housatonic River at Gaylordsville, Conn., during 1902.

*Discharge measurements of Housatonic River at Gaylordsville, Conn.*

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| September 8 | H. K. Barrows | 3.45 | 543 |
| September 19 | Barrow & Churchill | 3.75 | 640 |
| August 20 | H. K. Barrows | 3.95 | 835 |
| August 5 | do | 4.28 | 983 |
| July 11 | do | 4.30 | 1,159 |
| November 29 | F. H. Tillinghast | 4.40 | 1,282 |
| June 23 | W. W. Schlecht | 4.46 | 1,177 |
| November 15 | F. H. Tillinghast | 4.50 | 1,356 |
| October 3 | P. M. Churchill | 5.35 | 2,133 |
| May 3 | W. W. Schlecht | 6.10 | 4,459 |
| December 20 | F. H. Tillinghast | 6.65 | 5,465 |
| July 22 | H. K. Barrows | 6.68 | 5,119 |
| March 18 | W. W. Schlecht | 7.63 | 8,259 |
| March 4 | do | 9.9 | 13,601 |

*Mean daily gage height, in feet, of Housatonic River at Gaylordsville, Conn.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 7.10 | 4.90 | 14.30 | 6.80 | 6.80 | 4.70 | 4.80 | 4.80 | 3.80 | 5.50 | 5.50 | 4.1 |
| 2 | 6.50 | 4.90 | 10.80 | 6.60 | 6.30 | 4.40 | 4.60 | 4.65 | 3.55 | 5.50 | 5.30 | 4.15 |
| 3 | 5.90 | 5.40 | 9.90 | 6.80 | 6.10 | 4.40 | 4.40 | 4.65 | 3.50 | 5.25 | 5.00 | 4.4 |
| 4 | 5.30 | 4.90 | 10.20 | 5.80 | 5.90 | 4.60 | 4.70 | 4.45 | 3.60 | 5.15 | 4.95 | 4.6 |
| 5 | 5.20 | 4.80 | 7.80 | 5.80 | 5.60 | 4.90 | 4.50 | 4.30 | 3.65 | 5.00 | 4.85 | 4.6 |
| 6 | 5.30 | 4.60 | 6.80 | 5.50 | 5.50 | 4.80 | 4.50 | 4.40 | 3.55 | 5.15 | 4.75 | 4.3 |
| 7 | 5.30 | 4.50 | 6.50 | 5.50 | 5.50 | 4.60 | 4.80 | 4.60 | 3.65 | 5.00 | 4.65 | 4.35 |
| 8 | 5.20 | 4.40 | 6.80 | 5.70 | 5.30 | 4.60 | 5.00 | 4.55 | 3.50 | 4.85 | 4.60 | 4.3 |
| 9 | 5.30 | 8.50 | 6.80 | 6.10 | 5.20 | 4.40 | 4.70 | 4.55 | 3.55 | 4.70 | 4.5 | 3.45 |
| 10 | 5.10 | 6.80 | 7.50 | 6.80 | 4.90 | 4.60 | 4.50 | 4.45 | 4.00 | 4.55 | 4.35 | 3.55 |
| 11 | 5.00 | 7.00 | 7.20 | 6.90 | 5.00 | 4.50 | 4.40 | 4.50 | 4.00 | 4.40 | 4.3 | 3.7 |
| 12 | 4.90 | 8.00 | 7.70 | 6.80 | 4.90 | 4.50 | 4.30 | 5.15 | 3.90 | 5.30 | 4.45 | 3.75 |
| 13 | 4.70 | 8.80 | 7.80 | 6.80 | 4.90 | 4.40 | 4.20 | 5.00 | 3.85 | 5.30 | 4.4 | 4.0 |
| 14 | 4.30 | 8.30 | 8.00 | 6.70 | 4.80 | 4.70 | 4.00 | 4.70 | 4.10 | 5.10 | 4.5 | 4.05 |
| 15 | 4.50 | 8.00 | 7.90 | 6.20 | 4.70 | 4.60 | 3.90 | 4.50 | 4.00 | 5.00 | 4.5 | 4.25 |
| 16 | 4.50 | 7.10 | 7.70 | 5.90 | 4.60 | 4.30 | 4.10 | 4.35 | 3.60 | 4.80 | 4.4 | 4.90 |
| 17 | 4.30 | 6.80 | 7.90 | 5.80 | 4.60 | 4.50 | 4.20 | 4.20 | 3.70 | 4.75 | 4.35 | 7.9 |
| 18 | 4.20 | 7.00 | 7.60 | 5.60 | 4.50 | 4.40 | 3.90 | 4.00 | 3.75 | 4.60 | 4.25 | 7.35 |
| 19 | 4.40 | 7.50 | 7.30 | 5.60 | 4.40 | 4.40 | 3.80 | 3.80 | 3.80 | 4.55 | 4.3 | 6.7 |
| 20 | 4.20 | 7.30 | 7.00 | 5.50 | 4.30 | 4.40 | 4.65 | 4.05 | 3.85 | 4.25 | 4.25 | 6.35 |
| 21 | 4.50 | 7.20 | 6.60 | 5.20 | 4.60 | 4.30 | 6.00 | 3.95 | 4.05 | 4.30 | 4.3 | 6.65 |
| 22 | 8.50 | 7.20 | 6.60 | 5.20 | 4.40 | 4.70 | 6.60 | 4.05 | 3.75 | 4.45 | 4.2 | 8.6 |
| 23 | 6.80 | 6.80 | 6.10 | 5.10 | 4.30 | 4.50 | 6.00 | 4.10 | 3.60 | 4.40 | 4.2 | 8.4 |
| 24 | 6.30 | 6.50 | 5.90 | 5.10 | 4.10 | 4.30 | 5.70 | 4.10 | 3.70 | 4.45 | 4.05 | 7.55 |
| 25 | 5.80 | 6.80 | 6.00 | 5.00 | 4.20 | 4.30 | 5.50 | 3.95 | 3.65 | 4.45 | 4.15 | 7.3 |
| 26 | 5.60 | 7.00 | 6.00 | 4.90 | 4.50 | 4.30 | 5.30 | 3.95 | 3.85 | 4.40 | 4.25 | 6.9 |
| 27 | 5.90 | 10.60 | 5.90 | 5.00 | 4.60 | 4.20 | 4.95 | 3.95 | 4.20 | 4.30 | 4.6 | 6.65 |
| 28 | 5.70 | 9.00 | 5.90 | 5.10 | 5.30 | 4.20 | 4.85 | 3.95 | 4.60 | 5.85 | 4.5 | 6.0 |
| 29 | 5.30 | ------ | 6.70 | 5.10 | 5.30 | 4.10 | 5.55 | 3.90 | 6.30 | 6.55 | 4.4 | 5.75 |
| 30 | 4.90 | ------ | 6.70 | 6.20 | 5.00 | 4.30 | 5.45 | 3.90 | 6.00 | 6.00 | 4.25 | 5.9 |
| 31 | 4.90 | ------ | 6.70 | ------ | 4.70 | ------ | 5.40 | 3.70 | ------ | 5.80 | ------ | 5.6 |

## PASSAIC RIVER DRAINAGE BASIN.

Passaic River has its rise 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 sandstones, to which in large measure must be attributed the turbidity of its waters. In contrast with the sluggish, muddy character of the Passaic, the Pompton is a rapid stream and its waters are clear. It drains parts of Sussex, Passaic, and Morris 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 flow of Passaic River is of special interest from the fact that several large cities in its drainage basin take their public water supply from it, and because of the valuable water-power privileges along its course, particularly at the city of Paterson. Several cities, including Paterson and Passaic, throw their sewage into this stream, and in the lower part of its course it becomes so polluted as to be offensive to property holders along its banks and to seriously interfere with the comfort and pleasure of the inhabitants of several towns.

Measurements of the flow over the dam at Paterson have been made for several years, but the data are not available for publication.

The United States Geological Survey has a gaging station on the Passaic River at Two Bridges, New Jersey, and also on the Pompton River at the same place. These stations are under the supervision of George B. Hollister.

The highest recorded flood occurring on these watersheds is that of February and March, 1902, the estimated discharge at Dundee dam being 24,800 second-feet. The next highest occurred on September 22 to 30, 1882, when the estimated discharge was 18,265 second-feet. These floods will be fully described in a forthcoming paper.

### POMPTON RIVER AT TWO BRIDGES, NEW JERSEY.

A station was established May 2, 1901, by George B. Hollister, on Pompton River just above its junction with Passaic River, a point 2 miles south of the railway station at Mountain View, N. J., and 2½ miles west of Littlefalls, N. J. Measurements are made from a wagon bridge. The gage is a vertical pine board, marked in feet and tenths, spiked to the middle masonry pier on the downstream side. The bench mark is the top of the capstone of the same pier, and its elevation is 10.7 feet above the datum of the gage. The channel, which is gravelly, is straight for some distance above and below the bridge, the banks on both sides being about 8 feet high and subject to overflow at times of freshets only.

The flood of February–March, 1902, is considered the highest that has been recorded.

The following discharge measurements were made during 1902 by George B. Hollister:

January 17: Gage height, 1.55 feet; discharge, 475 second-feet.
March 1: Gage height, 11.70 feet; discharge, 8,023 second-feet.
May 30: Gage height, 2.10 feet; discharge, 556 second-feet.
June 18: Gage height, 1.30 feet; discharge, 189 second-feet.
September 11: Gage height, 1.50 feet; discharge, 170 second-feet.

*Daily gage height, in feet, of Pompton River at Two Bridges, New Jersey.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 8.35 | 3.00 | 10.40 | 4.35 | 3.30 | 2.15 | 2.50 | 2.75 | 1.30 | 4.55 | 2.75 | 1.20 |
| 2 | 7.55 | 3.50 | 14.40 | 4.15 | 3.05 | 1.75 | 2.25 | 2.65 | 1.20 | 4.95 | 2.70 | 1.45 |
| 3 | 6.45 | 3.70 | 14.00 | 3.40 | 2.80 | 1.30 | 2.00 | 2.55 | 1.10 | 4.70 | 2.70 | 1.70 |
| 4 | 6.25 | 3.50 | 10.80 | 3.25 | 2.95 | 1.30 | 2.10 | 2.30 | 1.10 | 4.45 | 2.65 | 2.00 |
| 5 | 5.15 | 3.40 | 9.75 | 3.15 | 2.55 | 1.20 | 2.00 | 2.10 | 1.10 | 4.45 | 2.55 | 2.00 |
| 6 | 4.00 | 3.30 | 8.40 | 3.00 | 2.40 | 1.20 | 1.85 | 2.00 | 1.10 | 4.75 | 2.35 | 2.10 |
| 7 | 3.30 | 2.60 | 7.15 | 3.15 | 2.15 | 1.10 | 1.65 | 1.85 | 1.00 | 4.50 | 2.25 | 2.10 |
| 8 | 2.95 | 2.10 | 6.15 | 3.65 | 2.00 | 1.10 | 1.45 | 1.70 | 1.10 | 4.25 | 2.20 | 2.20 |
| 9 | 2.55 | 1.90 | 6.55 | 5.30 | 2.00 | 1.10 | 1.40 | 1.60 | 1.10 | 3.95 | 2.05 | 2.35 |
| 10 | 2.35 | 1.70 | 7.35 | 6.60 | 1.85 | 1.00 | 1.40 | 1.50 | 1.20 | 3.60 | 1.90 | 2.25 |
| 11 | 2.25 | 1.50 | 7.70 | 6.60 | 1.50 | 1.00 | 1.35 | 2.55 | 1.25 | 3.30 | 1.80 | 2.10 |
| 12 | 2.35 | 1.50 | 7.45 | 6.15 | 1.30 | 1.00 | 1.30 | 2.95 | 1.30 | 4.60 | 1.55 | 2.10 |
| 13 | 2.30 | 1.40 | 7.30 | 5.80 | 1.30 | 1.05 | 1.20 | 3.60 | 1.40 | 5.05 | 1.45 | 2.00 |
| 14 | 2.20 | 1.40 | 7.50 | 4.55 | 1.30 | 1.25 | 1.20 | 3.50 | 1.50 | 4.85 | 1.35 | 1.90 |
| 15 | 2.05 | 1.30 | 7.15 | 4.05 | 1.20 | 1.20 | 1.20 | 3.50 | 1.50 | 4.65 | 1.30 | 1.85 |
| 16 | 1.50 | 1.20 | 7.00 | 3.60 | 1.20 | 1.30 | 1.20 | 3.25 | 1.40 | 4.15 | 1.30 | 2.30 |
| 17 | 1.60 | 1.20 | 5.90 | 3.40 | 1.20 | 1.30 | 1.10 | 3.05 | 1.15 | 3.65 | 1.30 | 5.65 |
| 18 | 1.50 | 1.20 | 6.60 | 3.10 | 1.15 | 1.30 | 1.20 | 2.70 | 1.10 | 3.00 | 1.20 | 8.25 |
| 19 | 1.45 | 1.10 | 5.55 | 2.60 | 1.10 | 1.25 | 1.30 | 2.55 | 1.10 | 3.00 | 1.20 | 8.20 |
| 20 | 1.30 | 1.20 | 4.65 | 2.50 | 1.20 | 1.25 | 1.30 | 2.65 | 1.10 | 2.95 | 1.20 | 8.00 |
| 21 | 1.30 | 1.30 | 4.35 | 2.50 | 1.20 | 1.35 | 1.35 | 2.45 | 1.10 | 2.80 | 1.20 | 8.00 |
| 22 | 5.75 | 1.50 | 4.10 | 2.40 | 1.20 | 1.70 | 1.50 | 2.25 | 1.10 | 2.65 | 1.10 | 7.55 |
| 23 | 7.75 | 1.70 | 3.75 | 2.40 | 1.10 | 1.65 | 1.45 | 2.15 | 1.00 | 2.40 | 1.00 | 7.90 |
| 24 | 6.85 | 1.85 | 3.40 | 2.30 | 1.10 | 1.50 | 1.40 | 1.90 | 1.10 | 2.05 | 1.00 | 9.55 |
| 25 | 5.45 | 2.45 | 3.15 | 2.20 | 1.20 | 1.50 | 1.75 | 1.60 | 1.25 | 1.85 | 1.20 | 9.25 |
| 26 | 4.35 | 4.30 | 2.85 | 1.80 | 1.75 | 1.50 | 2.15 | 1.45 | 2.70 | 1.75 | 1.30 | 8.30 |
| 27 | 4.30 | 7.20 | 2.60 | 1.65 | 2.15 | 1.65 | 2.20 | 1.20 | 3.30 | 1.65 | 1.45 | 8.05 |
| 28 | 4.05 | 8.60 | 2.45 | 1.60 | 2.75 | 1.55 | 2.20 | 1.35 | 3.95 | 2.40 | 1.50 | 7.20 |
| 29 | 3.45 | ..... | 3.30 | 2.40 | 2.80 | 1.35 | 2.15 | 1.40 | 4.60 | 2.85 | 1.40 | 6.65 |
| 30 | 3.15 | ..... | 4.55 | 3.00 | 2.45 | 2.45 | 2.70 | 1.30 | 4.55 | 3.00 | 1.30 | 6.65 |
| 31 | 3.20 | ..... | 4.45 | ..... | 2.25 | ..... | 2.80 | 1.30 | ..... | 3.90 | ..... | 6.55 |

*Estimated monthly discharge of Pompton River at Two Bridges, New Jersey.*

[Drainage area, 360 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 5,415 | 300 | 2,080 | 5.76 | 6.66 |
| February | 5,598 | 221 | 1,180 | 3.28 | 3.42 |
| March | [a]11,600 | 1,109 | [a]4,050 | [a]11.25 | [a]12.97 |
| April | 4,138 | 505 | 1,867 | 5.19 | 5.79 |
| May | 1,729 | 221 | 703 | 1.95 | 2.25 |
| June | 1,109 | 195 | 376 | 1.04 | 1.16 |
| July | 1,400 | 221 | 583 | 1.62 | 1.87 |
| August | 1,948 | 255 | 969 | 2.69 | 3.10 |
| September | 2,678 | 195 | 569 | 1.58 | 1.76 |
| October | 3,006 | 540 | 1,927 | 5.35 | 6.17 |
| November | 1,327 | 195 | 575 | 1.60 | 1.79 |
| December | 6,291 | 255 | 2,795 | 7.76 | 8.95 |
| The year | [a]11,600 | 195 | 1,473 | 4.09 | 55.89 |

[a] Estimated.

PASSAIC RIVER AT TWO BRIDGES, NEW JERSEY.

This station was established May 2, 1901, by George B. Hollister, just above the confluence with Pompton River. Discharge measurements are made from a wagon bridge. The gage consists of a vertical pine board, marked in feet and tenths, spiked to the protecting timber on the upstream side of the first pier from the left bank. The bench mark is the top of the capstone of this pier, and its elevation is 13.65 feet above the datum of the gage. The channel is straight for some distance above and below the bridge. The bottom is gravelly. The right bank is about 10 feet high, while the left bank is lower and liable to overflow.

The flood of February–March, 1902, is considered the highest that has been recorded.

The following discharge measurements were made during 1902 by George B. Hollister:

January 17: Gage height, 2.30 feet; discharge, 398 second-feet.
March 1: Gage height, 13 feet; discharge, 8,096 second-feet.
May 20: Gage height, 3 feet; discharge, 622 second-feet.
June 18: Gage height, 2.30 feet; discharge, 328 second-feet.
September 11: Gage height, 2.30 feet; discharge, 354 second-feet.

*Daily gage height, in feet, of Passaic River at Two Bridges, New Jersey.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 9.50 | 3.70 | 11.55 | 5.25 | 4.40 | 3.10 | 3.30 | 3.75 | 2.30 | 5.55 | 3.75 | 2.20 |
| 2 | 8.25 | 4.35 | 13.50 | 5.15 | 4.10 | 2.70 | 3.25 | 3.95 | 2.20 | 5.95 | 3.70 | 2.45 |
| 3 | 7.45 | 4.50 | 12.80 | 4.65 | 3.80 | 2.40 | 3.00 | 3.55 | 2.15 | 5.70 | 3.65 | 2.70 |
| 4 | 7.40 | 4.30 | 11.80 | 4.40 | 3.95 | 2.30 | 3.10 | 3.30 | 2.00 | 5.55 | 3.55 | 3.00 |
| 5 | 7.05 | 4.15 | 10.75 | 4.15 | 3.55 | 2.20 | 3.00 | 3.10 | 2.00 | 5.45 | 3.35 | 3.00 |
| 6 | 6.90 | 4.00 | 9.40 | 4.00 | 3.40 | 2.15 | 2.85 | 3.00 | 2.00 | 5.75 | 3.30 | 3.10 |
| 7 | 4.50 | 3.80 | 8.15 | 4.15 | 3.15 | 2.10 | 2.65 | 2.85 | 2.00 | 5.50 | 3.20 | 3.10 |
| 8 | 3.90 | 3.60 | 7.20 | 4.60 | 3.00 | 2.10 | 2.55 | 2.70 | 2.10 | 5.25 | 3.20 | 3.20 |
| 9 | 3.50 | 3.40 | 7.50 | 6.25 | 3.00 | 2.10 | 2.40 | 2.60 | 2.10 | 4.95 | 3.05 | 3.35 |
| 10 | 3.20 | 3.20 | 8.35 | 7.65 | 2.85 | 2.00 | 2.40 | 2.45 | 2.20 | 4.60 | 2.90 | 5.25 |
| 11 | 3.00 | 3.20 | 8.70 | 7.65 | 2.50 | 2.00 | 2.35 | 3.50 | 2.25 | 4.30 | 2.80 | 3.10 |
| 12 | 3.40 | 2.90 | 8.45 | 7.15 | 2.30 | 2.00 | 2.30 | 3.95 | 2.30 | 5.55 | 2 55 | 3.10 |
| 13 | 3.25 | 2.60 | 8.30 | 6.70 | 2.30 | 2.20 | 2.20 | 4.60 | 2.40 | 6.05 | 2.45 | 3.00 |
| 14 | 3.10 | 2.30 | 8.50 | 5.55 | 2.30 | 2.30 | 2.20 | 4.50 | 2.50 | 5.85 | 2.35 | 2.90 |
| 15 | 2.80 | 2.10 | 8.15 | 5.10 | 2.30 | 2.30 | 2.20 | 4.50 | 2.50 | 5.65 | 2.30 | 2.85 |
| 16 | 2.50 | 2.10 | 8.00 | 4.60 | 2.20 | 2.20 | 2.20 | 4.25 | 2.40 | 5.15 | 2.30 | 2.80 |
| 17 | 2.50 | 2.10 | 6.90 | 4.40 | 2.20 | 2.30 | 2.10 | 4.05 | 2.15 | 5.65 | 2.30 | 6.65 |
| 18 | 2.50 | 2.10 | 7.55 | 4.10 | 2.15 | 2.30 | 2.20 | 3.70 | 2.10 | 4.40 | 2.20 | 9.25 |
| 19 | 2.45 | 2.20 | 6.75 | 3.40 | 2.10 | 2.25 | 2.25 | 3.55 | 2.10 | 4.00 | 2.20 | 9.20 |
| 20 | 2.40 | 2.30 | 5.65 | 3.50 | 2.20 | 2.25 | 2.30 | 3.60 | 2.10 | 3.95 | 2.20 | 9.00 |
| 21 | 2.00 | 2.45 | 5.35 | 3.50 | 2.20 | 2.40 | 2.35 | 3.35 | 2.10 | 3.80 | 2.20 | 9.00 |
| 22 | 5.65 | 2.65 | 5.10 | 3.40 | 2.20 | 2.80 | 2.50 | 3.20 | 2.10 | 3.65 | 2.10 | 8.55 |
| 23 | 8.80 | 2.70 | 4.75 | 3.40 | 2.10 | 2.75 | 2.45 | 3.05 | 2.00 | 3.40 | 2.00 | 8.95 |
| 24 | 7.95 | 3.40 | 4.40 | 3.30 | 2.10 | 2.60 | 2.40 | 2.90 | 2.10 | 3.05 | 2.00 | 10.55 |
| 25 | 6.80 | 3.90 | 4.15 | 3.20 | 2.25 | 2.60 | 2.75 | 2.60 | 2.25 | 2.85 | 2.20 | 10.25 |
| 26 | 5.80 | 5.45 | 3.75 | 2.80 | 2.60 | 2.50 | 3.15 | 2.35 | 2.85 | 2.75 | 2.30 | 9.45 |
| 27 | 5.70 | 8.15 | 3.50 | 2.65 | 2.95 | 2.65 | 3.20 | 2.20 | 3.60 | 2.65 | 2.45 | 9.05 |
| 28 | 5.45 | 9.60 | 3.35 | 2.65 | 3.35 | 2.55 | 3.20 | 2.35 | 4.55 | 3.40 | 2.50 | 8.20 |
| 29 | 4.75 | ..... | 4.25 | 3.30 | 3.65 | 2.40 | 3.15 | 2.40 | 5.60 | 3.60 | 2.40 | 7.65 |
| 30 | 4.40 | ..... | 5.55 | 3.90 | 3.45 | 3.30 | 3.70 | 2.30 | 5.55 | 4.00 | 2.30 | 7.65 |
| 31 | 3.80 | ..... | 5.35 | ..... | 3.25 | ..... | 3.85 | 2.30 | ..... | 3.90 | ..... | 7.55 |

*Estimated monthly discharge of Passaic River at Two Bridges, New Jersey.*

[Drainage area, 360 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 3,832 | 225 | 1,616 | 4.49 | 5.18 |
| February | 4,011 | 271 | 1,003 | 2.79 | 2.91 |
| March | [a] 11,600 | 863 | [a] 2,863 | [a] 7.95 | [a] 9.16 |
| April | 3,016 | 527 | 1,424 | 3.96 | 4.42 |
| May | 1,375 | 271 | 618 | 1.72 | 1.98 |
| June | 839 | 225 | 408 | 1.13 | 1.26 |
| July | 1,103 | 271 | 550 | 1.53 | 1.76 |
| August | 1,475 | 317 | 808 | 2.24 | 2.58 |
| September | 1,975 | 225 | 488 | 1.36 | 1.52 |
| October | 2,200 | 527 | 1,467 | 4.08 | 4.70 |
| November | 1,055 | 225 | 534 | 1.48 | 1.65 |
| December | 4,496 | 317 | 2,071 | 5.75 | 6.63 |
| The year | [a] 11,600 | 225 | 1,154 | 3.21 | 43.75 |

[a] Estimated.

## MISCELLANEOUS NEW JERSEY STREAMS.

The following discharge measurements were made on streams in New Jersey:

*Miscellaneous discharge measurements made on New Jersey streams.*

| Date. | Stream. | Locality. | Discharge. |
|---|---|---|---|
| 1902. | | | *Sec.-ft.* |
| July 1 | Paulinskill | Warrington, N. J | 1,390 |
| August 31 | do | Columbia, N. J | 98 |
| June 26 | Ramapo | Mahwah, N. J | 123 |
| October 29 | do | do | 678 |
| September 24 | Rockaway | Old Boonton, N. J | 33 |
| August 23 | do | do | 146 |
| September 11 | do | do | 164 |
| September 23 | do | do | 102 |
| October 30 | do | do | 488 |
| October 30 | Pompton | Pompton Plains, N. J | 1,066 |
| September 26 | Passaic | Stanley, N. J | 195 |
| October 30 | do | do | 431 |
| September 26 | do | Millington, N. J | 92 |
| August 28 | Whippany | Whippany, N. J | 35 |
| July 1 | North Branch Raritan | Far Hills, N. J | 35 |
| August 29 | do | do | 41 |
| September 26 | do | Pluckemin, N. J | 171 |
| September 19 | Raritan | Bound Brook, N. J | 323 |
| September 20 | do | do | 427 |
| November 6 | do | do | 947 |
| September 24 | South Branch Raritan | German Valley, N. J | 58 |
| September 24 | do | Califon, N. J | 51 |
| September 25 | do | Neshanic, N. J | 172 |
| September 25 | do | High Bridge, N. J | 120 |
| July 1 | Lamington | Pottersville, N. J | 545 |
| August 29 | do | do | 32 |
| September 23 | Pequannock | Pompton, N. J | 90 |
| August 22 | Wanaque | do | 97 |

## DELAWARE RIVER DRAINAGE BASIN.

Gaging stations are maintained in this basin by the United States Geological Survey on the West Branch of the Delaware at Hancock, N. Y.; on the East Branch of the Delaware at Hancock, N. Y.; on the Delaware River at Port Jervis, N. Y., and at Lambertville, N. J.; on the Neversink River at Port Jervis, N. J.; and on the Lehigh

River at South Bethlehem, Pa. Aside from these stations measurements have been made for several years by John E. Codman, hydrographer of the water department of the city of Philadelphia. The stations maintained by Mr. Codman are located on the following streams, all in the vicinity of Philadelphia: Perkiomen, Wissahickon, Tohickon, and Neshaminy creeks, and on the Schuylkill River. The following pages give the records of these stations for 1902.

### WEST BRANCH OF DELAWARE RIVER AT HANCOCK, N. Y.

The Delaware River rises on the slope of Mine Mountain, near the southwestern line of Schoharie County, flows southwesterly across central Delaware County to Deposit, where it is joined by Oquaga Creek, a large tributary draining eastern Broome County. The upper drainage area is relatively long and narrow, with numerous short lateral tributaries. It is rugged and to a considerable extent wooded. There are low water-power dams near Hamden and Delhi. At Deposit the stream turns abruptly to the southeast, forming the boundary line between New York and Pennsylvania, until Port Jervis is reached. Here it encounters the foot of the Shawangunk Range, and its direction of flow is again turned to the southwest. Below Port Jervis the Delaware forms the division between Pennsylvania and New Jersey, and ultimately empties into Delaware Bay below Philadelphia. Above Hancock the main stream is known as the West Branch of Delaware River,[a] to distinguish it from the smaller East or Pepacton Branch of Delaware River.

The gaging station on West Branch of Delaware River is situated at the suspension bridge in Hancock village. A 15-foot weight and wire gage, reading decimally, is attached to the upstream side of the bridge. The stream bed is of rock, overlain with gravel and cobblestone.

The bench mark is a circular chisel draft on the upstream corner of the left abutment. Elevation of bench mark is 100 feet. Elevation of water surface when gage reads zero is 75.75. The gage was erected October 15, 1902, by P. M. Churchill and C. C. Covert.

The gage is read each day at 8 a. m. and again at 4 p. m. by David Pulver, collector of tolls at the bridge.

The gaging station is situated approximately one-half mile upstream from the junction of the East and West branches of the stream. The bridge has a span between abutments of 235 feet. The bridge is spaced in 5-foot intervals on the downstream side, beginning at face of left abutment. Discharge measurements are made from the lower side of the bridge.

A discharge measurement by P. M. Churchill and C. C. Covert, hydrographers, October 15, 1902, showed a discharge of 1,123 second-feet, gage height 3.95 feet.

[a] Sometimes called Mohawk. It should not be confused with the Mohawk River, a tributary of Hudson River.

*Mean daily gage height, in feet, of West Branch of Delaware River at Hancock, N. Y.*

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | 1902. | | | | 1902. | | | |
| 1 | ..... | 4.55 | 3.00 | 12 | ..... | 3.30 | 3.70 | 23 | 3.18 | 2.65 | 6.90 |
| 2 | ..... | 4.33 | 2.98 | 13 | ..... | 3.20 | 3.85 | 24 | 3.18 | 2.80 | 5.50 |
| 3 | ..... | 4.33 | 3.25 | 14 | ..... | 3.20 | 3.80 | 25 | 3.20 | 2.73 | 5.23 |
| 4 | ..... | 4.43 | 3.30 | 15 | 3.90 | 3.07 | 3.90 | 26 | 3.00 | 2.90 | 4.72 |
| 5 | ..... | 3.75 | 3.25 | 16 | 3.60 | 2.97 | 5.25 | 27 | 3.15 | 3.15 | 4.55 |
| 6 | ..... | 3.75 | 3.25 | 17 | 3.40 | 2.87 | 7.47 | 28 | 7.03 | 3.13 | 4.35 |
| 7 | ..... | 3.53 | 3.25 | 18 | 3.40 | 2.87 | 6.23 | 29 | 6.83 | 3.05 | 4.05 |
| 8 | ..... | 3.35 | 3.28 | 19 | 3.47 | 2.85 | 5.40 | 30 | 5.57 | 2.93 | 4.25 |
| 9 | ..... | 3.32 | 3.03 | 20 | 3.50 | 2.80 | 5.18 | 31 | 5.00 | ..... | 4.00 |
| 10 | ..... | 3.25 | 3.20 | 21 | 3.43 | 2.82 | 4.93 | | | | |
| 11 | ..... | 3.15 | 3.75 | 22 | 3.35 | 2.85 | 8.43 | | | | |

## EAST BRANCH OF DELAWARE RIVER AT HANCOCK, N. Y.

East Branch of Delaware River flows parallel to the West Branch across southern Delaware County. The drainage area is broader and the tributaries longer and more branching than those of the West Branch. Many of the tributaries head in small lakes and ponds.

The gaging station is situated at the highway bridge in Hancock village. A 15-foot weight and wire gage, graduated decimally, is attached to the horizontal chords of the upstream side of the second span from the left or south abutment. The reference point is a circular chisel draft on the downstream corner of the left abutment. Its elevation referred to the bench mark described above in connection with the station on the West Branch of the stream is 98.52.

The elevation of the datum plane of the gage or of water surface when the gage reads zero is 70.59, or 5.16 feet lower than that for the West Branch station.

The bridge consists of five spans and has a length between abutments of 425.5 feet. Discharge measurements are usually made from the downstream side. Bridge is marked off in 5-foot spaces, beginning at right abutment.

During low water the elevation of water in the East Branch is lower than that in the West Branch at the respective gaging stations. There is considerable fall in each branch from the gaging station to the mouth of the stream.

The gage was erected October 14, 1902, by P. M. Churchill and C. C. Covert. The gage is read twice daily, at 8 a. m. and 4 p. m., by D. B. Van Etten. A discharge measurement made by Messrs. Churchill and Covert October 14, 1902, with a gage height of 4.345 feet, showed a discharge of 2,320 second-feet.

The drainage area tributary to each branch between the gaging station and the mouth of the stream is approximately 1 square mile.

The location of the two gaging stations close to the mouths of the

branches enables the total discharge of the main stream at the confluence of its principal branches to be determined.

The highest recent freshet on the East Branch occurred December 15–16, 1901. The elevation of water surface was 93.02 feet, equivalent to a gage reading of 22.43 feet.

*Mean daily gage height, in feet, of East Branch of Delaware River at Hancock, N. Y.*

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | 1902. | | | | 1902. | | | |
| 1 | ..... | 4.85 | 3.40 | 12 | ..... | 3.60 | 5.55 | 23 | 3.60 | 3.20 | 7.45 |
| 2 | ..... | 4.55 | 3.40 | 13 | ..... | 3.60 | 5.60 | 24 | 3.50 | 3.30 | 5.75 |
| 3 | ..... | 4.40 | 3.50 | 14 | ..... | 3.50 | 5.85 | 25 | 3.50 | 3.20 | 5.40 |
| 4 | ..... | 4.25 | 3.70 | 15 | 4.20 | 3.40 | 5.95 | 26 | 3.40 | 3.25 | 5.00 |
| 5 | ..... | 4.10 | 3.70 | 16 | 4.10 | 3.40 | 6.50 | 27 | 3.40 | 3.45 | 4.75 |
| 6 | ..... | 4.00 | 3.50 | 17 | 4.00 | 3.40 | 8.65 | 28 | 6.95 | 3.60 | 4.45 |
| 7 | ..... | 3.95 | 3.50 | 18 | 3.90 | 3.30 | 6.35 | 29 | 7.05 | 3.55 | 4.15 |
| 8 | ..... | 3.80 | 3.70 | 19 | 3.80 | 3.30 | 5.50 | 30 | 5.75 | 3.50 | 4.35 |
| 9 | ..... | 3.70 | 5.75 | 20 | 3.80 | 3.30 | 5.00 | 31 | 5.40 | ..... | 4.10 |
| 10 | ..... | 3.60 | 5.60 | 21 | 3.75 | 3.20 | 4.80 | | | | |
| 11 | ..... | 3.60 | 5.90 | 22 | 3.60 | 3.20 | 10.00 | | | | |

## DELAWARE RIVER AT PORT JERVIS, N. Y.

From Hancock to Port Jervis, a distance by river of 76 miles, the Delaware flows in a broad, shallow channel, with numerous slight rifts and a relatively rapid current. Several large tributaries enter in this section of the stream, notably Mongaup and Callicoon creeks and Neversink River from the New York side, and the Lackawaxen River from Pennsylvania.[a]

The following table shows the drainage areas of the Upper Delaware River and its principal tributaries:

*Drainage area of Upper Delaware River and principal tributaries.*

| | Square miles. |
|---|---|
| Delaware River at mouth | 10,000 |
| Delaware River at Lambertville, N. J.[b] | 6,820 |
| Delaware River at Port Jervis, below mouth of Neversink River | 3,600 |
| Delaware River at Port Jervis, above mouth of Neversink River | 3,254 |
| Neversink River at mouth | 346 |
| Lackawaxen River at mouth | 597 |
| Mongaup Creek at mouth | 231 |
| Delaware River below junction of branches at Hancock, N. Y | 1,604 |
| West Branch of Delaware River above mouth at Hancock, N. Y | 685 |
| West Branch of Delaware River above Oquaga Creek at Deposit, N. Y | 519 |
| West Branch of Delaware River at Walton, N. Y | 348 |
| East Branch of Delaware River at mouth, Hancock, N. Y | 919 |

[a] For general description and drainage areas of Delaware River see Tenth United States Census, Volume XVI, pp. 607–638.

[b] Results are given in Water-Supply and Irrigation Paper United States Geological Survey No. 65, p. 214.

The drainage area of Delaware River above Port Jervis lies about four-fifths in New York and one-fifth in Pennsylvania.

Arrangements have been made for the establishment of a gaging station at the upper railroad bridge in Port Jervis. The bridge is situated about 1 mile upstream from the mouth of Neversink River. The bridge consists of two spans and stands squarely across the stream. The current is smooth and uniform. The stream bed is cobblestone and gravel, and fairly permanent.

The following discharge measurements have been made by George B. Hollister, resident hydrographer for New Jersey, at the Barrett suspension toll bridge:

June 28: Gage height, 29.3 feet; discharge, 4,629 second-feet.
September 2: Gage height, 30.6 feet; discharge, 1,501 second-feet.

The gage height as given is the distance down to water surface from a reference point on top of upstream guard rail 470 feet from the left-hand abutment.

### NEVERSINK RIVER AT PORT JERVIS, N. Y.

Neversink River rises in southwestern Ulster County. Two branches unite to form the main stream near Sullivan County line. The stream then flows southerly, crossing eastern Sullivan County, and enters Delaware River at Port Jervis.

The drainage basin contains numerous small lakes. The fall is rapid and often precipitous. This stream has been suggested as a possible source of water supply for New York, the proposed point of diversion being "The Kitchen," at Quarryville, at an elevation of 850 feet above tide. The drainage area at this point is 200 square miles and at the mouth of the stream 346 square miles.[a]

The gaging station is situated at the East Main street highway bridge in Port Jervis.[b] A wire-and-weight gage is secured to the iron-work of the bridge on the downstream side. The bench mark is an anchor bolt in top of cemetery wall on right bank of stream; its elevation is taken at 100 feet. The datum plane of the gage referred to this bench mark is 72.24. The station was established October 16, 1902, by P. M. Churchill and C. C. Covert. The gage record is kept by Edwin J. Earley. Readings are taken at 8.30 a. m. and 5 p. m. each day.

The bridge has a single span of 130 feet between abutments. The stream flows between entraining walls and has a rock bed overlain in part by earth. The discharge measurements are usually made from the upstream side of the bridge, which has been divided into 5-foot stations, beginning at the right-hand abutment.

[a] See Freeman's report on New York water supply, 1900, p. 491.
[b] Temporary.

*Discharge measurements of Neversink River at Port Jervis, N. Y.*

| Date. | Gage height. | Discharge. | Hydrographer. |
|---|---|---|---|
| 1902. | *Feet.* | *Second-feet.* | |
| October 16 | 7.45 | 945 | Churchill and Covert. |
| November 10 | 7.00 | 524 | F. H. Tillinghast. |

Two discharge measurements were made before the gage was placed by George B. Hollister:

| | Second-feet. |
|---|---|
| June 28, 1902 | 374 |
| September 17, 1902 | 15 |

*Mean daily gage height, in feet, of Neversink River at Port Jervis, N. Y.*

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | 1902. | | | | 1902. | | | |
| 1 | ..... | 7.60 | 6.90 | 12 | ..... | 7.00 | 6.90 | 23 | 7.05 | 6.80 | 13.45 |
| 2 | ..... | 7.40 | 6.90 | 13 | ..... | 7.00 | 6.90 | 24 | 7.03 | 6.80 | 10.45 |
| 3 | ..... | 7.25 | 7.10 | 14 | ..... | 6.90 | 6.90 | 25 | 7.00 | 6.80 | 8.55 |
| 4 | ..... | 7.20 | 7.20 | 15 | ..... | 6.90 | 6.85 | 26 | 6.95 | 6.80 | 8.15 |
| 5 | ..... | 7.20 | 7.00 | 16 | 7.50 | 6.90 | 6.95 | 27 | 6.90 | 6.90 | 7.85 |
| 6 | ..... | 7.15 | 7.00 | 17 | 7.40 | 6.90 | 11.75 | 28 | 8.75 | 7.00 | 7.60 |
| 7 | ..... | 7.15 | 7.00 | 18 | 7.30 | 6.90 | 9.11 | 29 | 10.05 | 7.00 | 7.50 |
| 8 | ..... | 7.10 | 6.90 | 19 | 7.30 | 6.80 | 9.50 | 30 | 8.85 | 6.90 | 7.40 |
| 9 | ..... | 7.00 | 6.70 | 20 | 7.20 | ..... | 9.05 | 31 | 7.95 | ..... | 7.35 |
| 10 | ..... | 7.00 | 6.70 | 21 | 7.10 | ..... | 8.45 | | | | |
| 11 | ..... | 7.00 | 6.90 | 22 | 7.08 | ..... | 13.10 | | | | |

## LEHIGH RIVER AT SOUTH BETHLEHEM, PA.

This station was established ~~December~~ 22, 1902, on the New street bridge, and is under the general supervision of Prof. Mansfield Merriman, C. E., of Lehigh University. The equipment consists of a standard chain-and-weight gage, which is referred to a horizontal scale board graduated to feet and tenths, inclosed in a lock box attached to the lower side of the bridge. The length of the chain from the zero to the extreme end of the weight is 43.77 feet. The datum of the gage is 210.55 feet above sea level, and is referred to the Lehigh Valley Railroad bench mark No. 72, which is an iron pin in the south pier of the New street bridge. Its elevation is 232.87 feet above sea level.

The following discharge measurements were made during 1902:

September 22: Gage height, 2.3 feet; discharge, 1,171 second-feet.
November 14: Gage height, 2.8 feet; discharge, 1,696 second-feet.
November 20: Gage height, 2.6 feet; discharge, 1,436 second-feet.

*Daily gage height, in feet, of Lehigh River at New street bridge, South Bethlehem, Pa.*

| Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | 1902. | | | | | 1902. | | | | |
| 1 | ..... | 6.10 | 3.75 | 2.60 | 12 | ..... | 5.67 | 2.85 | 2.70 | 23 | 2.20 | 3.20 | 2.60 | 8.35 |
| 2 | ..... | 6.10 | 3.65 | 2.60 | 13 | ..... | 5.85 | 2.80 | 2.75 | 24 | 2.17 | 3.05 | 2.60 | 6.45 |
| 3 | ..... | 5.30 | 3.50 | 2.90 | 14 | ..... | 5.05 | 2.80 | 2.80 | 25 | 2.80 | 3.80 | 2.60 | 5.65 |
| 4 | ..... | 4.75 | 3.40 | 3.00 | 15 | ..... | 4.55 | 2.80 | 2.80 | 26 | 8.45 | 3.00 | 2.60 | 5.10 |
| 5 | ..... | 4.65 | 3.30 | 3.00 | 16 | ..... | 4.25 | 2.70 | 4.40 | 27 | 8.10 | 2.95 | 2.60 | 4.70 |
| 6 | ..... | 5.55 | 3.40 | 3.00 | 17 | ..... | 3.95 | 2.75 | 8.70 | 28 | 6.20 | 5.25 | 2.60 | 4.30 |
| 7 | ..... | 5.05 | 3.35 | 3.00 | 18 | ..... | 3.80 | 2.65 | 6.00 | 29 | 5.85 | 4.90 | 2.60 | 4.10 |
| 8 | ..... | 4.60 | 3.20 | 3.00 | 19 | ..... | 3.75 | 2.65 | 5.10 | 30 | 5.70 | 4.40 | 2.60 | 4.00 |
| 9 | ..... | 4.40 | 3.05 | 2.55 | 20 | ..... | 3.65 | 2.60 | 4.60 | 31 | ..... | 4.00 | ..... | 3.90 |
| 10 | ..... | 4.00 | 2.95 | 2.55 | 21 | ..... | 3.40 | 2.60 | 4.90 | | | | | |
| 11 | ..... | 3.75 | 2.90 | 2.60 | 22 | 2.30 | 3.25 | 2.60 | 12.30 | | | | | |

## DELAWARE RIVER AT LAMBERTVILLE, N. J.

This river rises in Delaware County, N. Y., flows in a southerly direction, forming the boundary between the States of Pennsylvania and New Jersey, and empties into Delaware Bay. Measurements of flow were made during the latter half of June, 1891, by Prof. Dwight Porter and students at the Delaware Watergap, Pa. The results show a flow of from 2,000 to 2,200 second-feet. This was said to be the lowest June stage for five years. Measurements were made during the drought of 1895 by Prof L. M. Haupt at Point Pleasant, Pa., near the intake of the Delaware and Raritan Canal feeder. The discharge above the bridge was 1,657 second-feet and below the bridge 1,328 second-feet. Delaware River was measured by E. G. Paul, June 4, 1899, at Martins Creek, Pa., 7 miles above the mouth of Lehigh River, and a discharge of 2,724 second-feet was found. Systematic measurements of river height were begun on July 23, 1897, at the covered toll bridge at Lambertville, N. J., a town on the Belvidere division of the Pennsylvania Railroad, 16 miles above Trenton. The gage, established by E. G. Paul, consists of a stamped-link brass chain with a 6-pound sash weight attached. The chain passes over a pulley and the index is referred to a scale painted on a horizontal board 32 feet long, fastened to the studding and inclosed in a wooden cover. The zero of the gage chain is marked by a copper rivet, which is 28.85 feet from the end of the weight, and reads 2 feet when the water is at zero on a gage on the first bridge pier. Measurements are made from the windows of this covered bridge. The initial point for soundings is on the left bank. The channel above and below is nearly straight, the water being sluggish for a short space on the left side. The right bank is high and and the bed of the stream is of gravel and sand. The observer is Charles H. Naylor, collector of bridge tolls, Lambertville, N. J.

The following discharge measurements were made during 1902 by E. G. Paul:

April 15: Gage height, 6.3 feet; discharge, including canal, 30,549 second-feet; discharge of canal, 513 second-feet.

September 23: Gage height, 2.9 feet; discharge measurement, including canal, 3,985 second-feet; discharge of canal, 517 second-feet.

*Daily gage height, in feet, of Delaware River at Lambertville, N. J.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 7.40 | (a) | 18.17 | 7.05 | 5.80 | 3.70 | 6.10 | 5.45 | 3.30 | 10.55 | 6.15 | 4.10 |
| 2 | 6.45 | 4.75 | 20.21 | 6.60 | 5.85 | 3.55 | 6.05 | 5.20 | 3.20 | 9.60 | 5.75 | 4.00 |
| 3 | 5.80 | 4.90 | 16.40 | 6.25 | 5.40 | 3.45 | 5.50 | 5.95 | 3.10 | 8.60 | 5.40 | 4.60 |
| 4 | 5.40 | (a) | 12.50 | 5.95 | 5.20 | 3.40 | 5.15 | 5.70 | 2.95 | 7.40 | 5.10 | 4.65 |
| 5 | 5.00 | ..... | 9.45 | 5.65 | 5.15 | 3.30 | 5.75 | 5.15 | 2.90 | 6.90 | 5.00 | 4.55 |
| 6 | 4.95 | ..... | 8.15 | 5.45 | 5.00 | 3.30 | 5.20 | 4.85 | 2.85 | 7.10 | 4.85 | 4.50 |
| 7 | 4.90 | ..... | 6.80 | 5.60 | 4.70 | 3.55 | 5.00 | 4.70 | 2.70 | 6.65 | 4.75 | 4.40 |
| 8 | 4.85 | ..... | 6.45 | 6.05 | 4.65 | 3.55 | 5.10 | 4.50 | 2.80 | 6.25 | 4.65 | 4.20 |
| 9 | 4.70 | ..... | 7.00 | 7.20 | 4.50 | 3.40 | 5.10 | 4.35 | 2.90 | 5.80 | 4.55 | 4.15 |
| 10 | 4.70 | ..... | 7.70 | 8.05 | 4.30 | 3.35 | 4.70 | 4.20 | 3.45 | 5.45 | 4.40 | 4.10 |
| 11 | 4.50 | ..... | 7.95 | 8.30 | 4.20 | 3.30 | 4.50 | 4.15 | 3.65 | 5.20 | 4.30 | 4.10 |
| 12 | 4.45 | ..... | 7.60 | 7.55 | 4.10 | 3.40 | 4.25 | 4.20 | 4.10 | 6.70 | 4.20 | 4.10 |
| 13 | 4.15 | ..... | 8.85 | 7.10 | 4.10 | 3.45 | 4.15 | 4.10 | 3.95 | 7.15 | 4.10 | 4.20 |
| 14 | (a) | ..... | 11.05 | 6.75 | 4.00 | 3.65 | 4.00 | 3.90 | 3.70 | 6.90 | 4.10 | 4.10 |
| 15 | ..... | ..... | 10.20 | 6.25 | 3.90 | 3.65 | 3.80 | 3.80 | 3.55 | 6.30 | 4.00 | 4.10 |
| 16 | ..... | ..... | 8.70 | 5.95 | 3.90 | 3.55 | 3.65 | 3.70 | 3.45 | 5.90 | 3.95 | 5.60 |
| 17 | ..... | ..... | 9.35 | 5.60 | 3.80 | 3.55 | 3.60 | 3.60 | 3.25 | 5.55 | 4.00 | 8.75 |
| 18 | ..... | ..... | 11.80 | 5.45 | 3.75 | 3.75 | 3.50 | 3.50 | 3.20 | 5.25 | 3.85 | 9.60 |
| 19 | ..... | ..... | 9.70 | 5.15 | 3.75 | 3.85 | 3.50 | 3.30 | 3.00 | 5.10 | 3.80 | 8.25 |
| 20 | 3.90 | ..... | 7.90 | 5.10 | 3.65 | 3.80 | 3.65 | 3.45 | 2.95 | 4.95 | 3.80 | 7.30 |
| 21 | 3.80 | ..... | 7.20 | 4.90 | 3.70 | 3.75 | 3.95 | 3.30 | 2.95 | 4.75 | 3.70 | 7.60 |
| 22 | 8.93 | ..... | 6.75 | 4.80 | 3.65 | 4.85 | 6.10 | 3.50 | 3.10 | 4.60 | 3.70 | 11.80 |
| 23 | 8.55 | ..... | 6.35 | 4.65 | 3.60 | 4.30 | 6.35 | 3.35 | 3.00 | 4.50 | 3.70 | 12.90 |
| 24 | 7.95 | ..... | 6.20 | 4.55 | 3.55 | 4.15 | 5.75 | 3.40 | 2.85 | 4.40 | 3.70 | 10.70 |
| 25 | 6.60 | ..... | 6.10 | 4.45 | 3.50 | 3.85 | 5.55 | 3.30 | 2.90 | 4.30 | 3.70 | 8.60 |
| 26 | 5.80 | 8.90 | 5.90 | 4.30 | 3.50 | 3.85 | 5.90 | 3.20 | 5.65 | 4.25 | 3.85 | 7.60 |
| 27 | 5.70 | 8.66 | 5.70 | 4.30 | 3.95 | 4.00 | 5.45 | 3.00 | 9.70 | 4.20 | 4.10 | 7.10 |
| 28 | 5.75 | 12.34 | 5.45 | 4.30 | 4.05 | 3.95 | 4.90 | 2.95 | 9.05 | 4.90 | 4.10 | 6.35 |
| 29 | 5.45 | ..... | 5.80 | 4.20 | 4.10 | 4.00 | 4.80 | 3.15 | 8.35 | 7.20 | 4.20 | 5.85 |
| 30 | (a) | ..... | 7.60 | 5.15 | 3.90 | 4.70 | 5.20 | 3.10 | 12.10 | 8.20 | 4.15 | 5.70 |
| 31 | ..... | ..... | 7.90 | ..... | 3.85 | ..... | 5.60 | 3.30 | ..... | 6.95 | ..... | 5.45 |

a Frozen January 14 to 19, January 30 to February 1, and February 4 to 25.

*Rating table for Delaware River at Lambertville, N. J., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 2.4 | 1,750 | 4.0 | 8,550 | 5.6 | 22,150 | 7.2 | 37,810 |
| 2.6 | 2,100 | 4.2 | 10,000 | 5.8 | 24,050 | 7.4 | 39,870 |
| 2.8 | 2,600 | 4.4 | 11,650 | 6.0 | 25,950 | 7.6 | 41,930 |
| 3.0 | 3,300 | 4.6 | 13,350 | 6.2 | 27,850 | 7.8 | 43,990 |
| 3.2 | 4,100 | 4.8 | 15,050 | 6.4 | 29,750 | 8.0 | 46,050 |
| 3.4 | 5,050 | 5.0 | 16,750 | 6.6 | 31,700 | 8.5 | 51,200 |
| 3.6 | 6,100 | 5.2 | 18,500 | 6.8 | 33,710 | 9.0 | 56,350 |
| 3.8 | 7,250 | 5.4 | 20,300 | 7.0 | 35,750 | 9.5 | 61,500 |

*Estimated monthly discharge of Delaware River at Lambertville, N. J.*

[Drainage area, 6,855 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January [a] | ---------- | ---------- | [b] 20,017 | [b] 2.92 | [b] 3.37 |
| February [a] | ---------- | ---------- | ---------- | ---------- | ---------- |
| March | 171,813 | 20,750 | 55,811 | 8.14 | 9.38 |
| April | 49,140 | 10,000 | 24,039 | 3.51 | 3.92 |
| May | 24,525 | 5,550 | 10,701 | 1.56 | 1.80 |
| June | 14,200 | 4,550 | 6,848 | 1.00 | 1.12 |
| July | 26,900 | 5,550 | 16,352 | 2.39 | 2.76 |
| August | 25,475 | 3,125 | 9,310 | 1.36 | 1.41 |
| September | 88,280 | 2,300 | 12,922 | 1.89 | 2.11 |
| October | 72,315 | 10,000 | 28,250 | 4.12 | 4.75 |
| November | 27,375 | 6,650 | 11,323 | 1.65 | 1.84 |
| December | 96,520 | 8,550 | 29,351 | 4.28 | 4.93 |

[a] Frozen January 14 to 19, January 30 to February 1, and February 4 to 25. [b] Estimated.

## PERKIOMEN CREEK AT FREDERICK, PA.

Perkiomen Creek drains an area lying northwest of the city of Philadelphia. It flows in a southerly direction, emptying into Schuylkill River about 7 miles above Norristown and about 18 miles above Philadelphia. The point of measurement of discharge is located at Frederick, this being about 12 miles above the mouth. This point is also above two large tributaries known as West Swamp Creek and

Northeast Branch of Perkiomen. Both of these tributaries have been measured—the first at Zieglerville, and the second near Schwenkville. The drainage area of the Perkiomen above the point of measurement is given by Rudolph Hering as 152 square miles, of which 111 are cultivated and improved and 41 untillable and wooded. Measurements of this creek were begun on August 20, 1884. Water-Supply Paper No. 35 contains tables of the daily discharge for the entire period from 1884 to 1899, inclusive. The records of daily discharge for 1902, as furnished by John E. Codman, hydrographer of the water department of Philadelphia, are given in the following table:

*Daily discharge, in second-feet, of Perkiomen Creek at Frederick, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 269 | 119 | 2,657 | 246 | 253 | 47 | 226 | 69 | 51 | 877 | 128 | 172 |
| 2 | 249 | 228 | 1,598 | 199 | 196 | 45 | 124 | 68 | 39 | 394 | 117 | 283 |
| 3 | 193 | 375 | 703 | 157 | 194 | 51 | 79 | 58 | 33 | 215 | 113 | 1,190 |
| 4 | 168 | 307 | 400 | 142 | 191 | 51 | 102 | 45 | 31 | 158 | 109 | 409 |
| 5 | 143 | 236 | 284 | 133 | 162 | 45 | 107 | 45 | 26 | 596 | 104 | 361 |
| 6 | 114 | 168 | 315 | 270 | 140 | 45 | 67 | 45 | 26 | 1,185 | 102 | 270 |
| 7 | 111 | 121 | 301 | 345 | 123 | 45 | 59 | 51 | 26 | 358 | 107 | 204 |
| 8 | 111 | 75 | 284 | 1,638 | 109 | 45 | 54 | 49 | 26 | 228 | 101 | 224 |
| 9 | 111 | 75 | 1,443 | 1,564 | 96 | 45 | 51 | 43 | 77 | 158 | 83 | 209 |
| 10 | 111 | 75 | 2,840 | 738 | 88 | 45 | 43 | 43 | 171 | 119 | 65 | 194 |
| 11 | 101 | 66 | 1,753 | 426 | 79 | 45 | 43 | 49 | 69 | 380 | 51 | 184 |
| 12 | 92 | 51 | 835 | 301 | 74 | 45 | 45 | 212 | 38 | 2,350 | 71 | 318 |
| 13 | 92 | 45 | 828 | 238 | 75 | 45 | 43 | 114 | 31 | 522 | 75 | 257 |
| 14 | 83 | 45 | 497 | 188 | 79 | 56 | 38 | 50 | 28 | 288 | 75 | 220 |
| 15 | 66 | 45 | 352 | 166 | 79 | 67 | 35 | 49 | 29 | 219 | 73 | 209 |
| 16 | 58 | 45 | 323 | 154 | 73 | 71 | 35 | 37 | 28 | 193 | 72 | 4,200 |
| 17 | 51 | 45 | 972 | 150 | 61 | 83 | 40 | 24 | 26 | 165 | 89 | 3,440 |
| 18 | 45 | 45 | 406 | 143 | 53 | 79 | 43 | 30 | 28 | 140 | 104 | 751 |
| 19 | 45 | 45 | 273 | 134 | 57 | 67 | 40 | 33 | 28 | 133 | 92 | 698 |
| 20 | 45 | 45 | 235 | 119 | 66 | 62 | 75 | 34 | 26 | 123 | 84 | 587 |
| 21 | 1,084 | 137 | 219 | 114 | 69 | 61 | 82 | 38 | 26 | 110 | 79 | 3,334 |
| 22 | 5,259 | 1,798 | 198 | 118 | 67 | 103 | 113 | 39 | 26 | 101 | 55 | 5,011 |
| 23 | 388 | 800 | 178 | 112 | 64 | 66 | 66 | 32 | 28 | 99 | 46 | 905 |
| 24 | 221 | 485 | 163 | 105 | 56 | 54 | 53 | 20 | 30 | 95 | 79 | 522 |
| 25 | 160 | 1,104 | 143 | 100 | 59 | 54 | 113 | 18 | 44 | 89 | 106 | 405 |
| 26 | 142 | 6,035 | 123 | 95 | 65 | 227 | 150 | 30 | 1,379 | 78 | 434 | 367 |
| 27 | 688 | 2;569 | 118 | 88 | 77 | 143 | 73 | 38 | 1,684 | 71 | 438 | 332 |
| 28 | 238 | 6,843 | 123 | 86 | 96 | 101 | 58 | 254 | 360 | 1,045 | 295 | 292 |
| 29 | 194 | ..... | 944 | 159 | 84 | 68 | 58 | 324 | 313 | 428 | 188 | 279 |
| 30 | 168 | ..... | 765 | 581 | 61 | 175 | 58 | 101 | 186 | 260 | 147 | 267 |
| 31 | 139 | ..... | 341 | ..... | 51 | ..... | 66 | 69 | ..... | 163 | ..... | 248 |

*Estimated monthly discharge of Perkiomen Creek at Frederick, Pa.*

[Drainage area, 152 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 5,259 | 45 | 353 | 2.32 | 2.67 |
| February | 6,843 | 45 | 787 | 5.18 | 5.39 |
| March | 2,840 | 118 | 665 | 4.38 | 5.05 |
| April | 1,638 | 86 | 300 | 1.97 | 2.20 |
| May | 253 | 51 | 97 | .64 | .74 |
| June | 227 | 45 | 71 | .47 | .52 |
| July | 226 | 35 | 72 | .47 | .54 |
| August | 324 | 18 | 68 | .45 | .52 |
| September | 1,684 | 26 | 164 | 1.08 | 1.20 |
| October | 2,350 | 71 | 366 | 2.41 | 2.78 |
| November | 438 | 46 | 123 | .81 | .90 |
| December | 5,011 | 172 | 850 | 5.59 | 6.44 |
| The year | 6,843 | 18 | 326 | 2.15 | 28.95 |

WISSAHICKON CREEK NEAR PHILADELPHIA, PA.

The drainage basin of this creek is immediately adjacent to Philadelphia, and between Little Neshaminy and Perkiomen creeks. It flows through Fairmount Park, emptying into the Schuylkill River about 12 miles from its mouth. Measurements of flow were begun in April, 1897, under the direction of John E. Codman, at a point about 100 yards above the junction of the creek with Schuylkill River. June 5, 1899, the observations were discontinued temporarily, and were not again resumed until July 1, 1900. The figures for monthly flow for 1899 and diagrams of daily discharge for the entire period of observation (1897 to 1899, inclusive) will be found in the Twenty-first Annual Report, Part IV, pages 81 and 82. The following figures for 1902 were furnished by Mr. Codman.

*Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. |
|---|---|---|---|---|---|
| 1902. | | | | | |
| 1 | 163 | 22 | 1,967 | 114 | 123 |
| 2 | 153 | 146 | 870 | 106 | 96 |
| 3 | 112 | 162 | 485 | 102 | 96 |
| 4 | 99 | 138 | 198 | 102 | 106 |
| 5 | 93 | 49 | 104 | 106 | 96 |
| 6 | 77 | 22 | 119 | 106 | 82 |
| 7 | 63 | 22 | 148 | 106 | 77 |
| 8 | 45 | 22 | 184 | 490 | 77 |
| 9 | 42 | 22 | 247 | 415 | 77 |
| 10 | 44 | 22 | 267 | 183 | 77 |
| 11 | 32 | 22 | 255 | 161 | 82 |
| 12 | 31 | 22 | 255 | 157 | 86 |
| 13 | 31 | 22 | 247 | 140 | 82 |
| 14 | 31 | 22 | 227 | 123 | 70 |
| 15 | 31 | 22 | 195 | 106 | 63 |
| 16 | 31 | 22 | 168 | 106 | 61 |
| 17 | 27 | 22 | 155 | 114 | 51 |
| 18 | 22 | 22 | 118 | 114 | 44 |
| 19 | 22 | 22 | 104 | 106 | 44 |
| 20 | 22 | 22 | 143 | 106 | 47 |
| 21 | 151 | 22 | 161 | 98 | 47 |
| 22 | 1,093 | 398 | 148 | 91 | [a]40 |
| 23 | 101 | 557 | 140 | 91 | ---------- |
| 24 | 84 | 270 | 141 | 89 | ---------- |
| 25 | 68 | 334 | 141 | 84 | ---------- |
| 26 | 77 | 1,511 | 131 | 82 | ---------- |
| 27 | 171 | 1,821 | 123 | 72 | ---------- |
| 28 | 124 | 1,983 | 124 | 72 | ---------- |
| 29 | 26 | ---------- | 127 | 111 | ---------- |
| 30 | 25 | ---------- | 207 | 168 | ---------- |
| 31 | 24 | ---------- | 128 | ---------- | ---------- |

[a] Water drained out of pond for repairs.

## TOHICKON CREEK AT POINT PLEASANT, PA.

Tohickon Creek drains an area of 102 square miles in Bucks County, north of Philadelphia. It flows in an easterly course, entering Delaware River about 8 miles above Lambertville, N. J. In a statement by Rudolph Hering, printed in the report of the Philadelphia water department for 1885, on page 350, is given a classification of the drainage area of Tohickon Creek, from which it appears that 76 square miles is cultivated and improved and 26 square miles untillable and wooded. Measurements of the discharge of the creek are made near its mouth at Point Pleasant. Rain gages are located within the drainage basin at Quakertown, also at a point about 3 miles north of Bedminster, and near Point Pleasant.

Tables of daily discharge in second-feet, for the years 1883 to 1899, inclusive, are published in Water-Supply Paper No. 47, page 81. Daily records of gage height were not kept during 1900. The following figures of discharge for 1902 were furnished by Mr. Codman.

*Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 339 | 206 | 5,958 | 142 | 166 | 10 | 69 | 18 | 3 | 363 | 64 | 107 |
| 2 | 201 | 357 | 551 | 112 | 65 | 7 | 51 | 20 | 2 | 351 | 55 | 136 |
| 3 | 135 | 584 | 460 | 78 | 65 | 7 | 40 | 20 | 4 | 214 | 51 | 1,359 |
| 4 | 87 | 708 | 348 | 58 | 73 | 5 | 34 | 12 | 4 | 114 | 48 | 430 |
| 5 | 87 | 528 | 175 | 50 | 61 | 5 | 26 | 16 | 3 | 1,227 | 45 | 274 |
| 6 | 87 | 266 | 185 | 96 | 47 | 3 | 21 | 13 | 3 | 1,500 | 41 | 215 |
| 7 | 87 | 184 | 212 | 297 | 35 | 3 | 19 | 17 | 2 | 430 | 41 | 148 |
| 8 | 79 | 157 | 153 | 1,523 | 31 | 4 | 19 | 12 | 2 | 162 | 39 | 124 |
| 9 | 71 | 109 | 1,089 | 1,772 | 27 | 5 | 16 | 7 | 13 | 92 | 94 | 107 |
| 10 | 71 | 102 | 1,977 | 589 | 23 | 6 | 9 | 6 | 6 | 68 | 94 | 107 |
| 11 | 71 | 102 | 1,280 | 286 | 20 | 5 | 11 | 12 | 8 | 612 | 32 | 68 |
| 12 | 71 | 79 | 775 | 133 | 22 | 3 | 13 | 37 | 6 | 2,616 | 30 | 102 |
| 13 | 64 | 71 | 741 | 96 | 22 | 4 | 6 | 37 | 6 | 909 | 31 | 103 |
| 14 | 58 | 71 | 539 | 83 | 18 | 10 | 8 | 27 | 6 | 227 | 29 | 119 |
| 15 | 53 | 55 | 246 | 67 | 17 | 10 | 9 | 17 | 4 | 119 | 32 | 119 |
| 16 | 48 | 34 | 291 | 56 | 17 | 8 | 9 | 15 | 7 | 87 | 30 | 2,505 |
| 17 | 48 | 26 | 1,197 | 48 | 17 | 12 | 9 | 14 | 6 | 70 | 26 | 3,367 |
| 18 | 43 | 23 | 488 | 45 | 12 | 12 | 5 | 12 | 5 | 57 | 26 | 1,024 |
| 19 | 39 | 17 | 159 | 43 | 15 | 10 | 3 | 17 | 6 | 50 | 23 | 444 |
| 20 | 39 | 10 | 110 | 38 | 20 | 9 | 4 | 15 | 5 | 48 | 22 | 429 |
| 21 | 614 | 34 | 98 | 35 | 12 | 7 | 7 | 11 | 4 | 48 | 21 | 1,999 |
| 22 | 2,969 | 710 | 88 | 34 | 9 | 13 | 33 | 11 | 4 | 41 | 22 | 4,260 |
| 23 | 407 | 675 | 80 | 31 | 9 | 6 | 26 | 12 | 5 | 36 | 88 | 1,854 |
| 24 | 124 | 642 | 72 | 27 | 9 | 8 | 260 | 8 | 5 | 39 | 92 | 353 |
| 25 | 82 | 582 | 60 | 20 | 7 | 9 | 515 | 8 | 7 | 34 | 31 | 147 |
| 26 | 59 | 3,406 | 49 | 16 | 7 | 19 | 180 | 8 | 1,129 | 26 | 337 | 54 |
| 27 | 300 | 2,419 | 48 | 16 | 10 | 24 | 81 | 4 | 2,291 | 23 | 435 | 75 |
| 28 | 114 | 5,216 | 85 | 20 | 12 | 23 | 44 | 4 | 1,536 | 1,304 | 189 | 84 |
| 29 | 131 | ..... | 996 | 23 | 14 | 45 | 39 | 4 | 734 | 526 | 94 | 205 |
| 30 | 102 | ..... | 772 | 251 | 9 | 110 | 37 | 3 | 830 | 189 | 71 | 337 |
| 31 | 137 | ..... | 226 | ..... | 12 | ..... | 23 | 3 | ..... | 97 | ..... | 157 |

*Estimated monthly discharge of Tohickon Creek at Point Pleasant, Pa.*

[Drainage area, 102 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 2,969 | 39 | 220 | 2.16 | 2.49 |
| February | 3,406 | 10 | 620 | 6.08 | 6.33 |
| March | 5,958 | 48 | 629 | 6.17 | 7.11 |
| April | 1,772 | 16 | 203 | 1.99 | 2.22 |
| May | 166 | 7 | 28 | .27 | .31 |
| June | 110 | 3 | 13 | .13 | .15 |
| July | 515 | 3 | 52 | .51 | .59 |
| August | 37 | 3 | 14 | .14 | .16 |
| September | 2,291 | 2 | 222 | 2.18 | 2.43 |
| October | 2,616 | 23 | 377 | 3.70 | 4.27 |
| November | 435 | 21 | 74 | .73 | .81 |
| December | 4,260 | 54 | 671 | 6.58 | 7.59 |
| The year | 5,958 | 2 | 260 | 2.55 | 34.46 |

## NESHAMINY CREEK, PENNSYLVANIA, BELOW THE FORKS.

The drainage basin of Neshaminy Creek is immediately south of that of Tohickon Creek and of a portion of that of Perkiomen Creek. The stream flows in a general southeasterly and southerly course, entering Delaware River at a point about 12 miles above Philadelphia. The point of measurement is at the forks of Big and Little Neshaminy creeks. The drainage area at this point is 139.3 square miles, of which 128.2 are cultivated and improved and 11.1 miles untillable and wooded. The daily discharges from 1884 to 1900 are given in Water-Supply Paper No. 47, pages 90 to 98. The following table of daily discharge for 1902 was furnished by Mr. Codman:

*Daily discharge, in second-feet, of Neshaminy Creek below the forks, Pennsylvania.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 224 | 223 | 2,553 | 190 | 129 | 22 | 103 | 52 | 24 | 2,375 | 136 | 328 |
| 2 | 318 | 551 | 1,414 | 148 | 84 | 22 | 61 | 32 | 23 | 464 | 125 | 246 |
| 3 | 223 | 753 | 619 | 121 | 93 | 19 | 41 | 87 | 17 | 237 | 115 | 1,083 |
| 4 | 144 | 540 | 264 | 114 | 93 | 17 | 36 | 358 | 16 | 194 | 105 | 377 |
| 5 | 144 | 474 | 225 | 114 | 81 | 17 | 31 | 42 | 16 | 1,787 | 105 | 373 |
| 6 | 144 | 381 | 176 | 145 | 70 | 18 | 28 | 72 | 15 | 2,063 | 105 | 323 |
| 7 | 144 | 176 | 229 | 248 | 57 | 20 | 28 | 80 | 15 | 379 | 105 | 213 |
| 8 | 134 | 154 | 243 | 2,009 | 59 | 22 | 26 | 44 | 16 | 257 | 100 | 188 |
| 9 | 125 | 144 | 2,597 | 1,510 | 56 | 18 | 18 | 38 | 53 | 208 | 95 | 188 |
| 10 | 125 | 144 | 2,272 | 562 | 39 | 18 | 16 | 409 | 61 | 173 | 87 | 194 |
| 11 | 115 | 134 | 1,682 | 380 | 31 | 18 | 18 | 729 | 35 | 659 | 77 | 140 |
| 12 | 105 | 125 | 751 | 272 | 31 | 16 | 22 | 388 | 26 | 3,497 | 72 | 206 |
| 13 | 105 | 125 | 502 | 221 | 36 | 20 | 19 | 133 | 16 | 591 | 71 | 307 |
| 14 | 96 | 125 | 621 | 200 | 31 | 18 | 15 | 86 | 15 | 337 | 67 | 499 |
| 15 | 88 | 115 | 501 | 182 | 26 | 15 | 22 | 70 | 16 | 258 | 46 | 433 |
| 16 | 88 | 105 | 309 | 154 | 26 | 25 | 24 | 55 | 16 | 218 | 43 | 3,174 |
| 17 | 88 | 105 | 1,283 | 144 | 26 | 33 | 20 | 49 | 15 | 194 | 59 | 2,718 |
| 18 | 88 | 105 | 445 | 134 | 23 | 26 | 16 | 49 | 14 | 181 | 46 | 656 |
| 19 | 88 | 105 | 235 | 125 | 21 | 20 | 16 | 39 | 14 | 169 | 42 | 506 |
| 20 | 80 | 105 | 186 | 113 | 26 | 16 | 15 | 37 | 15 | 152 | 50 | 560 |
| 21 | 619 | 329 | 179 | 99 | 31 | 308 | 12 | 40 | 15 | 137 | 50 | 2,682 |
| 22 | 3,226 | 3,043 | 175 | 93 | 31 | 157 | 13 | 34 | 15 | 125 | 51 | 2,709 |
| 23 | 352 | 1,495 | 154 | 81 | 31 | 49 | 15 | 30 | 15 | 115 | 48 | 616 |
| 24 | 183 | 604 | 144 | 72 | 31 | 36 | 481 | 36 | 13 | 110 | 52 | 422 |
| 25 | 139 | 853 | 124 | 72 | 68 | 36 | 758 | 41 | 42 | 105 | 91 | 345 |
| 26 | 134 | 6,063 | 115 | 73 | 70 | 175 | 168 | 36 | 1,399 | 102 | 255 | 267 |
| 27 | 601 | 3,438 | 125 | 64 | 49 | 79 | 55 | 95 | 1,249 | 107 | 282 | 213 |
| 28 | 368 | 4,041 | 153 | 60 | 55 | 30 | 31 | 100 | 379 | 1,195 | 146 | 213 |
| 29 | 188 | ------- | 448 | 95 | 48 | 312 | 45 | 33 | 440 | 320 | 104 | 294 |
| 30 | 164 | ------- | 679 | 206 | 37 | 269 | 65 | 28 | 174 | 182 | 113 | 294 |
| 31 | 154 | ------- | 450 | ------- | 24 | ------ | 71 | 26 | ------- | 150 | ------ | 200 |

*Estimated monthly discharge of Neshaminy Creek below the forks, Pennsylvania.*

[Drainage area, 139 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 3,226 | 80 | 284 | 2.04 | 2.35 |
| February | 6,063 | 105 | 877 | 6.31 | 6.57 |
| March | 2,597 | 115 | 640 | 4.60 | 5.30 |
| April | 2,009 | 60 | 267 | 1.92 | 2.14 |
| May | 129 | 21 | 49 | .35 | .40 |
| June | 312 | 15 | 62 | .45 | .50 |
| July | 758 | 12 | 74 | .53 | .61 |
| August | 729 | 26 | 108 | .78 | .90 |
| September | 1,399 | 13 | 139 | 1.00 | 1.12 |
| October | 3,497 | 102 | 550 | 3.96 | 4.57 |
| November | 282 | 42 | 95 | .68 | .76 |
| December | 3,174 | 140 | 676 | 4.86 | 5.60 |
| The year | 6,063 | 12 | 318 | 2.29 | 30.82 |

## SCHUYLKILL RIVER NEAR PHILADELPHIA, PA.

This river receives the drainage of the portion of southeastern Pennsylvania lying between the Lehigh River on the north and the Susquehanna River on the south. It flows in a general southeasterly course, emptying into Delaware River, the city of Philadelphia being located at the junction of these streams. 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 in computing daily discharges. In 1898, however, careful estimates were prepared by Mr. Codman, the results being given in the Twentieth Annual Report, Part IV, page 97.

The figures for daily discharge in the following table do not represent the total flow of the stream, but the amount wasted over the flashboards at Fairmount dam. To this must be added the pumpage from the river, also the leakage, and also the quantity used for power at Fairmount. The total discharge is given at foot of the table of monthly totals in cubic feet. There has been no method for obtaining the daily flow when the water does not waste over the flashboards. When the water is below the overflow line recourse is had to pumping, and the draft is on the storage of the pool. As soon as the water begins to rise after a rain the turbine wheels are started, and thus it often occurs that no water flows to waste for from one to three months in succession.

The following figures for 1902 were furnished by Mr. Codman:

*Daily discharge, in second-feet, of Schuylkill River above Philadelphia, Pa., being the amount wasted over flashboards at Fairmount dam.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 1,817 | 953 | 82,156 | 2,712 | 1,537 | | 1,000 | | | 6,057 | 1,999 | 1,276 |
| 2 | 4,938 | 1,964 | 25,172 | 1,819 | 896 | | 305 | | | 4,814 | 1,831 | 1,120 |
| 3 | 3,814 | 6,747 | 12,765 | 1,267 | 605 | | | | | 2,300 | 1,605 | 3,601 |
| 4 | 2,120 | 4,556 | 5,297 | 1,308 | 92 | | 416 | | | 1,443 | 1,140 | 5,349 |
| 5 | 1,634 | 945 | 1,887 | 1,308 | | | 275 | | | 3,137 | 903 | 3,436 |
| 6 | 1,524 | 500 | 1,216 | 1,308 | 92 | | | | | 9,534 | 903 | 3,132 |
| 7 | 1,349 | 530 | 734 | 1,873 | | | | | | 4,484 | 903 | 2,530 |
| 8 | 1,349 | 44 | 1,200 | 5,726 | | | | | | 2,510 | 903 | 2,167 |
| 9 | 1,349 | | 2,720 | 16,336 | | | | | | 2,180 | 920 | 1,992 |
| 10 | 1,041 | 166 | 10,078 | 13,019 | | | | 450 | | 895 | 413 | 1,831 |
| 11 | 1,041 | 92 | 8,873 | 7,976 | | | | 1,378 | 183 | 744 | 122 | 1,524 |
| 12 | 674 | 176 | 5,331 | 5,260 | | | | 3,358 | | 11,323 | 122 | 2,461 |
| 13 | 367 | 44 | 5,200 | 4,078 | | | | 1,818 | | 7,614 | 122 | 3,132 |
| 14 | 245 | | 5,331 | 3,125 | 46 | | | 107 | | 4,498 | 122 | 2,355 |
| 15 | 119 | 45 | 5,331 | 2,489 | 92 | | | | | 3,038 | 171 | 1,992 |
| 16 | 260 | | 4,573 | 1,887 | | | | | | 2,100 | 171 | 12,765 |
| 17 | 119 | 78 | 5,358 | 1,699 | 637 | | | | | 1,459 | 283 | 30,108 |
| 18 | 134 | | 6,430 | 1,362 | 92 | | | | | 1,076 | 283 | 19,492 |
| 19 | 92 | | 4,666 | 1,026 | 92 | | | | | 819 | 225 | 11,281 |
| 20 | 32 | | 3,071 | 880 | | | | | | 676 | 171 | 5,085 |
| 21 | 1,005 | 383 | 3,040 | 497 | | | | | | 413 | 225 | 6,723 |
| 22 | 37,901 | 17,369 | 2,577 | 239 | | | 97 | | | 243 | 122 | 45,712 |
| 23 | 22,919 | 11,045 | 2,182 | 45 | | | | | | 199 | 171 | 40,397 |
| 24 | 8,004 | 5,364 | 1,705 | 302 | | | | | | 159 | 268 | 10,848 |
| 25 | 4,156 | 5,446 | 1,354 | 605 | | | 184 | | | 184 | 171 | 5,712 |
| 26 | 2,182 | 38,856 | 961 | 423 | 119 | | | | 2,104 | 225 | 972 | 3,808 |
| 27 | 3,280 | 37,172 | 702 | 314 | | 92 | | | 12,349 | 254 | 3,027 | 2,109 |
| 28 | 4,817 | 38,174 | 670 | 314 | | | | | 6,818 | 3,919 | 3,236 | 1,669 |
| 29 | 2,349 | | 1,634 | 487 | | | | | 4,078 | 6,168 | 1,318 | 1,313 |
| 30 | 1,187 | | 4,183 | 1,246 | | 571 | 315 | | 2,524 | 3,407 | 413 | 1,076 |
| 31 | 953 | | 4,183 | | | | 944 | | | 2,443 | | 861 |

*Total monthly yield of Schuylkill River above Philadelphia, Pa., for 1902.*

| | Cubic feet. |
|---|---|
| January | 14,403,100,000 |
| February | 18,278,000,000 |
| March | 24,203,300,000 |
| April | 11,673,500,000 |
| May | 4,407,600,000 |
| June | 2,382,700,000 |
| July | 3,589,200,000 |
| August | 3,248,400,000 |
| September | 4,283,500,000 |
| October | 12,229,700,000 |
| November | 5,741,800,000 |
| December | 24,847,000,000 |

## SUSQUEHANNA RIVER DRAINAGE BASIN.

The North Branch of this river rises in New York State and flows in a southwesterly direction until it crosses the Pennsylvania State line, when it changes its course to the southeast, turns again, near Wilkesbarre, to the southwest and joins the West Branch on the western border of Northumberland County, to form the Susquehanna proper. The West Branch rises in Cambria County, Pa., and flows in a general northeasterly direction until it joins the North Branch. Measurements of flow of the North Branch are made at Binghamton, N. Y., and at Wilkesbarre and at Danville, Pa., and of the West Branch at Allenwood and at Williamsport, Pa. At Binghamton the Chenango River unites with the North Branch of the Susquehanna and a gaging station is located at this place. The Juniata River, which rises in Center County, Pa., flows into the Susquehanna about 15 miles above Harrisburg. Most of its drainage area is mountainous and covered with forest growth. A gaging station is located on this branch at Newport, about 15 miles above the junction of the river with the Susquehanna. On the main branch of the Susquehanna River measurements are being made at Harrisburg. The measurements at these stations are made by E. G. Paul and R. E. Horton.

### CHENANGO RIVER AT BINGHAMTON, N. Y.

The gage on this stream is located on the upstream side of the first span from the right bank of Court street bridge, in Binghamton.

It consists of a horizontal wooden box containing a scale graduated in feet and tenths to 15.5 feet, secured to the vertical supports of the hand railing by means of U-bolts. At the zero end of the scale is placed a pulley over which passes the weight wire. The bench mark is a circular chisel draft in upstream corner of bridge seat on left-hand abutment. Elevation of bench mark, 100 feet; elevation of water surface when gage reads zero, 65.98 feet.

The Court street bridge stands squarely across the stream, which has a nearly horizontal bed of gravel and small cobblestones, affording a smooth uniform current for gaging. The channel is obstructed by three masonry piers supporting the four spans of the bridge, 79 feet clear width each, the bridge having a total length of 337 feet between abutments. The bridge is situated 2,500 feet above the mouth of Chenango River. A small rift below the bridge cuts off backwater from Susquehanna River at ordinary stages of the rivers. During freshets, when the gage readings may be affected by backwater, making them appear too large, check readings are taken at De Forest street bridge, 1.4 miles upstream.

During 1901 nine current-meter measurements were made through the cooperation of E. C. Murphy.

The gage reader, E. F. Weeks, takes readings of the river stage twice daily. During freshets additional readings are taken at frequent intervals at the Chenango and Susquehanna stations by the United States Weather Bureau, of which W. E. Donaldson is official in charge at Binghamton.

Three-fourths mile above the gage is located the dam of the Binghamton Cold Storage Company. Six water wheels are used under a head varying from zero to 5 feet, rated at a total of 150 horsepower. The dam is a low structure, giving but 3-foot fall. It consists of large blocks of bluestone laid dry, offering numerous leaks and crevices. The dam affords little obstruction to the flow of the stream, which passes the gage in nearly its normal regimen.[a]

The flow at Binghamton does not represent the entire natural runoff of the Chenango drainage basin, as a portion of the headwaters are diverted across the Chenango-Mohawk divide through Oriskany Creek to feed the Rome or summit level of Erie Canal.[b]

Additional diversion takes place from the headwaters of Tioughnioga River through Fayetteville feeder. De Ruyter reservoir, at the head of the feeder, which has a tributary drainage of 18 square miles, receives most of its supply from across the Chenango divide.

*Nominal and effective drainage areas of Chenango River above Binghamton.*

| | Square miles. |
|---|---|
| Natural drainage area above Binghamton | 1,582 |
| Area tributary to canal storage reservoirs | 105 |
| Effective area above Binghamton during navigation season | 1,477 |

*Discharge measurements of Chenango River at Binghamton, N. Y.*

| Date. | Hydrographer. | Gage height.[c] | Discharge. |
|---|---|---|---|
| 1901. | | *Feet.* | *Second-feet.* |
| July 29 | E. C. Murphy | 5.21 | 405 |
| July 29 | do | 5.21 | 425 |
| August 19 | do | 5.48 | 566 |
| August 19 | do | 5.49 | 577 |
| July 2 | do | 5.64 | 848 |
| July 9 | do | 5.71 | 942 |
| July 8 | do | 5.78 | 1,119 |
| October 19 | do | 5.81 | [d]987 |
| October 19 | do | 5.81 | [d]927 |

[a] See description of Chenango River in "Report on water power," part 1, Tenth United States Census, 1880, Vol. XVI, pp. 583–585.

[b] See description of Oriskany Creek station, p. 79.

[c] Datum elevation 65.98 feet.

[d] Subject to revision.

*Discharge measurements of Chenango River at Binghamton, N. Y.*—Continued.

| Date. | Hydrographer. | Gage height. | Discharge. |
|---|---|---|---|
| 1902. | | *Feet.* | *Second-feet.* |
| August 15 | E. C. Murphy | 6.08 | 1,341 |
| August 14 | do | 6.20 | 1,608 |
| July 15 | do | 6.56 | 2,098 |
| June 6 | R. E. Horton | 6.58 | 2,407 |
| July 3 | E. C. Murphy | 7.16 | 2,688 |
| March 27 | do | 8.15 | 4,201 |
| March 28 | do | 8.21 | 4,377 |
| July 1 | do | 8.41 | 4,815 |
| March 29 | do | 8.75 | 5,205 |
| August 3 | do | 9.04 | 5,543 |

*Mean daily gage height, in feet, of Chenango River at Binghamton, N. Y.*[a]

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | | | | | | | | 5.18 | 5.58 | 5.70 | 5.46 | 6.12 |
| 2 | | | | | | | | 5.08 | 5.75 | 5.50 | 5.31 | 6.33 |
| 3 | | | | | | | | 5.10 | 5.58 | 5.52 | 5.26 | 6.61 |
| 4 | | | | | | | | 5.10 | 5.50 | 5.68 | 5.28 | 6.52 |
| 5 | | | | | | | | 5.05 | 5.43 | 5.55 | 5.27 | 6.19 |
| 6 | | | | | | | | 5.20 | 5.28 | 5.51 | 5.25 | 5.95 |
| 7 | | | | | | | | 5.01 | 5.23 | 5.45 | 5.25 | 5.91 |
| 8 | | | | | | | | 5.10 | 5.20 | 5.47 | 5.23 | 6.03 |
| 9 | | | | | | | | 5.20 | 5.18 | 5.40 | 5.24 | 6.86 |
| 10 | | | | | | | | 5.20 | 5.15 | 5.37 | 5.21 | 9.64 |
| 11 | | | | | | | | 5.23 | 5.15 | 5.34 | 5.14 | 10.00 |
| 12 | | | | | | | | 5.20 | 5.18 | 5.34 | 5.26 | 8.82 |
| 13 | | | | | | | | 5.18 | 5.30 | 5.42 | 6.85 | ..... |
| 14 | | | | | | | | 5.13 | 5.48 | 6.47 | 6.45 | 8.48 |
| 15 | | | | | | | | 5.15 | 5.35 | 6.41 | 6.20 | 19.54 |
| 16 | | | | | | | | 6.35 | 5.43 | 6.08 | 6.11 | 18.02 |
| 17 | | | | | | | | 5.90 | 5.55 | 5.89 | 6.10 | 12.61 |
| 18 | | | | | | | | 5.60 | 5.63 | 5.85 | 6.06 | 9.42 |
| 19 | | | | | | | | 5.48 | 5.55 | 5.80 | 6.06 | 8.11 |
| 20 | | | | | | | | 5.40 | 5.45 | 5.82 | 6.00 | 7.40 |
| 21 | | | | | | | | 5.55 | 5.45 | 5.78 | 5.96 | 6.84 |
| 22 | | | | | | | | 5.58 | 5.30 | 5.75 | 5.96 | 6.67 |
| 23 | | | | | | | | 5.48 | 5.23 | 5.70 | 5.94 | 6.77 |
| 24 | | | | | | | | 6.70 | 5.20 | 5.67 | 6.72 | 8.18 |
| 25 | | | | | | | | 6.20 | 5.25 | 5.57 | 7.78 | 7.42 |
| 26 | | | | | | | | 5.65 | 5.24 | 5.48 | 7.19 | 6.89 |
| 27 | | | | | | | | 5.38 | 5.25 | 5.45 | 6.64 | 6.84 |
| 28 | | | | | | | | 5.30 | ..... | 5.39 | 6.06 | 6.50 |
| 29 | | | | | | | | 5.25 | 5.15 | 5.40 | 6.20 | 6.53 |
| 30 | | | | | | | | 5.20 | 5.88 | 5.35 | 6.33 | 7.20 |
| 31 | | | | | | | | 5.20 | ..... | 5.39 | ..... | 7.36 |

[a] Tables give actual gage readings. Datum changes from 65.98 to 65.57 August 21, 1902.

*Mean daily gage height, in feet, of Chenango River at Binghamton, N. Y.*—Cont'd.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 6.62 | 6.31 | 19.44 | 8.65 | 6.53 | 6.20 | 8.50 | 8.33 | 6.03 | 7.73 | 8.48 | 6.98 |
| 2 | 6.64 | 6.26 | 23.32 | 8.61 | 6.30 | 6.03 | 7.80 | 9.33 | 5.98 | 7.70 | 8.00 | 6.93 |
| 3 | 6.74 | 6.13 | 21.64 | 8.45 | 6.20 | 5.95 | 7.31 | 8.35 | 6.00 | 7.13 | 7.70 | 7.13 |
| 4 | 6.91 | 6.34 | 17.15 | 8.10 | 6.20 | 6.23 | 7.35 | 7.70 | 5.93 | 6.73 | 7.43 | 7.68 |
| 5 | 6.65 | 6.20 | 12.30 | 7.83 | 6.20 | 6.95 | 7.05 | 7.20 | 5.90 | 6.48 | 7.28 | 7.58 |
| 6 | 6.61 | 6.19 | 9.93 | 7.70 | 6.10 | 6.58 | 7.38 | 6.88 | 5.88 | 6.73 | 7.18 | 7.18 |
| 7 | 6.52 | 6.16 | 9.25 | 7.60 | 6.10 | 6.30 | 8.12 | 6.90 | 5.93 | 7.00 | 7.15 | 7.05 |
| 8 | 6.30 | 6.20 | 9.03 | 7.57 | 6.10 | 6.30 | 7.93 | 6.75 | 5.90 | 6.88 | 7.03 | 6.95 |
| 9 | 6.22 | 6.21 | 8.67 | 8.12 | 6.10 | 6.33 | 7.73 | 6.68 | 5.93 | 6.90 | 6.88 | 6.70 |
| 10 | 6.13 | 6.08 | 9.45 | 8.50 | 5.98 | 6.30 | 7.80 | 6.45 | 6.30 | 6.75 | 6.78 | 6.63 |
| 11 | 6.14 | 6.10 | 9.28 | 8.97 | 5.95 | 8.45 | 9.15 | 6.40 | 6.53 | 6.58 | 6.73 | 7.00 |
| 12 | 6.02 | 5.99 | 11.60 | 8.78 | 5.90 | 6.33 | 8.33 | 6.65 | 6.25 | 6.60 | 6.68 | 6.98 |
| 13 | 5.87 | 5.90 | 15.08 | 8.48 | 5.85 | 6.25 | 7.33 | 6.60 | 6.10 | 6.60 | 6.93 | 6.68 |
| 14 | 5.63 | 5.84 | 15.77 | 8.23 | 5.80 | 6.30 | 6.88 | 6.29 | 6.05 | 6.80 | 6.85 | 6.45 |
| 15 | 5.89 | 5.77 | 14.17 | 7.80 | 5.75 | 6.20 | 6.60 | 6.13 | 6.00 | 7.08 | 6.75 | 6.55 |
| 16 | 5.91 | 5.87 | 11.97 | 7.43 | 5.70 | 6.18 | 6.48 | 6.10 | 5.90 | 6.75 | 6.60 | 6.99 |
| 17 | 5.89 | 5.76 | 15.87 | 7.18 | 5.73 | 6.20 | 6.48 | 5.98 | 5.85 | 6.55 | 6.55 | 10.97 |
| 18 | 5.76 | 5.78 | 15.72 | 7.05 | 5.70 | 6.10 | 6.40 | 5.93 | 5.80 | 6.45 | 6.53 | 11.38 |
| 19 | 5.78 | 5.74 | 13.10 | 6.90 | 5.60 | 6.00 | 6.73 | 5.88 | 5.80 | 6.40 | 6.50 | 10.35 |
| 20 | 5.78 | 5.71 | 10.47 | 6.80 | 5.75 | 6.00 | 11.57 | 5.88 | 5.75 | 7.25 | 6.55 | 9.53 |
| 21 | 5.67 | 5.64 | 9.40 | 6.70 | 6.00 | 5.95 | 14.98 | 6.15 | 5.73 | 7.30 | 6.50 | 8.95 |
| 22 | 6.02 | 5.67 | 9.20 | 6.63 | 5.88 | 6.20 | 14.90 | 6.44 | 5.70 | 6.95 | 6.53 | 13.29 |
| 23 | 8.24 | 5.68 | 9.32 | 6.50 | 5.78 | 6.25 | 13.40 | 6.35 | 5.75 | 6.78 | 6.53 | 14.47 |
| 24 | 8.66 | 5.67 | 9.38 | 6.38 | 5.83 | 6.08 | 12.22 | 6.33 | 5.73 | 6.75 | 6.60 | 11.72 |
| 25 | 7.62 | 5.69 | 8.90 | 6.30 | 5.95 | 5.93 | 11.35 | 6.28 | 5.75 | 6.75 | 6.65 | 9.75 |
| 26 | 6.87 | 5.73 | 8.47 | 6.18 | 6.30 | 5.98 | 9.60 | 6.25 | 5.98 | 6.65 | 6.73 | 9.15 |
| 27 | 6.86 | 6.08 | 8.15 | 6.18 | 6.58 | 6.10 | 8.50 | 6.15 | 6.20 | 6.60 | 7.23 | 8.68 |
| 28 | 7.28 | 8.42 | 8.15 | 6.13 | 6.30 | 6.08 | 11.50 | 6.23 | 6.10 | 10.19 | 7.50 | 8.08 |
| 29 | 7.39 | ..... | 8.90 | 6.13 | 6.20 | 6.65 | 9.58 | 6.18 | 8.08 | 12.15 | 7.23 | 7.68 |
| 30 | 6.86 | ..... | 9.28 | 6.28 | 6.18 | 10.48 | 8.50 | 6.18 | 6.88 | 10.85 | 7.05 | 7.73 |
| 31 | 6.41 | ..... | 8.97 | ..... | 6.15 | ..... | 9.18 | 6.10 | ..... | 9.30 | ..... | 7.43 |

SUSQUEHANNA RIVER AT BINGHAMTON, N. Y.

A gaging station was established on this stream July 31, 1901. The gage is located on the upstream side of the left span of the Washington street bridge. This bridge is situated about 800 feet upstream from the junction of Chenango and Susquehanna rivers. A rift extends diagonally across the stream underneath the bridge. The gage stands above a stretch of smooth water extending from the crest of the rift to the dam, 2,800 feet upstream, and the gage readings are unaffected by backwater from Chenango River at ordinary stages. Owing to unfavorable conditions underneath the Washington street bridge, discharge measurements are made at Exchange street bridge, 1,900 feet upstream. The gage is of the weight-and-wire variety, reading to feet and tenths, its datum being determined as follows:

Bench mark, chisel draft on corner left-hand bridge abutment, upstream side, elevation ..... 100.00
Elevation water surface, when gage reads zero ..... 76.29

The gage is read twice daily by E. F. Weeks,

There are no tributaries of noticeable magnitude entering between the gaging stations on the Chenango and Susquehanna rivers at Binghamton and the junction of the two streams. Simultaneous discharge measurements of the two streams were made on several occasions. By combining the flow of the two branches, that of the Susquehanna below the junction at Binghamton has been obtained, as follows:[a]

By taking levels of high-water marks furnished by the mill owners, the following data relative to flood discharge of Susquehanna River have been obtained:

*Flood discharge of Susquehanna River.*

| Date. | Depth on crest of present dam. | Estimated discharge. |
|---|---|---|
| | *Feet.* | *Second-feet.* |
| March, 1865 | 13.8 | ---------- |
| Highest since 1865 (prior to 1901) | 9.0 | 41,000 |
| 1898 and 1899 | 9.0 | 38,000 |
| 1901 (spring) | 7.4 | 38,000 |

A current-meter measurement made at the highway bridge at Union, N. Y., by R. E. Horton, June 6, 1902, showed a discharge of 5,475 second-feet. Elevation of water surface referred to Delaware, Lackawanna and Western Railroad datum, 803.88. The drainage area at Union is 4,032 square miles. The accompanying tables show the progress of the floods of December 15–16, 1901, and March 1–2, 1902; the latter exceeded all known previous floods except that of 1865. The following comparative data have been obtained from these two floods at Binghamton and at Union highway bridge, 8.8 miles below the gaging station. Elevations were referred to the Delaware, Lackawanna and Western Railroad datum or mean tide at Sandy Hook.

*Elevation of water surface of Susquehanna River at Binghamton and Union.*

| Flood. | Elevation at Binghamton. | Elevation at Union. | Fall. |
|---|---|---|---|
| | | | *Feet.* |
| December 15–16, 1901 | 835.67 | 820.59 | 15.08 |
| March 1–2, 1902 | 839.77 | 826.71 | 13.06 |
| ——— —, 1865 | 840.00 | 827.82 | 12.18 |

From the stage and slope as given above and from cross sections obtained, the discharge during these freshets has been calculated by means of the Kutter formula. The coefficient of roughness $n=0.040$

[a] See description Chenango River, page 143.

has been used, this value having been calculated from observed slopes and measured discharges at lower stages of the stream.

*Flood discharge of Susquehanna River, estimated by Kutter formula.*

| Flood. | Estimated discharge. | Per square mile. |
|---|---|---|
| | *Second-feet.* | *Second-feet.* |
| December 15–16, 1901 | 67,160 | 16.7 |
| March 1–2, 1902 | 104,470 | 25.9 |
| ——— —, 1865 | 104,770 | 26.0 |

*Total flow of Susquehanna River below junction.*

| 1901. | Second-feet. |
|---|---|
| July 2–3 | 1,795 |
| July 8–10 | 2,544 |
| July 29–30 | 1,013 |
| August 19–20 | 1,519 |
| Do | 1,518 |

*Estimated drainage areas of Susquehanna and Chenango rivers, above Binghamton, N. Y.*

| | Square miles. |
|---|---|
| Susquehanna above Oneonta | 686 |
| Susquehanna above mouth of Unadilla River | 914 |
| Unadilla River above junction with Susquehanna | 565 |
| Susquehanna River below mouth of Unadilla River | 1,479 |
| Susquehanna, total drainage in New York above Chenango | 1,900 |
| Susquehanna, drainage in Pennsylvania above Chenango | 500 |
| Susquehanna River, total above Chenango River | 2,400 |
| Chenango River above Chenango Forks | 694 |
| Tioughnioga River above junction with Chenango River | 753 |
| Chenango River below mouth of Tioughnioga River | 1,447 |
| Chenango River above mouth | 1,582 |
| Susquehanna River below junction of Chenango River | 3,982 |

The Susquehanna gage is located a short distance below the Binghamton Water Power dam, and the records show the amount passed by the turbines or wasting over spillway each day. The dam was built in 1833 by Whitney and Waterman. In 1869 it was repaired and its crest raised by the State of New York, and it now furnishes water power to four mills under an effective head of 6 feet.

*Water-power privileges at Susquehanna River dam, Binghamton, N. Y.*

| Firm. | Business. | Water rights, etc. |
|---|---|---|
| H. J. Lyon's Sons | Saw and planing mill | First privilege, unlimited. |
| Luke Doolittle | Custom grinding | For 1 reaction water wheel. |
| Binghamton Box Co | Cigar boxes | Specified number of square inches. |
| Wilkinson Manufacturing Co. | Novelty works | Do. |

The following tables show the variation of the gage readings during the floods of 1901 and 1902:

*Variations in gage readings during flood of December 15–16, 1901, at Binghamton, N. Y.*

| Date. | Susquehanna River. | | Chenango River. | |
|---|---|---|---|---|
| | Time. | Gage. | Time. | Gage. |
| December 15 | 8.45 a. m. | 14.44 | 9.10 a. m. | 18.73 |
| | 12.30 p. m. | 14.94 | 11.00 a. m. | 19.45 |
| | 5.30 p. m. | 15.64 | 5.00 p. m. | 20.45 |
| December 16 | 8.00 a. m. | 14.59 | 7.30 a. m. | 18.63 |
| | 11.00 a. m. | 14.19 | 11.30 a. m. | 17.90 |
| | 4.30 p. m. | 12.89 | 5.00 p. m. | 16.50 |
| December 17 | 7.50 a. m. | 10.29 | 7.20 a. m. | 13.73 |
| | | | 2.45 p. m. | 12.20 |
| | | | 4.50 p. m. | 11.90 |

*Variations in gage readings during flood of March 1–2, 1902, at Binghamton, N. Y.*

| Date. | Susquehanna River. | | Chenango River. | |
|---|---|---|---|---|
| | Time. | Gage.[a] | Time. | Gage. |
| February 28 | 7.35 a. m. | 3.54 | 7.15 a. m. | 5.95 |
| | 2.00 p. m. | 5.44 | 1.20 p. m. | 8.50 |
| | 4.30 p. m. | 7.84 | 5.00 p. m. | 11.32 |
| March 1 | 7.25 a. m. | 13.79 | 7.05 a. m. | 17.38 |
| | 9.00 a. m. | 14.09 | 8.45 a. m. | 17.80 |
| | 10.50 a. m. | 14.49 | 10.40 a. m. | 18.10 |
| | 1.30 p. m. | 14.99 | 1.05 p. m. | 18.60 |
| | 3.10 p. m. | 15.19 | 3.00 p. m. | 19.10 |
| | 5.00 p. m. | 16.54 | 4.00 p. m. | 20.10 |
| | 7.20 p. m. | 17.59 | 7.30 p. m. | 21.50 |
| March 2 | 7.40 a. m. | 19.74 | 8.00 a. m. | 22.80 |
| | 10.30 a. m. | 18.69 | 11.00 a. m. | 22.60 |
| | 1.55 p. m. | 18.79 | 1.35 p. m. | 22.60 |
| | 4.00 p. m. | 18.79 | 4.20 p. m. | 22.70 |
| | 7.35 p. m. | 18.99 | 8.20 p. m. | 22.90 |
| | | | 10.30 p. m. | 23.10 |

[a] Referred to No. 1 or original gage.

*Variations in gage readings during flood of March 1–2, 1902, at Binghamton, N. Y.*—Continued.

| Date. | Susquehanna River. | | Chenango River. | |
|---|---|---|---|---|
| | Time. | Gage. | Time. | Gage. |
| March 3 | 7.55 a. m. | 18.69 | 7.30 a. m. | 22.50 |
| | 9.15 a. m. | 18.39 | 9.00 a. m. | 22.30 |
| | 1.30 p. m. | 17.99 | 11.30 a. m. | 21.95 |
| | 7.30 p. m. | 16.99 | 1.00 p. m. | 21.70 |
| | | | 3.40 p. m. | 21.40 |
| | | | 7.00 p. m. | 20.80 |
| March 4 | 7.20 a. m. | 14.89 | 7.00 a. m. | 18.40 |
| | 1.15 p. m. | 13.74 | 12.00 a. m. | 17.30 |
| | 3.15 p. m. | 13.34 | 3.25 p. m. | 16.60 |
| | 5.00 p. m. | 12.99 | 5.30 p. m. | 16.30 |
| March 5 | 7.45 a. m. | 10.19 | 7.00 a. m. | 13.65 |
| | 5.00 p. m. | 8.49 | 4.30 p. m. | 11.95 |
| March 6 | 7.55 a. m. | 6.79 | 7.30 a. m. | 10.25 |
| | 4.45 p. m. | 6.24 | | |

*Discharge measurements of Susquehanna River at Binghamton, N. Y.*

| Date. | Hydrographer. | Gage height.[a] | Discharge. |
|---|---|---|---|
| 1901. | | *Feet.* | *Sec.-ft.* |
| July 30 | E. C. Murphy | 1.99 | 608 |
| August 20 | do | 2.09 | 942 |
| Do | do | 2.10 | 689 |
| July 3 | do | 2.12 | 947 |
| July 10 | do | 2.35 | 1,425 |
| August 23 | do | 2.64 | 2,176 |
| August 22 | do | 2.94 | 2,983 |
| Do | do | 3.23 | 3,752 |
| August 21 | do | 4.64 | 7,244 |
| 1902. | | | |
| August 16 | E. C. Murphy | 2.50 | 1,920 |
| August 15 | do | 2.61 | 2,105 |
| July 14 | do | 2.96 | 3,064 |
| July 4 | do | 3.90 | 5,230 |
| July 2 | do | 4.08 | 5,839 |
| August 4 | do | 4.59 | 6,902 |
| August 3 | do | 5.08 | 8,633 |

[a] All gage readings reduced to original gage (No. 1). Datum = 76.29.

*Daily gage height, in feet, of Susquehanna River at Binghamton, N. Y.*[a]

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901. | | | | | | | | | | | | |
| 1 | | | | | | | | 1.87½ | 2.25 | 2.75 | 2.6 | 3.05 |
| 2 | | | | | | | | 2.0 | 2.2 | 2.75 | 2.57 | 3.05 |
| 3 | | | | | | | | 1.95 | 2.2 | 2.72½ | 2.5 | 3.2 |
| 4 | | | | | | | | 1.9 | 2.25 | 2.72½ | 2.5 | 3.12 |
| 5 | | | | | | | | 1.9 | 2.22½ | 2.7 | 2.52 | 3.2 |
| 6 | | | | | | | | 1.9 | 2.2 | 2.62½ | 2.5 | 3.0 |
| 7 | | | | | | | | 1.9 | 2.1 | 2.6 | 2.5 | 2.88 |
| 8 | | | | | | | | 1.95 | 2.07½ | 2.55 | 2.5 | 2.9 |
| 9 | | | | | | | | 1.95 | 2.07½ | 2.6 | 2.47 | 3.0 |
| 10 | | | | | | | | 1.9 | 2.0 | 2.55 | 2.5 | 5.76 |
| 11 | | | | | | | | 1.97½ | 2.02½ | 2.57½ | 2.47 | 6.68 |
| 12 | | | | | | | | 1.97½ | 2.1 | 2.52½ | 2.52 | 5.88 |
| 13 | | | | | | | | 1.95 | 2.07½ | 2.55 | 3.05 | ------ |
| 14 | | | | | | | | 2.0 | 2.05 | 2.62½ | 3.52 | 5.18 |
| 15 | | | | | | | | 1.97½ | 2.12½ | 2.7 | 3.35 | 15.42 |
| 16 | | | | | | | | 1.97½ | 2.2 | 2.87½ | 3.10 | 14.3 |
| 17 | | | | | | | | 2.0 | 2.25 | 2.95 | 3.0 | 9.8 |
| 18 | | | | | | | | 2.15 | 2.4 | ------ | 2.98 | 6.22 |
| 19 | | | | | | | | 2.2 | 2.4 | 2.82½ | 2.92 | 4.85 |
| 20 | | | | | | | | 2.1 | 2.37½ | 2.8 | 2.95 | 3.05 |
| 21 | | | | | | | | 3.7 | 2.27½ | 2.8 | 2.95 | 3.52 |
| 22 | | | | | | | | 3.02½ | 2.2 | 2.82½ | 2.88 | 3.32 |
| 23 | | | | | | | | 2.65 | 2.1 | 2.8 | 2.85 | 4.3 |
| 24 | | | | | | | | 4.55 | 2.1 | 2.75 | 3.28 | 5.22 |
| 25 | | | | | | | | 3.9 | 2.1 | 2.7 | 3.98 | 4.52 |
| 26 | | | | | | | | 3.25 | 2.07½ | 2.65 | 3.5 | 3.88 |
| 27 | | | | | | | | 2.82½ | 2.3 | 2.62½ | 3.08 | 3.88 |
| 28 | | | | | | | | 2.5 | ------ | 2.62½ | 2.8 | 3.42 |
| 29 | | | | | | | | 2.4 | 2.57½ | 2.6 | 2.9 | 3.45 |
| 30 | | | | | | | | 2.3 | 2.6 | 2.6 | 2.95 | 3.25 |
| 31 | | | | | | | 1.95 | 2.35 | ------ | 2.12½ | ------ | 4.62 |

[a] Means of actual readings of gage. Datum as follows:

| | |
|---|---|
| July 31, 1901, to September 26, 1901 | 76.29 |
| September 27, 1901, to March 27, 1902 | 75.88 |
| After March 27, 1902 | 75.65 |

*Mean daily gage height, in feet, of Susquehanna River at Binghamton, N. Y.*—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 3.78 | 3.10 | 16.10 | 5.95 | 3.60 | 3.10 | 5.85 | 5.65 | 2.88 | 5.33 | 5.35 | 3.50 |
| 2 | 3.95 | 3.10 | 19.39 | 5.85 | 3.60 | 3.13 | 4.98 | 6.68 | 2.88 | 5.00 | 4.83 | 3.48 |
| 3 | 3.78 | 3.13 | 18.39 | 5.60 | 3.50 | 3.05 | 4.35 | 6.02 | 2.88 | 4.43 | 4.45 | 3.60 |
| 4 | 4.13 | 3.80 | 14.26 | 5.30 | 3.40 | 3.38 | 4.63 | 5.25 | 2.90 | 4.10 | 4.23 | 3.85 |
| 5 | 3.78 | 3.53 | 9.75 | 4.95 | 3.40 | 3.83 | 4.18 | 4.53 | 2.88 | 3.65 | 4.03 | 4.08 |
| 6 | 3.70 | 3.23 | 6.92 | 4.80 | 3.43 | 3.60 | 4.73 | 4.20 | 2.83 | 3.68 | 3.88 | 3.93 |
| 7 | 3.58 | 3.28 | 6.15 | 4.65 | 3.33 | 3.38 | 5.18 | 4.13 | 2.80 | 3.58 | 3.83 | 3.68 |
| 8 | 3.38 | 3.30 | 5.90 | 4.58 | 3.28 | 3.33 | 5.10 | 3.85 | 2.85 | 3.53 | 3.75 | 3.53 |
| 9 | 3.23 | 3.35 | 5.60 | 5.50 | 3.20 | 3.40 | 4.75 | 3.73 | 2.83 | 3.50 | 3.58 | 3.48 |
| 10 | 3.10 | 3.28 | 6.30 | 6.15 | 3.20 | 3.35 | 4.78 | 3.58 | 3.00 | 3.43 | 3.53 | 3.60 |
| 11 | 3.08 | 3.40 | 6.15 | 6.45 | 3.10 | 3.23 | 5.53 | 3.48 | 3.00 | 3.30 | 3.45 | 3.58 |
| 12 | 3.25 | 3.20 | 8.37 | 6.20 | 3.08 | 3.23 | 5.13 | 3.50 | 3.00 | 3.43 | 3.40 | 3.70 |
| 13 | 3.13 | 2.98 | 11.75 | 5.78 | 3.05 | 3.33 | 4.18 | 3.55 | 2.98 | 3.53 | 3.40 | 3.58 |
| 14 | 3.03 | 2.90 | 12.50 | 5.45 | 3.05 | 3.33 | 3.53 | 3.50 | 2.90 | 3.65 | 3.50 | 3.43 |
| 15 | 2.90 | 2.80 | 11.17 | 5.10 | 3.03 | 3.40 | 3.50 | 3.35 | 2.90 | 3.65 | 3.43 | 3.50 |
| 16 | 2.88 | 2.88 | 8.98 | 4.73 | 3.00 | 3.40 | 3.45 | 3.24 | 2.85 | 3.63 | 3.30 | 3.69 |
| 17 | 2.80 | 2.75 | 18.57 | 4.45 | 3.00 | 3.28 | 3.38 | 3.15 | 2.80 | 3.50 | 3.30 | 7.89 |
| 18 | 2.78 | 2.70 | 12.43 | 4.28 | 2.90 | 3.30 | 3.40 | 3.10 | 2.80 | 3.35 | 3.28 | 8.40 |
| 19 | 2.98 | 2.73 | 10.02 | 4.13 | 2.90 | 3.25 | 3.40 | 3.05 | 2.80 | 3.25 | 3.23 | 7.45 |
| 20 | 3.20 | 2.73 | 7.38 | 3.93 | 2.90 | 3.25 | 7.53 | 3.05 | 2.75 | 3.35 | 3.25 | 6.63 |
| 21 | 2.70 | 2.75 | 6.27 | 3.83 | 3.00 | 3.20 | 11.80 | 3.10 | 2.70 | 3.50 | 3.20 | 6.03 |
| 22 | 3.13 | 2.68 | 6.05 | 3.73 | 3.08 | 3.23 | 12.10 | 3.10 | 2.70 | 3.48 | 3.20 | 10.20 |
| 23 | 5.33 | 2.88 | 6.17 | 3.60 | 3.10 | 3.33 | 10.75 | 3.03 | 2.75 | 3.33 | 3.23 | 11.37 |
| 24 | 5.73 | 2.85 | 6.32 | 3.43 | 3.00 | 3.25 | 9.65 | 3.03 | 2.73 | 3.28 | 3.20 | 8.95 |
| 25 | 4.78 | 2.73 | 6.00 | 3.38 | 2.95 | 3.13 | 8.85 | 3.00 | 2.75 | 3.28 | 3.23 | 7.03 |
| 26 | 3.95 | 2.68 | 5.47 | 3.30 | 3.13 | 3.03 | 7.12 | 3.00 | 3.10 | 3.25 | 3.28 | 6.38 |
| 27 | 3.70 | 2.98 | 5.12 | 3.25 | 3.30 | 3.13 | 6.15 | 2.95 | 3.38 | 3.20 | 3.45 | 5.73 |
| 28 | 4.23 | 5.50 | 5.00 | 3.28 | 3.28 | 3.13 | 8.27 | 3.00 | 3.30 | 7.10 | 3.60 | 5.23 |
| 29 | 4.58 | ..... | 6.05 | 3.28 | 3.23 | 3.60 | 6.60 | 3.03 | 5.75 | 9.05 | 3.65 | 4.70 |
| 30 | 3.90 | ..... | 6.45 | 3.35 | 3.15 | 3.68 | 5.55 | 3.03 | 4.55 | 7.90 | 3.58 | 4.55 |
| 31 | 3.43 | ..... | 6.27 | ..... | 3.10 | ..... | 6.15 | 2.93 | ..... | 6.28 | ..... | 4.38 |

## NORTH BRANCH OF SUSQUEHANNA RIVER AT WILKESBARRE, PA.

Observations of fluctuations of Susquehanna River are made by the Weather Bureau above Wilkesbarre, at Towanda, Pa., where the drainage area is estimated to be 8,000 square miles. The river gage, made of iron 1 foot wide and one-half inch thick, is on the east side of the road bridge over Susquehanna River, and is securely bolted to the masonry of the pier. The graduation is from 0 to 25 feet. The highest water was 29 feet in March, 1869, and the lowest, —0.1, in October, 1895. The danger line is at 16 feet. The elevation of the zero is 633.7 feet.

The Wilkesbarre station was established by E. G. Paul on March 30, 1899, and is located at the Market street bridge. The gage is a sash chain and weight inclosed in a long, narrow box, covering 12 feet of the scale board. The scale board is divided into feet and tenths

and painted the color of the ironwork. The length of the chain from zero to extreme end of weight is 40.83 feet. The initial point of sounding is at the end of the iron guard rail on the left bank. The channel is straight for a quarter of a mile above and below the station, the current sluggish but unobstructed. The right bank is low and liable to overflow; the left bank is above ordinary floods. The bed of the stream is of sand and gravel, somewhat shifting. The observer is W. S. Bennett, Wilkesbarre, Pa. When this gage was established there was found to be a gage painted on the bridge pier, being a portion of one established by the Weather Bureau. The lower part of this gage, erected in January, 1898, originally consisted of heavy cast-brass plates graduated to feet and tenths. The gage plates were made in 4-foot sections and bolted to the stone bridge pier. The two lower sections of the brass plates had been torn away by ice, so that there was no graduation below the 8-foot mark, but readings were made by the figures painted on the stone pier. The zero of this old gage is at the base of the dressed-stone portion of the pier, and is reported to be 535 feet above sea level. During low stages of the river the water recedes from the pier, rendering it impracticable to read the gage. So far as could be ascertained, this has not been connected with the city datum. On account of the low water, which in 1897 had gone below the city datum, it was decided to put the zero of the new gage 4 feet below the zero of the old Weather Bureau gage, so as to obviate minus readings. In order, therefore, to compare with former records, it is necessary to add 4 feet to the old figures. The danger mark of this Weather Bureau gage is at 14 feet, or 18 feet of new gage, as at this elevation the west bank of the river is under water in places. River reports from this locality were furnished as early as 1888. During low water, measurements were made by wading at a better cross section, at Retreat, 10 miles below Wilkesbarre. A bench mark was established September 26, 1900, being the extreme west end of the stone doorsill of the north entrance to the Coal Exchange Building, at 32.99 feet above datum of the gage. During 1902 measurements of discharge were made by Mr. Paul, as follows:

September 20: Gage height, 3.1 feet; discharge, 2,170 second-feet.

*Daily gage height, in feet, of North Branch Susquehanna River at Wilkesbarre, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 14.00 | 12.70 | 29.57 | 9.70 | 5.00 | 4.10 | 10.60 | 8.80 | 3.60 | 9.60 | 9.50 | 5.10 |
| 2 | 13.00 | 11.40 | 30.75 | 9.20 | 4.90 | 4.00 | 10.50 | 9.50 | 3.50 | 10.80 | 8.20 | 5.00 |
| 3 | 12.10 | 10.80 | 30.05 | 9.00 | 5.10 | 3.90 | 8.30 | 11.10 | 3.40 | 10.60 | 7.40 | 5.00 |
| 4 | 10.90 | 10.70 | 25.25 | 8.50 | 5.10 | 3.90 | 7.80 | 9.60 | 3.40 | 8.50 | 6.80 | 5.20 |
| 5 | 9.60 | 8.50 | 20.20 | 8.10 | 4.80 | 3.80 | 8.50 | 8.80 | 3.20 | 7.30 | 6.40 | 5.50 |
| 6 | 9.90 | 7.00 | 14.65 | 7.90 | 4.80 | 3.80 | 8.26 | 7.50 | 3.20 | 7.10 | 6.00 | 5.90 |
| 7 | 9.80 | 9.10 | 11.65 | 7.60 | 4.70 | 4.80 | 12.70 | 6.80 | 3.20 | 6.90 | 5.80 | 5.80 |
| 8 | 9.60 | 9.80 | 10.70 | 7.70 | 4.70 | 4.50 | 14.20 | 6.50 | 3.20 | 6.70 | 5.50 | 5.50 |
| 9 | 9.70 | 9.60 | 10.30 | 11.85 | 4.50 | 4.40 | 13.15 | 6.20 | 3.20 | 6.20 | 5.60 | 5.20 |
| 10 | 9.40 | 9.40 | 11.00 | 15.80 | 4.40 | 4.20 | 8.75 | 5.80 | 3.20 | 5.80 | 5.70 | 5.90 |
| 11 | 9.20 | 9.00 | 12.50 | 15.45 | 4.30 | 4.20 | 9.00 | 5.60 | 3.60 | 5.50 | 5.00 | 7.20 |
| 12 | 9.00 | 9.00 | 14.80 | 12.80 | 4.20 | 4.20 | 9.70 | 5.50 | 3.50 | 5.80 | 4.70 | 8.00 |
| 13 | 8.20 | 9.00 | 18.00 | 14.40 | 4.10 | 4.10 | 8.50 | 5.40 | 3.60 | 6.50 | 4.70 | 9.85 |
| 14 | 7.20 | 8.30 | 19.60 | 10.30 | 4.00 | 4.20 | 7.40 | 5.40 | 3.50 | 6.00 | 4.70 | 10.20 |
| 15 | 6.40 | 8.00 | 18.20 | 9.40 | 3.90 | 4.20 | 6.30 | 5.20 | 3.50 | 5.80 | 4.70 | 9.20 |
| 16 | 6.80 | 8.20 | 15.80 | 8.60 | 3.80 | 4.20 | 5.80 | 5.00 | 3.40 | 5.90 | 4.60 | 10.70 |
| 17 | 7.20 | 7.80 | 18.50 | 8.00 | 3.80 | 5.00 | 5.40 | 4.60 | 3.30 | 5.90 | 4.50 | 13.45 |
| 18 | 7.00 | 7.70 | 20.20 | 7.40 | 3.70 | 4.70 | 5.20 | 4.40 | 3.30 | 5.60 | 4.40 | 12.70 |
| 19 | 6.70 | 7.20 | 17.45 | 7.00 | 3.70 | 4.40 | 5.10 | 4.20 | 3.20 | 5.30 | 4.30 | 12.40 |
| 20 | 6.10 | 6.60 | 14.30 | 6.70 | 3.60 | 4.60 | 5.40 | 4.10 | 3.10 | 4.90 | 4.20 | 11.30 |
| 21 | 6.20 | 6.60 | 11.60 | 6.40 | 3.50 | 4.30 | 12.10 | 4.00 | 3.10 | 4.80 | 4.20 | 10.00 |
| 22 | 10.60 | 6.50 | 10.20 | 6.20 | 3.50 | 4.30 | 15.90 | 4.00 | 3.00 | 4.90 | 4.20 | 15.60 |
| 23 | 16.70 | 6.40 | 9.70 | 6.00 | 3.50 | 4.20 | 13.90 | 4.00 | 3.00 | 5.20 | 4.10 | 17.65 |
| 24 | 12.20 | 7.20 | 9.60 | 5.70 | 3.70 | 4.20 | 13.45 | 3.90 | 3.00 | 5.00 | 4.10 | 16.35 |
| 25 | 10.70 | 7.20 | 9.50 | 5.50 | 3.70 | 4.20 | 13.85 | 3.90 | 3.00 | 4.70 | 4.10 | 13.70 |
| 26 | 9.70 | 7.70 | 9.00 | 5.20 | 3.70 | 4.20 | 14.90 | 3.80 | 4.20 | 4.70 | 4.10 | 11.00 |
| 27 | 8.90 | 8.80 | 8.50 | 5.00 | 3.80 | 4.10 | 11.70 | 3.70 | 7.10 | 4.60 | 4.50 | 9.70 |
| 28 | 8.20 | 14.03 | 8.00 | 4.80 | 3.90 | 3.90 | 9.70 | 3.60 | 6.00 | 7.62 | 4.70 | 8.50 |
| 29 | 7.70 | ..... | 9.00 | 4.70 | 4.60 | 3.80 | 10.80 | 3.60 | 7.90 | 11.05 | 5.00 | 8.00 |
| 30 | 7.60 | ..... | 10.40 | 4.90 | 4.60 | 5.10 | 10.60 | 3.60 | 10.70 | 12.05 | 5.20 | 7.00 |
| 31 | 13.30 | ..... | 9.80 | ..... | 4.20 | ..... | 9.30 | 3.60 | ..... | 11.10 | ..... | 6.80 |

*Rating table for North Branch of Susquehanna River at Wilkesbarre, Pa., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 2.2 | 1,000 | 4.6 | 4,340 | 7.0 | 13,600 | 13.0 | 47,200 |
| 2.4 | 1,200 | 4.8 | 4,760 | 7.5 | 16,400 | 13.5 | 50,000 |
| 2.6 | 1,400 | 5.0 | 5,200 | 8.0 | 19,200 | 14.0 | 52,800 |
| 2.8 | 1,600 | 5.2 | 5,700 | 8.5 | 22,000 | 14.5 | 55,600 |
| 3.0 | 1,860 | 5.4 | 6,250 | 9.0 | 24,800 | 15.0 | 58,400 |
| 3.2 | 2,120 | 5.6 | 6,850 | 9.5 | 27,600 | 15.5 | 61,200 |
| 3.4 | 2,400 | 5.8 | 7,560 | 10.0 | 30,400 | 16.0 | 64,000 |
| 3.6 | 2,700 | 6.0 | 8,340 | 10.5 | 33,200 | 16.5 | 66,800 |
| 3.8 | 3,000 | 6.2 | 9,240 | 11.0 | 36,000 | 17.0 | 69,600 |
| 4.0 | 3,300 | 6.4 | 10,260 | 11.5 | 38,800 | ..... | ..... |
| 4.2 | 3,600 | 6.6 | 11,360 | 12.0 | 41,600 | ..... | ..... |
| 4.4 | 3,940 | 6.8 | 12,480 | 12.5 | 44,400 | ..... | ..... |

*Estimated monthly discharge of North Branch Susquehanna River at Wilkesbarre, Pa.*

[Drainage area, 9,810 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 67,920 | 8,770 | 27,123 | 2.76 | 3.19 |
| February | 52,968 | 10,260 | 23,247 | 2.37 | 2.47 |
| March | 146,768 | 19,200 | 59,086 | 6.02 | 6.94 |
| April | 62,880 | 4,540 | 21,633 | 2.21 | 2.47 |
| May | 5,450 | 2,550 | 3,679 | .37 | .43 |
| June | 5,950 | 3,000 | 3,732 | .38 | .42 |
| July | 63,440 | 5,450 | 30,088 | 3.07 | 3.54 |
| August | 36,560 | 2,700 | 9,069 | .92 | 1.06 |
| September | 34,320 | 1,860 | 4,511 | .46 | .51 |
| October | 41,880 | 4,340 | 13,878 | 1.41 | 1.63 |
| November | 27,600 | 3,450 | 6,890 | .70 | .78 |
| December | 73,240 | 5,200 | 26,138 | 2.66 | 3.07 |
| The year | 146,768 | 1,860 | 19,090 | 1.94 | 26.51 |

NORTH BRANCH OF SUSQUEHANNA RIVER AT DANVILLE, PA.

This station, 52 miles below Wilkesbarre and 11 miles above the mouth of the West Branch, was established on March 25, 1899, by E. G. Paul. It is located at the Mill street bridge, 600 feet south of the public square, Danville, Pa. The equipment consists of a standard chain and weight gage referred to a horizontal scale board graduated to feet and tenths, inclosed in a lock box bolted to the hand rail on the lower side of the bridge, 200 feet from the right bank. The length of the chain from the zero to the extreme end of the weight is 42.85 feet. The initial point of soundings is at the end of the wooden hand rail on right bank. The channel is straight for half a mile above and below the station. The left bank is high, but the right bank is subject to overflow. The bed of the stream is rocky, with some gravel, and is unchangeable. A bench mark was established, being the extreme south end of the stone doorsill at the east entrance of the city filtering plant, at 31.7 feet above datum of the gage. During 1902 two measurements were made by Mr. Paul, as follows:

April 22: Gage height, 5.25 feet; discharge, 14,393 second-feet.
September 19: Gage height, 2.75 feet; discharge, 3,115 second-feet.

*Daily gage height, in feet, of North Branch of Susquehanna River at Danville, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 6.60 | 4.85 | 20.67 | 7.85 | 4.40 | 3.50 | 6.10 | 7.70 | 3.10 | 8.95 | 7.05 | 4.30 |
| 2 | 6.20 | 5.05 | 24.43 | 7.60 | 4.30 | 3.40 | 8.95 | 7.75 | 3.00 | 9.15 | 6.36 | 4.20 |
| 3 | 5.40 | (a) | 26.07 | 7.49 | 4.20 | 3.30 | 7.40 | 8.70 | 3.00 | 9.05 | 5.80 | 4.20 |
| 4 | 5.50 | ..... | 22.25 | 7.10 | 4.20 | 3.30 | 6.90 | 8.20 | 2.90 | 7.65 | 5.45 | 4.60 |
| 5 | 6.70 | ..... | 18.20 | 6.65 | 4.20 | 3.30 | 6.90 | 7.20 | 2.90 | 6.75 | 5.20 | 4.70 |
| 6 | (a) | ..... | 14.50 | 6.45 | 4.10 | 3.20 | 6.90 | 6.75 | 2.80 | 6.80 | 5.00 | 4.90 |
| 7 | ..... | ..... | 10.75 | 6.30 | 4.00 | 3.20 | 8.50 | 5.85 | 2.80 | 6.50 | 4.85 | 4.90 |
| 8 | ..... | ..... | 8.55 | 6.50 | 4.00 | 3.90 | 11.90 | 5.45 | 2.80 | 6.10 | 4.70 | 4.80 |
| 9 | 10.60 | ..... | 8.35 | 7.30 | 3.90 | 3.70 | 10.45 | 5.20 | 2.70 | 5.60 | 4.70 | 4.70 |
| 10 | 9.45 | ..... | 9.10 | 11.90 | 3.80 | 3.50 | 7.85 | 5.00 | 2.90 | 5.20 | 4.50 | 4.30 |
| 11 | 9.10 | ..... | 10.25 | 13.10 | 3.80 | 3.50 | 7.25 | 4.70 | 3.00 | 4.90 | 4.30 | 4.20 |
| 12 | 9.30 | ..... | 11.55 | 11.20 | 3.70 | 3.60 | 7.80 | 4.60 | 3.10 | 5.40 | 4.20 | 4.30 |
| 13 | (a) | ..... | 14.15 | 9.75 | 3.60 | 3.50 | 7.90 | 4.50 | 3.00 | 6.00 | 4.10 | 4.40 |
| 14 | ..... | ..... | 16.15 | 8.65 | 3.50 | 3.50 | 7.20 | 4.50 | 3.10 | 5.60 | 4.00 | 5.00 |
| 15 | ..... | ..... | 15.55 | 7.70 | 3.50 | 3.60 | 5.55 | 4.40 | 3.10 | 5.25 | 3.90 | 6.50 |
| 16 | ..... | ..... | 13.95 | 7.05 | 3.40 | 3.60 | 5.15 | 4.30 | 3.00 | 5.10 | 3.90 | 7.80 |
| 17 | ..... | ..... | 14.25 | 6.60 | 3.30 | 3.70 | 4.85 | 4.10 | 2.90 | 5.10 | 3.90 | 9.40 |
| 18 | ..... | ..... | 16.60 | 6.35 | 3.30 | 4.10 | 4.60 | 3.80 | 2.80 | 5.00 | 3.80 | 10.30 |
| 19 | ..... | ..... | 15.60 | 6.15 | 3.20 | 4.00 | 4.40 | 3.70 | 2.70 | 4.70 | 3.70 | 10.60 |
| 20 | ..... | ..... | 12.80 | 5.90 | 3.10 | 3.80 | 4.40 | 3.60 | 2.60 | 4.50 | 3.60 | 9.40 |
| 21 | ..... | ..... | 10.95 | 5.45 | 3.10 | 3.80 | 5.30 | 3.50 | 2.60 | 4.20 | 3.60 | 8.80 |
| 22 | 16.30 | ..... | 8.90 | 5.30 | 3.10 | 3.70 | 11.90 | 3.50 | 2.60 | 4.10 | 3.60 | 12.70 |
| 23 | 8.10 | ..... | 8.00 | 5.10 | 3.00 | 3.60 | 12.00 | 3.40 | 2.60 | 4.20 | 3.50 | 14.80 |
| 24 | 9.45 | ..... | 6.40 | 4.90 | 3.00 | 3.50 | 11.30 | 3.40 | 2.50 | 4.30 | 3.50 | 14.40 |
| 25 | 8.50 | ..... | 7.20 | 4.70 | 3.20 | 3.50 | 10.90 | 3.40 | 2.60 | 4.20 | 3.50 | 11.80 |
| 26 | 7.40 | ..... | 7.10 | 4.50 | 3.30 | 3.60 | 11.90 | 3.30 | 4.75 | 4.00 | 3.60 | 9.75 |
| 27 | 6.90 | ..... | 7.05 | 4.30 | 3.20 | 3.70 | 10.20 | 3.20 | 6.85 | 5.60 | 3.80 | 8.40 |
| 28 | 6.75 | 13.75 | 6.65 | 4.10 | 3.30 | 3.70 | 8.30 | 3.20 | 6.20 | 8.90 | 3.90 | 7.60 |
| 29 | 6.40 | ..... | 6.75 | 4.00 | 3.50 | 3.50 | 8.00 | 3.20 | 6.05 | 9.70 | 4.00 | 6.80 |
| 30 | 6.20 | ..... | 8.15 | 4.30 | 3.80 | 4.20 | 9.30 | 3.10 | 7.95 | 9.35 | 4.20 | 6.30 |
| 31 | 5.55 | ..... | 8.30 | ..... | 3.70 | ..... | 8.20 | 3.10 | ..... | 8.20 | ..... | 5.70 |

[a] Frozen January 6 to 8, 13 to 21, and February 3 to 27.

*Rating table for North Branch of Susquehanna River at Danville, Pa., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 1.6 | 825 | 4.8 | 11,500 | 8.0 | 33,200 | 16.0 | 90,800 |
| 1.8 | 1,100 | 5.0 | 12,550 | 8.5 | 36,800 | 16.5 | 94,400 |
| 2.0 | 1,400 | 5.2 | 13,720 | 9.0 | 40,400 | 17.0 | 98,000 |
| 2.2 | 1,800 | 5.4 | 14,900 | 9.5 | 44,000 | 17.5 | 101,600 |
| 2.4 | 2,250 | 5.6 | 16,100 | 10.0 | 47,600 | 18.0 | 105,200 |
| 2.6 | 2,750 | 5.8 | 17,390 | 10.5 | 51,200 | 18.5 | 108,800 |
| 2.8 | 3,300 | 6.0 | 18,800 | 11.0 | 54,800 | 19.0 | 112,400 |
| 3.0 | 3,900 | 6.2 | 20,240 | 11.5 | 58,400 | 19.5 | 116,000 |
| 3.2 | 4,550 | 6.4 | 21,680 | 12.0 | 62,000 | 20.0 | 119,600 |
| 3.4 | 5,250 | 6.6 | 23,120 | 12.5 | 65,600 | 20.5 | 123,200 |
| 3.6 | 6,000 | 6.8 | 24,560 | 13.0 | 69,200 | 21.0 | 126,800 |
| 3.8 | 6,800 | 7.0 | 26,000 | 13.5 | 72,800 | 21.5 | 130,400 |
| 4.0 | 7,650 | 7.2 | 27,440 | 14.0 | 76,400 | 22.0 | 134,000 |
| 4.2 | 8,575 | 7.4 | 28,880 | 14.5 | 80,000 | ..... | ..... |
| 4.4 | 9,525 | 7.6 | 30,320 | 15.0 | 83,600 | ..... | ..... |
| 4.6 | 10,500 | 7.8 | 31,760 | 15.5 | 87,200 | ..... | ..... |

*Estimated monthly discharge of North Branch of Susquehanna River, at Danville, Pa.*

[Drainage area, 11,070 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January [a] | ..... | ..... | [b] 32,645 | [b] 2.95 | [b] 2.08 |
| February [a] | ..... | ..... | ..... | ..... | ..... |
| March | 163,160 | 23,480 | 66,215 | 5.98 | 6.89 |
| April | 69,920 | 7,650 | 25,183 | 2.27 | 2.53 |
| May | 9,525 | 3,900 | 6,123 | .55 | .63 |
| June | 8,575 | 4,550 | 6,032 | .54 | .60 |
| July | 62,000 | 9,525 | 33,550 | 3.03 | 3.49 |
| August | 38,240 | 4,200 | 12,498 | 1.13 | 1.30 |
| September | 32,840 | 2,500 | 6,485 | .59 | .66 |
| October | 45,440 | 7,650 | 20,594 | 1.86 | 2.14 |
| November | 26,360 | 5,600 | 9,638 | .87 | .97 |
| December | 82,160 | 8,575 | 28,637 | 2.59 | 2.99 |

[a] Frozen, and no record for January 6 to 8, 13 to 21, and February 3 to 27.
[b] Partial month; 19 days.

WEST BRANCH OF SUSQUEHANNA RIVER AT WILLIAMSPORT, PA.

Observations of the water height on the West Branch have been made for several years from the Market street bridge. Bench mark and datum for observer's gage were established March 1, 1895, under the direction of Mr. George D. Snyder, city engineer, and since that time daily gage heights have been observed. F. A. Snyder, the present city engineer, supplies this office with daily gage-height reports. On August 16, 1901, a discharge measurement was made, and a United States Geological Survey standard chain gage was installed on the upper side of the bridge, for convenience in making the daily observations. The length of the chain from the zero to the extreme end of the weight is 42.29 feet. A bench mark cut in the face of the left bank abutment is 10 feet above the datum of the gage.

The following discharge measurements were made during 1902 by E. G. Paul:

April 20: Gage height, 3.9 feet; discharge, 9,318 second-feet.
September 18: Gage height, 0.41 feet; discharge, 1,006 second-feet.

*Daily gage height, in feet, of West Branch of Susquehanna River at Williamsport, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 3.20 | 4.30 | 20.38 | 6.00 | 2.50 | 1.30 | 8.30 | 5.00 | 0.50 | 2.70 | 1.90 | 1.00 |
| 2 | 2.90 | 4.20 | 21.10 | 5.70 | 2.50 | 1.20 | 7.40 | 4.90 | .60 | 4.10 | 1.70 | 1.30 |
| 3 | 2.60 | 5.00 | 16.45 | 5.30 | 2.40 | 1.20 | 6.40 | 4.60 | .50 | 3.10 | 1.60 | 1.50 |
| 4 | 2.50 | 4.70 | 13.00 | 4.90 | 2.70 | 1.10 | 9.70 | 4.30 | .50 | 2.50 | 1.50 | 2.20 |
| 5 | 2.40 | 4.50 | 10.00 | 4.50 | 2.70 | 1.10 | 10.80 | 3.80 | .50 | 2.40 | 1.40 | 2.40 |
| 6 | 2.30 | 4.00 | 8.10 | 4.30 | 2.90 | 1.30 | 8.60 | 3.30 | .40 | 2.30 | 1.40 | 2.50 |
| 7 | 2.30 | 3.90 | 6.80 | 4.50 | 2.90 | 1.20 | 8.80 | 3.10 | .40 | 2.20 | 1.30 | 2.30 |
| 8 | 2.30 | 3.70 | 5.90 | 4.70 | 3.20 | 1.20 | 7.30 | 3.00 | .40 | 2.20 | 1.40 | 2.30 |
| 9 | 2.40 | 3.60 | 5.30 | 13.30 | 3.40 | 1.10 | 6.30 | 2.80 | .40 | 2.00 | 1.40 | 2.80 |
| 10 | 2.40 | 3.40 | 5.50 | 16.60 | 3.20 | 1.00 | 6.00 | 2.60 | .60 | 1.80 | 1.30 | 1.90 |
| 11 | 2.40 | 3.30 | 6.30 | 12.90 | 3.00 | 1.10 | 7.70 | 2.40 | .50 | 1.60 | 1.30 | 2.00 |
| 12 | 2.40 | 3.00 | 7.10 | 10.30 | 2.80 | 1.10 | 7.20 | 2.20 | .50 | 1.40 | 1.20 | 2.30 |
| 13 | 2.40 | 2.90 | 9.60 | 8.40 | 2.60 | 1.30 | 6.30 | 2.50 | .60 | 1.20 | 1.20 | 3.10 |
| 14 | 2.30 | 3.00 | 12.20 | 7.30 | 2.50 | 1.40 | 5.00 | 2.10 | .50 | 1.00 | 1.10 | 4.40 |
| 15 | 2.10 | 2.60 | 10.80 | 6.30 | 2.40 | 1.60 | 4.20 | 1.90 | .40 | 1.20 | 1.00 | 3.60 |
| 16 | 2.10 | 2.30 | 8.40 | 5.50 | 2.20 | 1.80 | 3.60 | 1.80 | .40 | 1.30 | 1.00 | 3.00 |
| 17 | 2.00 | 2.10 | 13.80 | 5.00 | 2.00 | 1.90 | 3.10 | 1.60 | .40 | 1.60 | .90 | 5.80 |
| 18 | 2.00 | 2.10 | 12.70 | 4.70 | 1.90 | 2.00 | 3.30 | 1.50 | .40 | 1.50 | .90 | 8.10 |
| 19 | 1.80 | 2.50 | 10.00 | 4.30 | 1.80 | 2.00 | 3.70 | 1.40 | .30 | 1.40 | .90 | 6.40 |
| 20 | 1.60 | 2.20 | 8.10 | 3.90 | 1.70 | 1.80 | 4.40 | 1.30 | .20 | 1.30 | .80 | 5.30 |
| 21 | 2.00 | 1.90 | 6.80 | 4.40 | 1.70 | 1.80 | 5.80 | 1.20 | .20 | 1.30 | .90 | 5.10 |
| 22 | 5.30 | 2.20 | 6.00 | 3.50 | 1.70 | 1.70 | 6.80 | 1.40 | .20 | 1.20 | .90 | 8.00 |
| 23 | 6.73 | 1.90 | 5.40 | 3.20 | 1.60 | 1.50 | 6.30 | 1.30 | .20 | 1.10 | .90 | 10.70 |
| 24 | 4.50 | 1.80 | 5.00 | 2.90 | 1.60 | 1.40 | 5.70 | 1.10 | .20 | 1.00 | .90 | 9.10 |
| 25 | 4.50 | 1.80 | 4.50 | 2.80 | 1.60 | a.60 | 5.90 | 1.00 | .50 | 1.00 | 1.00 | 7.20 |
| 26 | 4.00 | 2.00 | 4.20 | 3.30 | 1.60 | 1.50 | 5.80 | .90 | .90 | .90 | 1.10 | 6.00 |
| 27 | 4.10 | 3.10 | 3.90 | 2.50 | 1.70 | 1.90 | 6.10 | .80 | 2.30 | .90 | 1.10 | 5.40 |
| 28 | 4.00 | 10.89 | 3.70 | 2.40 | 1.80 | 2.80 | 5.50 | .40 | 2.60 | 1.30 | 1.10 | 4.10 |
| 29 | 3.90 | ..... | 3.90 | 2.30 | 1.60 | 2.60 | 5.20 | .50 | 2.80 | 1.20 | 1.00 | 4.40 |
| 30 | 4.10 | ..... | 5.60 | 2.50 | 1.50 | 4.30 | 4.50 | .60 | 2.30 | 1.50 | 1.00 | 3.60 |
| 31 | 4.00 | ..... | 6.20 | ..... | 1.40 | ..... | 5.20 | .50 | ..... | 1.70 | ..... | 2.50 |

a Splash on dam.

WEST BRANCH OF SUSQUEHANNA RIVER AT ALLENWOOD, PA.

The West Branch of Susquehanna River rises in Cambria County, Pa., and flows in a general northeasterly direction, meeting the North Branch on the western border of Northumberland County and forming Susquehanna River.

Observations of height of water on the West Branch have been made by the weather bureau at Lockhaven, Pa., 47 miles above Allenwood. The drainage area is given as 3,740 square miles, and the width of river 1,125 feet. The gage is in two sections. The lower section is painted on the side wall of the canal lock, and the upper is on the highway bridge over the river. The elevation of the zero is 555.7 feet. The highest water was 18 feet, on June 1, 1889, and the danger line is at 10 feet.

Below the junction of the North and West Branches of Susquehanna River observations have been made of height of water by the Weather Bureau at Selins Grove, 45 miles above Harrisburg. The drainage area is given as 17,600 square miles. The river at this point is about 1 mile wide, including an island 400 feet wide. The gage is on the west abutment of a railroad bridge.

A gaging station was established on the West Branch by E. G. Paul on March 25, 1899, at Allenwood, Pa., 20 miles above the junction with the North Branch. Measurements are made from the public highway bridge, one-fourth of a mile east of the railroad station at Allenwood. The wire gauge is 42.15 feet from zero to the end of the weight, and is referred to a pine-board scale fastened to ironwork of the bridge and divided into feet and tenths. The initial point of soundings is at the end of the iron guard rail on the right bank. The channel is straight for one-half a mile above and below the station. The current is sluggish, but unobstructed. The banks are low and subject to overflow at time of high water. The bed of the stream is rocky and constant. The observer is Frank L. Allen, a farmer, living 200 feet from the gage. A bench mark was established on September 24, 1900. It consists of a copper bolt set in the capstone of the wing wall on the lower side of the west end of the bridge, and is 33.19 feet above datum of the gage.

This station was discontinued in April, 1902, the station at Williamsport taking its place.

The following discharge measurement was made during 1902, by Mr. Paul:

April, 21: Gage height, 4.4 feet; discharge, 9,896 second-feet.

*Daily gage height, in feet, of West Branch of Susquehanna River at Allenwood, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | Day. | Jan. | Feb. | Mar. | Apr. |
|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | 1902. | | | | |
| 1 | 3.80 | 5.40 | 21.60 | 6.40 | 17 | 3.20 | 4.70 | 12.20 | ..... |
| 2 | 3.80 | 5.20 | 19.40 | 6.50 | 18 | 3.10 | 4.70 | 10.00 | ..... |
| 3 | 3.60 | 4.90 | 15.50 | 6.50 | 19 | 3.10 | 4.70 | 8.60 | ..... |
| 4 | 3.60 | 4.90 | 11.50 | 6.40 | 20 | 3.10 | 4.70 | 7.40 | ..... |
| 5 | 3.50 | 4.90 | 8.20 | 5.80 | 21 | 3.40 | 4.70 | 6.70 | ..... |
| 6 | 3.50 | 4.90 | 6.80 | ..... | 22 | 7.40 | 4.70 | 6.40 | ..... |
| 7 | 3.50 | 4.80 | 6.40 | ..... | 23 | 6.80 | 6.50 | 5.70 | ..... |
| 8 | 3.50 | 4.80 | 5.50 | ..... | 24 | 6.60 | 7.00 | 5.40 | ..... |
| 9 | 3.40 | 4.80 | 4.90 | ..... | 25 | 6.50 | 7.40 | 5.20 | ..... |
| 10 | 3.40 | 4.80 | 6.40 | ..... | 26 | 6.30 | 5.50 | 4.80 | ..... |
| 11 | 3.40 | 4.80 | 7.60 | ..... | 27 | 6.20 | 5.90 | 4.70 | ..... |
| 12 | 3.30 | 4.70 | 8.40 | ..... | 28 | 5.90 | 9.70 | 5.00 | ..... |
| 13 | 3.20 | 4.70 | 10.00 | ..... | 29 | 5.90 | ..... | 5.60 | ..... |
| 14 | 3.20 | 4.60 | 8.90 | ..... | 30 | 5.80 | ..... | 6.10 | ..... |
| 15 | 3.20 | 4.50 | 8.60 | ..... | 31 | 5.40 | ..... | 6.20 | ..... |
| 16 | 3.20 | 4.70 | 8.80 | ..... | | | | | |

## JUNIATA RIVER AT NEWPORT, PA.

Juniata River rises in Center County, Pa., and flows in a general southeasterly direction into Susquehanna River 15 miles above Harrisburg. Its drainage area is mountainous and for the most part covered with forest growth. The station was established at Newport, about 15 miles above its junction with the Susquehanna, on March 21, 1899, by E. G. Paul. It is at the covered wagon bridge, 800 feet east of the public square, Newport, Pa. Equipment consists of a standard chain-and-weight gage referred to a horizontal scale board graduated to feet and tenths inclosed in a lock box attached to the bridge timbers inside of the structure near the right bank. The length of the chain from the zero mark to the extreme end of the weight is 39.54 feet. The initial point of soundings is at the end of the woodwork of the bridge on the right bank. The channel is straight for half a mile above and below the station. The current is swift and unobstructed. The banks are high and not subject to overflow. The bed of the stream is rocky and the section constant. The observer is A. R. Bortel, a laborer living in Newport, Pa., about 800 feet from the gage. The following measurements were made by E. G. Paul during 1902:

April 19: Gage height, 5 feet; discharge, 6,779 second-feet.
September 17: Gage height, 2.84 feet; discharge, 734 second-feet.

*Daily gage height, in feet, of Juniata River at Newport, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 6.40 | 4.20 | 25.30 | 5.80 | 4.00 | 3.20 | 5.40 | 4.40 | 3.00 | 4.90 | 4.00 | 3.00 |
| 2 | 5.60 | 4.20 | 19.50 | 5.70 | 3.80 | 3.20 | 6.30 | 4.00 | 3.00 | 4.90 | 3.80 | 3.60 |
| 3 | 5.00 | 4.60 | 15.50 | 5.40 | 3.80 | 3.20 | 6.10 | 3.50 | 2.90 | 3.50 | 3.70 | 4.30 |
| 4 | 5.40 | 3.90 | 12.00 | 5.30 | 3.90 | 3.20 | 6.40 | 4.00 | 2.90 | 3.50 | 3.60 | 5.30 |
| 5 | 4.30 | 4.50 | 9.30 | 5.00 | 3.90 | 3.20 | 6.70 | 4.00 | 2.90 | 3.50 | 3.60 | 5.50 |
| 6 | 4.20 | 3.60 | 7.10 | 5.00 | 3.90 | 3.20 | 5.60 | 4.00 | 2.90 | 4.00 | 3.50 | 4.90 |
| 7 | 4.20 | 3.60 | 6.50 | 5.20 | 3.90 | 3.20 | 5.40 | 3.80 | 2.90 | 4.00 | 3.40 | 4.50 |
| 8 | 4.20 | 3.70 | 6.00 | 14.65 | 3.90 | 3.10 | 5.00 | 3.80 | 2.90 | 3.80 | 3.30 | 4.50 |
| 9 | 4.10 | 5.10 | 5.50 | 18.50 | 3.90 | 3.10 | 4.50 | 3.80 | 2.90 | 3.50 | 3.40 | 4.20 |
| 10 | 4.10 | 5.80 | 6.20 | 18.50 | 3.90 | 3.10 | 4.80 | 4.00 | 3.10 | 3.40 | 3.40 | 4.40 |
| 11 | 4.10 | 5.80 | 8.40 | 12.50 | 3.70 | 3.10 | 4.60 | 4.60 | 3.10 | 3.40 | 3.40 | 4.20 |
| 12 | 4.00 | 5.70 | 9.50 | 10.00 | 3.50 | 3.10 | 4.00 | 3.90 | 3.00 | 4.60 | 3.30 | 5.30 |
| 13 | 3.90 | 5.00 | 13.30 | 8.10 | 3.50 | 3.20 | 3.90 | 3.80 | 3.00 | 6.40 | 3.20 | 7.70 |
| 14 | 3.90 | 4.50 | 14.10 | 7.00 | 3.30 | 3.30 | 3.90 | 3.60 | 2.90 | 6.00 | 3.20 | 4.80 |
| 15 | 3.70 | 4.30 | 9.60 | 6.50 | 3.30 | 3.30 | 3.80 | 3.30 | 2.90 | 4.70 | 3.30 | 6.40 |
| 16 | 3.50 | 5.10 | 9.00 | 5.50 | 3.30 | 4.30 | 3.60 | 3.40 | 2.90 | 4.40 | 3.20 | 5.80 |
| 17 | 3.80 | 5.10 | 15.30 | 5.00 | 3.40 | 3.80 | 3.60 | 3.40 | 2.90 | 4.00 | 3.20 | 7.70 |
| 18 | 3.80 | 5.10 | 12.50 | 5.00 | 3.40 | 3.90 | 3.60 | 3.30 | 2.90 | 3.80 | 3.20 | 7.00 |
| 19 | 7.50 | 5.10 | 9.50 | 4.90 | 3.40 | 3.50 | 3.60 | 3.30 | 2.80 | 3.80 | 3.20 | 6.40 |
| 20 | 4.00 | 4.90 | 8.00 | 4.70 | 3.40 | 3.30 | 3.50 | 3.20 | 2.90 | 3.50 | 3.20 | 5.70 |
| 21 | 4.00 | 4.80 | 6.50 | 4.60 | 3.40 | 3.40 | 3.60 | 3.10 | 2.90 | 3.40 | 3.20 | 6.20 |
| 22 | 9.50 | 4.80 | 6.00 | 4.50 | 3.40 | 3.10 | 3.70 | 3.20 | 2.80 | 3.30 | 3.20 | 9.50 |
| 23 | 8.20 | 4.90 | 5.50 | 4.40 | 3.40 | 3.10 | 3.60 | 3.10 | 2.80 | 3.40 | 3.20 | 10.80 |
| 24 | 6.20 | 4.40 | 5.50 | 4.30 | 3.40 | 3.10 | 3.50 | 3.30 | 2.80 | 3.30 | 3.20 | 8.60 |
| 25 | 5.00 | 4.50 | 5.10 | 4.20 | 3.40 | 3.10 | 4.10 | 3.20 | 3.00 | 3.20 | 3.20 | 7.40 |
| 26 | 4.60 | 9.00 | 5.00 | 4.10 | 3.40 | 4.00 | 3.80 | 3.20 | 3.30 | 3.20 | 3.30 | 6.30 |
| 27 | 5.70 | 9.90 | 4.80 | 3.80 | 3.60 | 3.80 | 3.50 | 2.90 | 4.20 | 3.20 | 3.50 | 5.80 |
| 28 | 7.50 | 14.90 | 4.50 | 3.80 | 3.40 | 3.90 | 3.50 | 4.30 | 3.60 | 3.80 | 3.70 | 5.30 |
| 29 | 5.60 | ..... | 4.25 | 4.00 | 3.30 | 3.90 | 3.60 | 4.70 | 3.50 | 5.70 | 3.80 | 4.80 |
| 30 | 5.00 | ..... | 5.80 | 4.10 | 3.30 | 4.70 | 4.20 | 3.30 | 3.50 | 5.00 | 3.80 | 4.70 |
| 31 | 4.50 | ..... | 6.00 | ..... | 3.20 | ..... | 4.20 | 2.90 | ..... | 4.40 | ..... | 4.70 |

*Rating table for Juniata River at Newport, Pa., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 2.4 | 150 | 5.0 | 6,500 | 7.6 | 17,420 | 13.5 | 42,200 |
| 2.6 | 350 | 5.2 | 7,340 | 7.8 | 18,260 | 14.0 | 44,300 |
| 2.8 | 600 | 5.4 | 8,180 | 8.0 | 19,100 | 14.5 | 46,400 |
| 3.0 | 1,000 | 5.6 | 9,020 | 8.5 | 21,200 | 15.0 | 48,500 |
| 3.2 | 1,400 | 5.8 | 9,860 | 9.0 | 23,300 | 15.5 | 50,600 |
| 3.4 | 1,820 | 6.0 | 10,700 | 9.5 | 25,400 | 16.0 | 52,700 |
| 3.6 | 2,270 | 6.2 | 11,540 | 10.0 | 27,500 | 16.5 | 54,860 |
| 3.8 | 2,750 | 6.4 | 12,380 | 10.5 | 29,600 | 17.0 | 56,900 |
| 4.0 | 3,250 | 6.6 | 13,220 | 11.0 | 31,700 | 17.5 | 59,000 |
| 4.2 | 3,800 | 6.8 | 14,060 | 11.5 | 33,800 | 18.0 | 61,100 |
| 4.4 | 4,400 | 7.0 | 14,900 | 12.0 | 35,900 | | |
| 4.6 | 5,020 | 7.2 | 15,740 | 12.5 | 38,000 | | |
| 4.8 | 5,720 | 7.4 | 16,580 | 13.0 | 40,100 | | |

*Estimated monthly discharge of Juniata River at Newport, Pa.*

[Drainage area, 3,476 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 25,400 | 2,040 | 7,096 | 2.04 | 2.35 |
| February | 48,080 | 2,270 | 8,486 | 2.44 | 2.54 |
| March | 91,760 | 3,800 | 23,604 | 6.79 | 7.83 |
| April | 63,200 | 2,750 | 13,753 | 3.96 | 4.42 |
| May | 3,250 | 1,400 | 2,194 | .63 | .73 |
| June | 5,360 | 1,200 | 1,929 | .56 | .62 |
| July | 13,640 | 2,040 | 4,801 | 1.38 | 1.59 |
| August | 5,360 | 800 | 2,409 | .69 | .80 |
| September | 3,800 | 600 | 1,092 | .31 | .35 |
| October | 12,380 | 1,400 | 3,743 | 1.08 | 1.25 |
| November | 3,250 | 1,400 | 1,867 | .54 | .60 |
| December | 30,860 | 2,270 | 10,094 | 2.90 | 3.34 |
| The year | 91,760 | 600 | 6,756 | 1.94 | 26.42 |

## SUSQUEHANNA RIVER AT HARRISBURG, PA.

This station was established in 1890 by E. Mather, president of the Harrisburg water board.

Observations of the height of water since this time have been made

at the pump house of the waterworks located in the western part of the city of Harrisburg, Pa., this being about 55 miles below the junction of the north and west branches. A float is located in the pump well connected with the river, which indicates the height of water upon a painted scale. The datum is the low-water mark of 1804. Observations are made by the engineer, C. M. Nagle, each morning before starting the pumps. The record since 1890 has been furnished by E. Mather, president of the Harrisburg water board. Measurements of discharge are made from the open iron bridge on Second street. The initial point for soundings is the iron upright on the east end of the bridge. The stream is divided into two channels, with a large island between. The channel above and below the station is straight for about 2,500 feet, the banks high, and the current of moderate velocity. The first measurement was made on March 31, 1897, by E. G. Paul. During 1902 Mr. Paul made the following measurements:

April 17: Gage height, 5.40 feet; discharge, 60,534 second-feet.
September 15: Gage height, 1.10 feet; discharge, 6,982 second-feet.

*Daily gage height, in feet, of Susquehanna River at Harrisburg, Pa.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 5.25 | 3.58 | 20.33 | 6.25 | 2.75 | 1.75 | 3.58 | 5.83 | 1.25 | 4.83 | 5.50 | 2.41 |
| 2 | 4.75 | 3.66 | 23.91 | 5.58 | 2.83 | 1.75 | 6.16 | 5.33 | 1.25 | 6.00 | 4.75 | 2.41 |
| 3 | 4.25 | 3.50 | 23.33 | 5.33 | 2.83 | 1.66 | 7.33 | 5.50 | 1.25 | 5.91 | 4.50 | 2.58 |
| 4 | 3.83 | 3.25 | 21.41 | 5.00 | 2.66 | 1.66 | 6.66 | 6.25 | 1.25 | 5.66 | 4.00 | 3.33 |
| 5 | 3.00 | 2.41 | 16.33 | 4.75 | 2.66 | 1.66 | 7.83 | 5.50 | 1.16 | 4.66 | 3.50 | 3.75 |
| 6 | 3.00 | 2.00 | 12.25 | 4.50 | 2.83 | 1.66 | 7.50 | 4.83 | 1.08 | 4.66 | 3.50 | 3.25 |
| 7 | 3.00 | 6.08 | 9.50 | 4.50 | 2.75 | 1.50 | 6.83 | 4.50 | 1.00 | 4.66 | 3.25 | 3.50 |
| 8 | 2.83 | 5.25 | 7.00 | 4.50 | 2.66 | 1.25 | 7.33 | 4.00 | 0.91 | 4.41 | 3.08 | 3.41 |
| 9 | 2.75 | 5.00 | 5.25 | 9.00 | 2.66 | 1.50 | 8.50 | 3.58 | 0.91 | 3.83 | 2.91 | 3.41 |
| 10 | 3.00 | 5.08 | 5.00 | 14.66 | 2.66 | 1.58 | 7.16 | 3.25 | 0.91 | 3.83 | 2.75 | 3.16 |
| 11 | 2.91 | 5.33 | 6.66 | 14.16 | 2.66 | 1.50 | 6.16 | 3.50 | 0.91 | 3.50 | 2.66 | 3.00 |
| 12 | 2.66 | 5.16 | 8.33 | 11.58 | 2.50 | 1.50 | 6.16 | 3.58 | 1.25 | 3.58 | 2.41 | 3.00 |
| 13 | 2.58 | 4.83 | 10.91 | 10.91 | 2.41 | 1.50 | 6.25 | 3.25 | 1.25 | 4.75 | 2.41 | 3.83 |
| 14 | 2.25 | 4.41 | 13.41 | 8.16 | 2.33 | 1.50 | 5.50 | 3.08 | 1.08 | 4.83 | 2.33 | 3.66 |
| 15 | 2.25 | 4.41 | 13.58 | 7.08 | 2.25 | 1.75 | 4.58 | 2.83 | 1.16 | 3.75 | 2.33 | 4.00 |
| 16 | 2.25 | 4.25 | 12.00 | 6.41 | 2.16 | 1.75 | 4.00 | 2.75 | 1.08 | 3.91 | 2.25 | 4.00 |
| 17 | 2.16 | 4.08 | 12.16 | 5.66 | 2.16 | 2.25 | 3.50 | 2.50 | 1.08 | 3.75 | 2.16 | 5.33 |
| 18 | 2.00 | 3.83 | 15.00 | 5.08 | 2.00 | 2.41 | 3.25 | 2.50 | 1.00 | 3.16 | 2.16 | 8.58 |
| 19 | 2.00 | 3.75 | 13.66 | 4.75 | 1.83 | 2.41 | 3.25 | 2.16 | 1.00 | 3.33 | 2.16 | 8.33 |
| 20 | 2.16 | 3.75 | 11.33 | 4.41 | 1.83 | 2.33 | 3.16 | 2.00 | 1.00 | 3.00 | 1.91 | 7.66 |
| 21 | 2.16 | 3.75 | 9.50 | 4.08 | 1.75 | 2.16 | 3.33 | 2.00 | 1.00 | 2.91 | 1.83 | 7.16 |
| 22 | 5.16 | 4.00 | 6.00 | 3.83 | 1.75 | 2.16 | 4.33 | 1.91 | 0.91 | 2.66 | 1.75 | 8.50 |
| 23 | 10.00 | 4.00 | 5.50 | 3.50 | 1.83 | 2.16 | 8.08 | 1.91 | 0.83 | 2.58 | 1.75 | 12.50 |
| 24 | 6.75 | 4.08 | 5.33 | 3.41 | 1.66 | 2.00 | 8.00 | 1.75 | 0.83 | 2.41 | 1.66 | 12.66 |
| 25 | 6.50 | 4.16 | 5.33 | 3.25 | 1.66 | 2.00 | 7.25 | 1.75 | 0.83 | 2.25 | 1.66 | 11.50 |
| 26 | 5.41 | 6.41 | 4.66 | 3.00 | 1.66 | 2.00 | 7.75 | 1.58 | 1.66 | 2.41 | 1.91 | 8.25 |
| 27 | 5.08 | 9.41 | 3.66 | 2.91 | 1.66 | 2.16 | 8.08 | 1.58 | 3.75 | 2.33 | 2.00 | 7.25 |
| 28 | 5.33 | 9.66 | 3.66 | 2.75 | 1.66 | 2.41 | 6.83 | 1.50 | 5.16 | 2.33 | 2.25 | 6.16 |
| 29 | 5.33 | ..... | 4.41 | 2.75 | 1.66 | 2.41 | 5.83 | 1.41 | 4.33 | 3.66 | 2.33 | 5.58 |
| 30 | 4.33 | ..... | 4.41 | 2.75 | 1.66 | 3.00 | 6.16 | 1.25 | 4.33 | 5.66 | 2.41 | 4.83 |

*Rating table for Susquehanna River at Harrisburg, Pa., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Sec.-ft.* | *Feet.* | *Sec.-ft.* | *Feet.* | *Sec.-ft.* | *Feet.* | *Sec.-ft.* |
| 0.0 | 2,500 | 3.4 | 27,925 | 6.8 | 83,970 | 13.5 | 203,900 |
| .2 | 3,230 | 3.6 | 30,300 | 7.0 | 87,550 | 14.0 | 212,850 |
| .4 | 4,020 | 3.8 | 32,800 | 7.2 | 91,130 | 14.5 | 221,800 |
| .6 | 4,820 | 4.0 | 35,400 | 7.4 | 94,710 | 15.0 | 230,750 |
| .8 | 5,720 | 4.2 | 38,100 | 7.6 | 98,290 | 15.5 | 239,700 |
| 1.0 | 6,880 | 4.4 | 41,100 | 7.8 | 101,870 | 16.0 | 248,650 |
| 1.2 | 8,150 | 4.6 | 44,590 | 8.0 | 105,450 | 16.5 | 257,600 |
| 1.4 | 9,450 | 4.8 | 48,170 | 8.5 | 114,400 | 17.0 | 266,550 |
| 1.6 | 10,750 | 5.0 | 51,750 | 9.0 | 123,350 | 17.5 | 275,500 |
| 1.8 | 12,300 | 5.2 | 55,330 | 9.5 | 132,300 | 18.0 | 284,450 |
| 2.0 | 13,900 | 5.4 | 58,910 | 10.0 | 141,250 | 18.5 | 293,400 |
| 2.2 | 15,500 | 5.6 | 62,490 | 10.5 | 150,200 | 19.0 | 302,350 |
| 2.4 | 17,300 | 5.8 | 66,070 | 11.0 | 159,150 | 19.5 | 311,300 |
| 2.6 | 19,300 | 6.0 | 69,650 | 11.5 | 168,100 | 20.0 | 320,250 |
| 2.8 | 21,300 | 6.2 | 73,230 | 12.0 | 177,050 | 20.5 | 329,200 |
| 3.0 | 23,400 | 6.4 | 76,810 | 12.5 | 186,000 | 21.0 | 338,150 |
| 3.2 | 25,625 | 6.6 | 80,390 | 13.0 | 194,950 | 21.5 | 347,100 |

*Estimated monthly discharge of Susquehanna River at Harrisburg, Pa.*

[Drainage area, 24,030 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 141,250 | 13,900 | 37,243 | 1.55 | 1.79 |
| February | 134,985 | 13,900 | 47,035 | 1.96 | 2.04 |
| March | 390,060 | 30,900 | 146,782 | 6.11 | 7.04 |
| April | 224,485 | 20,800 | 68,458 | 2.85 | 3.18 |
| May | 21,800 | 11,125 | 15,806 | .66 | .76 |
| June | 23,400 | 8,475 | 13,314 | .55 | .61 |
| July | 114,400 | 25,050 | 71,078 | 2.96 | 3.41 |
| August | 74,125 | 8,475 | 21,241 | 1.13 | 1.30 |
| September | 54,435 | 5,990 | 11,951 | .50 | .56 |
| October | 69,650 | 15,950 | 36,579 | 1.52 | 1.75 |
| November | 60,700 | 11,125 | 21,216 | .88 | .98 |
| December | 188,685 | 17,300 | 64,016 | 2.66 | 3.07 |
| The year | 390,060 | 5,990 | 46,727 | 1.94 | 26.49 |

## PATAPSCO RIVER AT WOODSTOCK, MD.

This river rises in the north-central part of Maryland, flows in a southeasterly direction between Baltimore and Howard counties, and empties into Chesapeake Bay 13 miles below Baltimore. Its drainage basin is a hilly country largely under cultivation. A station was established at Woodstock August 6, 1896, by E. G. Paul. The drainage area is 251 square miles. Measurements are made from the county bridge on the road from Woodstock to Granite, Md., 1½ miles below the junction with the North Branch, as shown on the Ellicott atlas sheet. The scale is a board graduated to feet and tenths with small nails, and fastened to the floor timber of the bridge. The bench mark is a United States Geological Survey standard copper bolt, set in the face of the retaining wall of the entrance to the college grounds at the north end of the bridge. It is 22.06 feet above gage datum. The bridge was repaired on January 20–25, 1899, and the gage destroyed. A new gage was established on January 30, 1899, and referred to the same bench mark. The channel is rough and rocky. The banks are high and not subject to overflow. At a time of extreme high water the channel is liable to changes. The observer is David Donovan, a storekeeper at Woodstock, Md.

The following discharge measurement was made during 1902 by E. G. Paul:

September 4: Gage height 3.70 feet; discharge, 153 second-feet.

*Daily gage height, in feet, of Patapsco River at Woodstock, Md.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 4.00 | 4.90 | 5.35 | 4.65 | 4.50 | 3.85 | 4.30 | 3.85 | 3.65 | 6.50 | 3.85 | 4.85 |
| 2 | 4.00 | 4.95 | 5.75 | 4.60 | 4.45 | 3.75 | 4.05 | 3.80 | 3.60 | 4.95 | 3.75 | 5.20 |
| 3 | 4.00 | 4.70 | 5.50 | 4.55 | 4.45 | 3.75 | 3.95 | 3.75 | 3.65 | 4.40 | 3.85 | 6.45 |
| 4 | 4.15 | 4.65 | 5.15 | 4.45 | 4.45 | 3.80 | 3.95 | 4.10 | 3.75 | 4.10 | 3.85 | 4.50 |
| 5 | 4.15 | 4.55 | 5.15 | 4.50 | 4.35 | 3.70 | 3.85 | 3.80 | 3.45 | 4.05 | 3.75 | 4.45 |
| 6 | 4.10 | 4.45 | 5.10 | 4.55 | 4.30 | 3.70 | 3.80 | 4.70 | 3.50 | 3.95 | 3.85 | 4.45 |
| 7 | 4.20 | 4.35 | 5.00 | 4.60 | 4.30 | 3.65 | 3.70 | 4.85 | 3.50 | 3.85 | 3.85 | 4.45 |
| 8 | 4.25 | 4.30 | 4.95 | 7.20 | 4.30 | 4.85 | 3.65 | 4.80 | 3.50 | 3.85 | 8.75 | 4.45 |
| 9 | 4.30 | 4.35 | 5.15 | 5.50 | 4.30 | 4.05 | 3.65 | 4.60 | 4.85 | 3.75 | 3.80 | 4.35 |
| 10 | 4.20 | 4.35 | 5.30 | 5.15 | 4.30 | 4.00 | 3.45 | 4.30 | 4.05 | 3.75 | 3.90 | 4.45 |
| 11 | 4.20 | 4.25 | 5.25 | 4.95 | 4.25 | 3.90 | 3.70 | 4.05 | 3.60 | 3.85 | 3.80 | 4.35 |
| 12 | 4.20 | 4.25 | 5.20 | 4.85 | 4.30 | 3.85 | 3.60 | 3.75 | 3.45 | 3.85 | 3.80 | 4.45 |
| 13 | 4.15 | 4.35 | 5.40 | 4.85 | 4.30 | 3.85 | 3.70 | 3.85 | 3.45 | 3.85 | 3.80 | 4.45 |
| 14 | 4.00 | 4.70 | 5.20 | 4.80 | 4.30 | 3.90 | 3.80 | 3.70 | 3.50 | 3.90 | 3.80 | 4.45 |
| 15 | 4.15 | 4.55 | 4.80 | 4.75 | 4.25 | 3.80 | 3.80 | 3.70 | 3.45 | 3.80 | 3.75 | 4.45 |
| 16 | 4.10 | 4.60 | 5.10 | 4.75 | 4.25 | 4.15 | 3.70 | 3.75 | 3.35 | 3.75 | 3.70 | 4.35 |
| 17 | 4.10 | 4.55 | 4.95 | 4.65 | 4.20 | 4.15 | 3.60 | 3.60 | 3.45 | 3.85 | 3.80 | 4.55 |
| 18 | 4.10 | 4.60 | 4.90 | 4.60 | 4.15 | 4.05 | 3.80 | 3.60 | 3.45 | 3.85 | 3.80 | 4.45 |
| 19 | 4.10 | 4.75 | 4.75 | 4.60 | 4.10 | 4.10 | 3.65 | 3.70 | 3.40 | 3.90 | 3.80 | 4.50 |
| 20 | 4.05 | 4.55 | 4.70 | 4.55 | 4.10 | 4.00 | 3.65 | 3.65 | 3.50 | 3.80 | 3.75 | 4.35 |
| 21 | 4.50 | 5.70 | 4.75 | 4.50 | 4.05 | 4.50 | 3.70 | 3.70 | 3.45 | 3.75 | 3.75 | 4.45 |
| 22 | 6.50 | 6.50 | 4.55 | 4.45 | 4.10 | 4.20 | 3.80 | 3.70 | 3.55 | 3.75 | 3.80 | 4.45 |
| 23 | 4.40 | 5.70 | 4.60 | 4.45 | 4.10 | 4.05 | 3.85 | 3.70 | 3.55 | 3.85 | 3.85 | 4.45 |
| 24 | 4.25 | 4.95 | 4.55 | 4.45 | 4.05 | 3.90 | 3.85 | 3.60 | 3.50 | 3.70 | 3.90 | 4.45 |
| 25 | 4.20 | 8.60 | 4.50 | 4.40 | 4.00 | 4.25 | 3.70 | 3.65 | 3.90 | 3.75 | 4.70 | 4.45 |
| 26 | 4.85 | 5.75 | 4.45 | 4.40 | 3.95 | 5.45 | 3.80 | 3.65 | 5.50 | 3.75 | 4.70 | 4.55 |
| 27 | 5.75 | 13.50 | 4.55 | 4.45 | 3.90 | 4.70 | 3.65 | 3.60 | 4.50 | 3.80 | 4.60 | 4.55 |
| 28 | 4.90 | 10.40 | 4.55 | 4.40 | 4.10 | 4.35 | 3.70 | 3.80 | 3.85 | 3.75 | 4.00 | 4.55 |
| 29 | 4.40 | ..... | 4.75 | 4.40 | 4.00 | 3.95 | 3.75 | 3.80 | 3.65 | 3.85 | 4.00 | 4.55 |
| 30 | 4.20 | ..... | 4.60 | 4.95 | 3.95 | 4.70 | 3.95 | 3.70 | 3.60 | 3.85 | 3.95 | 4.55 |
| 31 | 4.05 | ..... | 4.55 | ..... | 3.90 | ..... | 4.25 | 3.70 | ..... | 3.80 | ..... | 4.55 |

*Rating table for Patapsco River at Woodstock, Md., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 3.0 | 50 | 4.8 | 830 | 6.6 | 2,615 | 9.0 | 5,075 |
| 3.2 | 83 | 5.0 | 1,000 | 6.8 | 2,820 | 9.5 | 5,588 |
| 3.4 | 123 | 5.2 | 1,200 | 7.0 | 3,025 | 10.0 | 6,100 |
| 3.6 | 173 | 5.4 | 1,400 | 7.2 | 3,229 | 10.5 | 6,612 |
| 3.8 | 235 | 5.6 | 1,600 | 7.4 | 3,435 | 11.0 | 7,125 |
| 4.0 | 310 | 5.8 | 1,800 | 7.6 | 3,640 | 11.5 | 7,638 |
| 4.2 | 400 | 6.0 | 2,000 | 7.8 | 3,844 | 12.0 | 8,150 |
| 4.4 | 520 | 6.2 | 2,205 | 8.0 | 4,050 | | |
| 4.6 | 670 | 6.4 | 2,410 | 8.5 | 4,562 | | |

*Estimated monthly discharge of Patapsco River at Woodstock, Md.*

[Drainage area, 251 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 2,307 | 235 | 432 | 1.72 | 1.98 |
| February | 9,483 | 332 | 1,348 | 5.38 | 5.60 |
| March | 1,550 | 425 | 797 | 3.18 | 3.67 |
| April | 3,025 | 400 | 649 | 2.58 | 2.88 |
| May | 450 | 200 | 313 | 1.24 | 1.43 |
| June | 1,250 | 135 | 305 | 1.22 | 1.36 |
| July | 355 | 91 | 174 | .69 | .80 |
| August | 710 | 122 | 225 | .90 | 1.04 |
| September | 1,500 | 111 | 245 | .98 | 1.09 |
| October | 2,512 | 200 | 351 | 1.40 | 1.61 |
| November | 750 | 200 | 292 | 1.16 | 1.29 |
| December | 1,200 | 425 | 651 | 2.59 | 2.99 |
| The year | 9,483 | 91 | 482 | 1.92 | 25.74 |

## POTOMAC RIVER DRAINAGE BASIN.

Potomac River is formed by the junction of the North and South branches, about 15 miles below Cumberland, Md. Regular gaging stations have been maintained on the North Branch at Piedmont, W. Va., on the South Branch near Springfield, W. Va., on Antietam Creek near Sharpsburg, Md., on the North Branch of Shenandoah River near Riverton, Va., on the South Branch of Shenandoah River near Front Royal, Va., on Shenandoah River at Millville, W. Va., on Potomac River at Point of Rocks, Md., and on Monocacy River near Frederick, Md.

### NORTH BRANCH OF POTOMAC RIVER AT PIEDMONT, W. VA.

This stream rises in the western part of West Virginia and flows in a northeasterly direction, forming the boundary between Maryland and West Virginia. At a point about 15 miles below Cumberland it is joined by the South Branch, forming the Potomac River. The drainage area is mapped on Piedmont, St. George, Accident, Grantsville, and Frostburg atlas sheets. Systematic measurements of discharge have been made at Piedmont, W. Va. This station, established June 27, 1899, by E. G. Paul, is located at the iron highway bridge connecting Luke, Md., with Piedmont, W. Va. The equipment

consists of a standard chain-and-weight gage, referred to a horizontal scale board graduated to feet and tenths, inclosed in lock-box secured by bolts to the hand rail on the lower side of the bridge. The length of the chain from the zero to the extreme end of the weight is 38.87 feet. The channel is straight for an eighth of a mile above and below the station. The current is swift and unobstructed. The right bank is high and rocky, but the left bank is low and liable to overflow. The bed of the stream is rocky and permanent in section. The observer is Charles W. Beck, a bookkeeper at Piedmont, W. Va.

The following discharge measurement were made during 1902, by E. G. Paul:

August 19: Gage height, 2.14 feet; discharge, 50 second-feet.

*Daily gage height, in feet, of North Branch of Potomac River at Piedmont, W. Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 4.45 | 3.80 | 8.05 | 4.90 | 3.55 | 3.30 | 4.75 | 2.85 | 1.90 | 3.30 | 2.60 | 4.00 |
| 2 | 4.00 | 3.60 | 7.10 | 4.65 | 3.40 | 3.20 | 3.80 | 2.70 | 1.90 | 3.35 | 2.50 | 3.75 |
| 3 | 4.30 | 3.50 | 6.20 | 4.40 | 3.70 | 3.10 | 3.35 | 2.60 | 1.90 | 2.85 | 2.50 | 5.25 |
| 4 | 3.80 | 3.20 | 5.40 | 4.70 | 3.70 | 3.00 | 3.20 | 2.50 | 2.00 | 2.70 | 2.40 | 4.55 |
| 5 | 3.55 | 3.40 | 4.95 | 5.05 | 3.55 | 3.00 | 3.10 | 2.50 | 2.20 | 2.90 | 2.40 | 4.30 |
| 6 | 3.60 | 3.50 | 4.50 | 5.95 | 3.45 | 2.85 | 2.95 | 2.50 | 2.35 | 2.90 | 2.40 | 3.90 |
| 7 | 3.60 | 3.50 | 4.20 | 6.20 | 3.50 | 2.80 | 2.80 | 2.50 | 2.20 | 2.85 | 2.40 | 3.80 |
| 8 | 3.60 | 3.40 | 4.20 | 6.45 | 3.40 | 2.85 | 3.05 | 2.40 | 2.10 | 2.60 | 2.50 | 3.75 |
| 9 | 3.45 | 3.30 | 4.65 | 5.85 | 3.30 | 2.95 | 3.20 | 2.40 | 2.00 | 2.50 | 2.50 | 3.50 |
| 10 | 3.45 | 3.20 | 4.95 | 5.70 | 3.20 | 2.85 | 2.95 | 2.45 | 2.00 | 2.40 | 2.50 | 3.45 |
| 11 | 3.40 | 3.15 | 5.65 | 6.20 | 3.40 | 2.70 | 3.20 | 2.50 | 2.00 | 2.40 | 2.50 | 5.65 |
| 12 | 3.30 | 3.15 | 6.85 | 7.05 | 3.25 | 2.70 | 3.05 | 2.40 | 2.00 | 3.25 | 2.50 | 6.45 |
| 13 | 3.10 | 3.10 | 8.10 | 6.25 | 3.20 | 2.60 | 2.80 | 2.35 | 1.90 | 3.70 | 2.50 | 6.00 |
| 14 | 3.20 | 3.05 | 6.60 | 5.80 | 3.15 | 3.10 | 2.70 | 2.30 | 1.90 | 3.35 | 2.50 | 5.80 |
| 15 | 3.20 | 3.10 | 5.85 | 5.55 | 3.10 | 2.90 | 2.60 | 2.25 | 1.90 | 3.15 | 2.40 | 5.00 |
| 16 | 3.10 | 3.00 | 5.85 | 5.25 | 3.10 | 2.80 | 2.50 | 2.20 | 1.90 | 2.95 | 2.40 | 7.60 |
| 17 | 3.05 | 3.00 | 6.75 | 5.10 | 3.00 | 2.70 | 2.45 | 2.20 | 1.90 | 2.70 | 2.45 | 6.45 |
| 18 | 2.90 | 3.00 | 5.65 | 4.95 | 3.00 | 2.60 | 2.40 | 2.20 | 1.90 | 2.70 | 2.50 | 5.45 |
| 19 | 3.00 | 3.00 | 4.95 | 4.55 | 2.90 | 2.50 | 2.40 | 2.15 | 1.90 | 2.70 | 2.50 | 4.90 |
| 20 | 2.90 | 2.85 | 4.60 | 4.40 | 3.45 | 2.50 | 2.55 | 2.10 | 1.90 | 2.60 | 2.50 | 4.70 |
| 21 | 2.90 | 2.80 | 4.45 | 4.25 | 3.75 | 2.60 | 2.60 | 2.15 | 1.90 | 2.50 | 9.50 | 5.00 |
| 22 | 2.90 | 2.80 | 4.50 | 4.15 | 3.45 | 2.90 | 2.50 | 2.50 | 2.00 | 2.40 | 2.50 | 5.90 |
| 23 | 2.90 | 3.00 | 4.50 | 4.25 | 3.40 | 2.70 | 2.40 | 2.40 | 2.00 | 2.40 | 2.50 | 5.15 |
| 24 | 3.00 | 3.05 | 4.50 | 4.15 | 3.30 | 2.50 | 2.40 | 2.30 | 2.00 | 2.40 | 2.50 | 4.70 |
| 25 | 3.00 | 3.35 | 4.45 | 3.80 | 3.30 | 2.40 | 2.30 | 2.20 | 2.00 | 2.40 | 2.75 | 4.50 |
| 26 | 3.30 | 6.55 | 4.25 | 3.70 | 3.60 | 2.80 | 2.30 | 2.10 | 2.20 | 2.40 | 5.45 | 4.10 |
| 27 | 5.73 | 6.05 | 4.15 | 3.65 | 4.10 | 3.00 | 2.30 | 2.10 | 2.20 | 2.40 | 4.50 | 3.80 |
| 28 | 5.00 | 10.50 | 4.20 | 3.55 | 4.00 | 2.70 | 2.30 | 2.00 | 2.65 | (a) | 3.85 | 3.70 |
| 29 | 4.65 | ------ | 5.50 | 3.60 | 3.80 | 2.60 | 2.30 | 1.90 | 2.40 | (a) | 3.60 | 3.55 |
| 30 | 4.10 | ------ | 5.30 | 3.70 | 3.60 | 2.75 | 2.20 | 1.90 | 2.45 | 2.80 | 3.50 | 4.00 |
| 31 | 4.05 | ------ | 5.25 | ------ | 3.35 | ------ | 2.30 | 1.90 | ------ | 2.70 | ------ | 3.70 |

(a) Gage chain broken.

*Rating table for North Branch Potomac River at Piedmont, W. Va., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 1.8 | 34 | 3.6 | 640 | 5.4 | 2,040 | 7.2 | 3,480 |
| 2.0 | 77 | 3.8 | 775 | 5.6 | 2,200 | 7.4 | 3,640 |
| 2.2 | 124 | 4.0 | 920 | 5.8 | 2,360 | 7.6 | 3,800 |
| 2.4 | 175 | 4.2 | 1,080 | 6.0 | 2,520 | 7.8 | 3,960 |
| 2.6 | 230 | 4.4 | 1,240 | 6.2 | 2,680 | 8.0 | 4,120 |
| 2.8 | 289 | 4.6 | 1,400 | 6.4 | 2,840 | 8.5 | 4,520 |
| 3.0 | 352 | 4.8 | 1,560 | 6.6 | 3,000 | 9.0 | 4,920 |
| 3.2 | 430 | 5.0 | 1,720 | 6.8 | 3,160 | | |
| 3.4 | 525 | 5.2 | 1,880 | 7.0 | 3,320 | | |

*Estimated monthly discharge of North Branch Potomac River at Piedmont, W. Va.*

[Drainage area, 409 square miles.]

| Month. | Discharge in second-feet | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 2,304 | 320 | 688 | 1.68 | 1.94 |
| February | 6,120 | 289 | 809 | 1.98 | 2.06 |
| March | 4,160 | 1,040 | 2,008 | 4.91 | 5.66 |
| April | 3,360 | 610 | 1,666 | 4.07 | 4.54 |
| May | 1,000 | 320 | 553 | 1.35 | 1.56 |
| June | 475 | 175 | 292 | .71 | .79 |
| July | 1,520 | 124 | 313 | .77 | .89 |
| August | 305 | 55 | 153 | .37 | .43 |
| September | 245 | 55 | 91 | .22 | .25 |
| October | 705 | 175 | 288 | .70 | .81 |
| November | 2,080 | 175 | 347 | .85 | .95 |
| December | 3,800 | 552 | 1,516 | 3.71 | 4.28 |
| The year | 6,120 | 55 | 727 | 1.78 | 24.16 |

SOUTH BRANCH OF POTOMAC RIVER AT SPRINGFIELD, W. VA.

This stream rises in Highland County, W. Va., and flows in a northeasterly direction, joining the North Branch of Potomac River about 15 miles below Cumberland, Md., forming Potomac River. The drainage area of the South Branch consists of long, narrow mountain valleys, sparsely settled and little cultivated, being for the greater part covered with timber. The region being free from manufacturing industries and mining operations, no pollution of the waters occurs. A gaging station was established at the railroad bridge, 2 miles south of Springfield, W. Va., in April, 1894, by Cyrus C. Babb, but was discontinued in 1896 for want of an observer. The present station, established June 26, 1899, by E. G. Paul, is located on the iron highway bridge, one-fourth of a mile from Graces Station and 1 mile from Springfield. The wire gage is 39.4 feet from the zero to the extreme end of the weight and is referred to a scale graduated to feet and tenths on the guard rail on the upper side of the bridge 80 feet from the abutment on the left bank. The channel of the stream at this point is curved and the current too sluggish to make satisfactory discharge measurements, and they are therefore made from the railroad bridge over the stream 1 mile above. The observer is John E. Grace, of Springfield, W. Va.

On February 2, 1902, the bridge and gage were carried away by the ice, and the station was discontinued.

ANTIETAM CREEK NEAR SHARPSBURG, MD.

This stream rises in the western part of Maryland and flows in a southerly direction, entering the Potomac 10 miles above Harpers Ferry. Its drainage area is mostly of a hilly character and largely cultivated. A station was established at Myers Mill, 1 mile east of Sharpsburg, Md., on the road to Keedysville, Md., on June 24, 1897, by Arthur P. Davis. The measurements are made from a three-fourths inch iron cable with 85-foot span supported by large trees on either side of the stream. The gage is a post driven into the gravel of the stream bed and bolted to an overhanging tree. The initial point for soundings is on the left bank. The channel both above and below the station is straight for 300 feet. The right bank is low and liable to overflow. The left bank is high and rocky. The current is of moderate velocity and the flow unobstructed.

During 1902 the following measurement was made by E. G. Paul:

September 1: Gage height, 1.7 feet; discharge, 126 second-feet.

*Daily gage height, in feet, of Antietam Creek near Sharpsburg, Md.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 2.90 | 2.40 | 7.00 | 2.90 | 2.60 | 2.10 | 2.20 | 2.60 | 1.70 | 1.70 | 1.60 | 1.80 |
| 2 | 2.70 | 2.40 | 5.05 | 2.90 | 2.50 | 2.20 | 2.10 | 2.40 | 1.60 | 1.80 | 1.70 | 2.40 |
| 3 | 2.70 | 2.60 | 4.60 | 2.80 | 2.50 | 2.20 | 2.10 | 1.80 | 1.60 | 1.60 | 1.70 | 4.05 |
| 4 | 2.50 | 2.50 | 3.90 | 2.80 | 2.50 | 2.20 | 2.00 | 1.80 | 1.70 | 1.60 | 1.60 | 3.60 |
| 5 | 2.40 | 2.40 | 4.00 | 2.80 | 2.50 | 2.10 | 2.00 | 1.90 | 1.60 | 2.30 | 1.60 | 2.60 |
| 6 | 2.40 | 2.30 | 3.60 | 2.70 | 2.40 | 2.10 | 1.90 | 1.90 | 1.50 | 2.10 | 1.70 | 2.50 |
| 7 | 2.30 | 2.20 | 3.50 | 2.90 | 2.40 | 2.10 | 2.30 | 1.90 | 1.50 | 1.90 | 1.70 | 2.30 |
| 8 | 2.30 | 2.10 | 3.50 | 3.90 | 2.40 | 2.00 | 2.70 | 1.70 | 1.40 | 1.70 | 1.70 | 2.10 |
| 9 | 2.30 | 2.10 | 3.70 | 6.45 | 2.30 | 2.00 | 2.70 | 1.70 | 1.60 | 1.70 | 1.70 | 1.80 |
| 10 | 2.30 | 2.30 | 4.20 | 4.45 | 2.30 | 2.00 | 3.50 | 1.60 | 1.60 | 1.60 | 1.70 | 1.90 |
| 11 | 2.30 | 2.40 | 4.40 | 3.90 | 2.40 | 2.00 | 2.00 | 1.80 | 1.70 | 1.80 | 1.60 | 2.00 |
| 12 | 2.20 | 2.20 | 4.40 | 3.60 | 2.30 | 2.10 | 2.00 | 1.80 | 1.60 | 1.80 | 1.60 | 2.40 |
| 13 | 2.20 | 2.30 | 4.80 | 3.50 | 2.30 | 2.20 | 1.80 | 1.70 | 1.70 | 2.10 | 1.60 | 2.80 |
| 14 | 2.20 | 2.20 | 4.70 | 3.30 | 2.30 | 2.20 | 1.80 | 1.60 | 1.50 | 1.90 | 1.50 | 2.70 |
| 15 | 2.10 | 2.20 | 3.90 | 3.20 | 2.30 | 2.20 | 1.80 | 1.60 | 1.40 | 1.80 | 1.50 | 2.70 |
| 16 | 2.10 | 2.00 | 3.70 | 3.10 | 2.20 | 2.30 | 1.70 | 1.60 | 1.60 | 1.70 | 1.60 | 2.80 |
| 17 | 2.10 | 2.20 | 5.10 | 3.10 | 2.20 | 2.40 | 1.70 | 1.40 | 1.60 | 1.70 | 1.70 | 4.10 |
| 18 | 2.10 | 2.10 | 4.20 | 3.00 | 2.20 | 2.40 | 1.70 | 1.40 | 1.60 | 1.70 | 1.70 | 3.80 |
| 19 | 2.10 | 1.90 | 3.70 | 2.90 | 2.90 | 2.20 | 2.40 | 1.50 | 1.60 | 1.60 | 1.60 | 3.80 |
| 20 | 2.10 | 2.00 | 3.50 | 2.90 | 2.40 | 2.30 | 2.70 | 1.50 | 1.50 | 1.80 | 1.60 | 3.50 |
| 21 | 3.80 | 3.15 | 3.60 | 2.80 | 2.30 | 2.30 | 1.80 | 2.00 | 1.30 | 1.70 | 1.60 | 3.60 |
| 22 | 4.25 | 4.70 | 3.40 | 2.80 | 2.30 | 2.00 | 1.80 | 2.00 | 1.40 | 1.70 | 1.50 | 3.80 |
| 23 | 2.70 | 3.60 | 3.40 | 2.80 | 2.20 | 2.00 | 1.70 | 1.90 | 1.50 | 1.80 | 1.50 | 3.60 |
| 24 | 2.40 | 3.50 | 3.40 | 2.70 | 2.20 | 2.00 | 1.70 | 1.70 | 1.70 | 1.70 | 1.50 | 3.10 |
| 25 | 2.40 | 6.20 | 3.10 | 2.70 | 2.40 | 1.90 | 1.90 | 1.50 | 1.70 | 1.70 | 1.60 | 3.10 |
| 26 | 2.30 | 10.00 | 3.00 | 2.60 | 2.60 | 2.20 | 1.80 | 1.50 | 1.80 | 1.70 | 1.80 | 2.80 |
| 27 | 4.25 | 5.15 | 3.00 | 2.60 | 2.20 | 2.20 | 1.80 | 1.50 | 2.30 | 1.70 | 2.20 | 2.90 |
| 28 | 3.20 | 7.45 | 2.90 | 2.60 | 2.30 | 2.20 | 1.70 | 1.60 | 1.60 | 1.70 | 2.10 | 3.00 |
| 29 | 2.70 | ..... | 3.40 | 2.60 | 2.20 | 2.20 | 1.70 | 1.50 | 1.60 | 2.10 | 1.80 | 3.20 |
| 30 | 2.60 | ..... | 3.10 | 2.70 | 2.20 | 2.40 | 1.90 | 1.50 | 1.50 | 1.80 | 2.30 | 3.10 |
| 31 | 2.40 | ..... | 3.00 | ..... | 2.20 | ..... | 2.55 | ..... | ..... | 1.60 | ..... | 3.10 |

*Rating table for Antietam Creek near Sharpsburg, Md., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 1.2 | 38 | 2.6 | 416 | 4.0 | 1,215 | 5.4 | 2,013 |
| 1.4 | 60 | 2.8 | 485 | 4.2 | 1,329 | 5.6 | 2,127 |
| 1.6 | 95 | 3.0 | 560 | 4.4 | 1,443 | 5.8 | 2,241 |
| 1.8 | 154 | 3.2 | 665 | 4.6 | 1,557 | 6.0 | 2,355 |
| 2.0 | 217 | 3.4 | 775 | 4.8 | 1,671 | | |
| 2.2 | 281 | 3.6 | 887 | 5.0 | 1,785 | | |
| 2.4 | 348 | 3.8 | 1,001 | 5.2 | 1,899 | | |

*Estimated monthly discharge of Antietam Creek near Sharpsburg, Md.*

[Drainage area, 293 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 1,357 | 249 | 434 | 1.48 | 1.71 |
| February | 4,635 | 185 | 787 | 2.68 | 2.79 |
| March | 2,925 | 520 | 1,094 | 3.73 | 4.30 |
| April | 2,612 | 416 | 668 | 2.28 | 2.54 |
| May | 520 | 281 | 333 | 1.14 | 1.31 |
| June | 348 | 185 | 268 | .92 | 1.03 |
| July | 830 | 123 | 238 | .81 | .93 |
| August | 416 | 60 | 139 | .47 | .54 |
| September | 314 | 60 | 102 | .35 | .39 |
| October | 314 | 95 | 148 | .51 | .59 |
| November | 314 | 75 | 123 | .42 | .47 |
| December | 1,272 | 154 | 591 | 2.02 | 2.33 |
| The year | 4,635 | 60 | 410 | 1.40 | 18.93 |

NORTH BRANCH OF SHENANDOAH RIVER AT RIVERTON, VA.

This stream rises in Rockingham County, Va., and flows in a northeasterly direction, joining the South Branch of the Shenandoah at Riverton, Va. The station was established at Riverton by A. P. Davis, June 26, 1899. Measurements were made from an iron-wire cable about 260 feet in span stretched across the river on timber supports 2 miles northwest of Riverton. The station is most easily reached by a private conveyance from Front Royal, Va. The gage is a vertical timber, graduated to feet and tenths, bolted to a large sycamore tree on the right bank of the stream. The initial point of soundings is on the right bank. The channel is straight above and below the station for about 600 feet. The banks are low and liable to overflow in time of high water. Bed of stream is rocky and constant. The observer is L. W. Burke, a farmer, Riverton, Va. Two observations of river height are taken daily. On September 10, 1900, the gage was moved to the left bank of the river and its datum changed 1 foot, causing all readings to be increased by 1 foot.

The gage at this station washed out in the flood of February 22, 1902, and the station was temporarily abandoned until August 17, 1902, when it was reestablished by Mr. Paul, the zero of the new gage being at the same elevation as the zero of the former gage.

The following discharge measurement was made during 1902 by Mr. Paul:

August 16: Gage height, 4.2 feet; discharge, 256 second-feet.

*Daily gage height, in feet, of North Branch of Shenandoah River near Riverton, Va.*

| Day. | Jan. | Feb. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | |
| 1 | 7.05 | 4.90 | (a) | 4.05 | 4.30 | 4.10 | 5.45 |
| 2 | 6.20 | 7.88 | ..... | 4.05 | 4.20 | 4.15 | 5.75 |
| 3 | 5.75 | 4.80 | ..... | 4.10 | 4.20 | 4.10 | 5.85 |
| 4 | 5.40 | 5.20 | ..... | 4.35 | 4.20 | 4.10 | 5.90 |
| 5 | 5.00 | 5.50 | ..... | 4.10 | 4.20 | 4.15 | 5.80 |
| 6 | 4.90 | 5.50 | ..... | 4.05 | 4.20 | 4.20 | 5.80 |
| 7 | 4.85 | 5.50 | ..... | 4.00 | 4.30 | 4.20 | 5.55 |
| 8 | 4.80 | 5.50 | ..... | 4.05 | 4.20 | 4.10 | 5.50 |
| 9 | 4.70 | 5.50 | ..... | 4.05 | 4.15 | 4.10 | 5.30 |
| 10 | 4.68 | 5.50 | ..... | 4.10 | 4.10 | 4.10 | 5.15 |
| 11 | 4.55 | 5.50 | ..... | 4.10 | 4.15 | 4.00 | 5.05 |
| 12 | 4.50 | 5.50 | ..... | 4.10 | 4.25 | 4.10 | 5.35 |
| 13 | 4.60 | 5.50 | ..... | 4.05 | 4.30 | 4.10 | 5.25 |
| 14 | 4.55 | 5.50 | ..... | 4.00 | 4.60 | 4.10 | 6.60 |
| 15 | 4.60 | 5.50 | ..... | 4.00 | 4.35 | 4.10 | 6.30 |
| 16 | 4.55 | 5.50 | ..... | 3.90 | 4.30 | 4.10 | 5.85 |
| 17 | 4.48 | 5.50 | 4.20 | 4.00 | 4.25 | 4.10 | 8.15 |
| 18 | 4.35 | 5.50 | 4.10 | 4.00 | 4.20 | 4.10 | 7.65 |
| 19 | 4.28 | 5.50 | 4.20 | 4.00 | 4.20 | 4.20 | 7.10 |
| 20 | 4.20 | 5.50 | 4.20 | 4.00 | 4.15 | 4.20 | 5.75 |
| 21 | 4.30 | 5.50 | 4.20 | 4.00 | 4.10 | 4.20 | 5.50 |
| 22 | 5.40 | 5.50 | 4.20 | 4.05 | 4.10 | 4.20 | 5.45 |
| 23 | 5.15 | (a) | 4.20 | 4.05 | 4.10 | 4.20 | 5.25 |
| 24 | 4.75 | ..... | 4.20 | 4.10 | 4.10 | 4.20 | 5.20 |
| 25 | 4.60 | ..... | 4.20 | 4.10 | 4.10 | 4.35 | 5.00 |
| 26 | 4.75 | ..... | 4.20 | 4.10 | 4.10 | 5.00 | 4.95 |
| 27 | 5.00 | ..... | 4.10 | 4.10 | 4.10 | 4.95 | 4.85 |
| 28 | 6.15 | ..... | 4.10 | 4.05 | 4.20 | 5.20 | 4.90 |
| 29 | 5.50 | ..... | 4.15 | 4.15 | 4.20 | 5.10 | 5.00 |
| 30 | 5.05 | ..... | 4.10 | 4.20 | 4.20 | 5.00 | 4.85 |
| 31 | 4.95 | ..... | 4.10 | ..... | 4.20 | ..... | 4.70 |

a Gage washed out Feb. 22, 1902; reestablished Aug. 17, 1902.

## SOUTH BRANCH OF SHENANDOAH RIVER AT FRONT ROYAL, VA.

This stream rises in Augusta County, Va., and flows in a northeasterly direction, joining the North Branch of the Shenandoah at Riverton to form Shenandoah River. A station was established on the South Branch by A. P. Davis, June 26, 1899. The measurements of flow are made from an iron wire cable, 300 feet in span, stretched across the stream 3 miles southwest of Front Royal, Va. The gage is a vertical timber divided into feet and tenths and bolted to the trunk of a tree on the left bank of the stream. The initial point for sounding is on the left bank. The channel is straight 600 feet above and below the station, and the current sluggish. The left

bank is low and liable to overflow. The bed of the stream is rocky in part, with patches of sand, somewhat shifting. The observer is Miss Brentie Johnson, Front Royal, Va.

The following discharge measurement was made during 1902 by Mr. Paul.

August 15: Gage height, 4.2 feet; discharge, 527 second-feet.

*Daily gage height, in feet, of South Branch of Shenandoah River at Front Royal, Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 9.50 | 6.10 | 23.50 | 6.55 | 5.40 | 4.90 | 4.60 | 4.40 | 4.00 | 5.00 | 4.25 | 5.80 |
| 2 | 9.15 | 5.25 | 13.00 | 6.45 | 5.35 | 4.80 | 4.55 | 4.40 | 3.95 | 4.30 | 4.25 | 6.30 |
| 3 | 8.30 | 6.70 | 9.90 | 6.25 | 5.30 | 4.75 | 4.50 | 4.60 | 3.90 | 6.00 | 4.40 | 7.00 |
| 4 | 7.70 | 6.05 | 9.50 | 6.15 | 6.50 | 4.70 | 4.45 | 4.60 | 3.90 | 5.10 | 4.50 | 7.25 |
| 5 | 8.40 | 6.60 | 8.90 | 5.95 | 6.35 | 4.60 | 4.40 | 4.60 | 3.85 | 5.00 | 4.30 | 7.85 |
| 6 | 8.15 | 5.90 | 8.40 | 7.40 | 6.15 | 4.55 | 4.50 | 4.50 | 3.80 | 4.30 | 4.30 | 7.65 |
| 7 | 8.00 | 5.70 | 7.95 | 7.25 | 5.85 | 4.50 | 4.45 | 4.50 | 3.80 | 4.30 | 4.20 | 6.85 |
| 8 | 7.75 | 6.90 | 7.50 | 7.70 | 5.65 | 4.90 | 4.40 | 4.40 | 4.00 | 4.20 | 4.20 | 6.55 |
| 9 | 7.55 | 5.90 | 9.10 | 9.10 | 5.50 | 4.90 | 4.40 | 4.30 | 4.20 | 4.10 | 4.20 | 6.40 |
| 10 | 7.30 | 5.70 | 10.50 | 10.50 | 5.35 | 4.85 | 4.30 | 4.40 | 4.10 | 4.55 | 4.20 | 6.15 |
| 11 | 6.55 | 5.90 | 13.25 | 10.50 | 5.50 | 4.80 | 4.30 | 4.35 | 4.10 | 4.90 | 4.25 | 5.95 |
| 12 | 6.00 | 6.10 | 11.85 | 9.60 | 5.45 | 4.80 | 4.20 | 4.30 | 4.00 | 4.90 | 4.35 | 5.75 |
| 13 | 5.90 | 6.10 | 10.10 | 6.90 | 5.40 | 4.70 | 4.60 | 4.30 | 4.00 | 5.50 | 4.35 | 6.30 |
| 14 | 5.80 | 5.75 | 8.50 | 6.75 | 5.40 | 4.60 | 4.60 | 4.20 | 4.00 | 5.65 | 4.25 | 6.35 |
| 15 | 5.75 | 5.45 | 8.10 | 6.60 | 5.30 | 4.80 | 4.50 | 4.20 | 4.00 | 5.35 | 4.10 | 6.30 |
| 16 | 5.65 | 5.50 | 8.80 | 6.45 | 5.30 | 4.80 | 4.50 | 4.15 | 4.00 | 5.00 | 4.25 | 6.55 |
| 17 | 5.55 | 5.40 | 8.45 | 6.25 | 5.30 | 4.70 | 4.45 | 4.25 | 4.00 | 4.65 | 4.60 | 6.85 |
| 18 | 5.50 | 5.35 | 8.20 | 6.15 | 5.40 | 4.65 | 4.40 | 4.30 | 4.10 | 4.45 | 4.50 | 8.10 |
| 19 | 5.50 | 5.30 | 7.80 | 6.00 | 5.40 | 4.60 | 4.35 | 4.35 | 3.90 | 4.40 | 4.50 | 7.60 |
| 20 | 5.45 | 5.25 | 7.35 | 6.20 | 5.40 | 4.55 | 4.50 | 4.35 | 3.85 | 4.40 | 4.45 | 6.60 |
| 21 | 5.35 | 5.20 | 6.75 | 6.15 | 5.30 | 4.45 | 4.50 | 4.30 | 3.80 | 4.35 | 4.40 | 6.50 |
| 22 | 6.30 | 7.45 | 6.45 | 6.00 | 5.25 | 4.80 | 4.40 | 4.20 | 3.80 | 4.30 | 4.35 | 6.40 |
| 23 | 5.75 | 6.20 | 7.90 | 5.80 | 5.20 | 4.75 | 4.40 | 4.10 | 4.00 | 4.30 | 4.30 | 6.35 |
| 24 | 5.30 | 7.35 | 7.90 | 5.70 | 5.10 | 4.70 | 4.30 | 4.20 | 4.10 | 4.30 | 4.35 | 6.25 |
| 25 | 5.30 | 11.00 | 7.80 | 5.55 | 5.20 | 4.60 | 4.20 | 4.15 | 4.15 | 4.35 | 4.40 | 5.90 |
| 26 | 5.25 | 15.00 | 7.70 | 5.50 | 5.10 | 4.50 | 4.20 | 4.10 | 4.20 | 4.35 | 4.50 | 5.65 |
| 27 | 6.40 | 20.00 | 7.60 | 5.60 | 5.10 | 4.50 | 5.50 | 4.10 | 4.20 | 4.40 | 5.75 | 5.55 |
| 28 | 7.50 | 14.50 | 7.45 | 5.55 | 5.00 | 4.40 | 5.35 | 4.00 | 4.20 | 4.50 | 6.25 | 5.50 |
| 29 | 8.55 | ..... | 6.55 | 5.45 | 4.90 | 4.70 | 5.05 | 4.00 | 6.00 | 4.35 | 5.75 | 5.50 |
| 30 | 6.70 | ..... | 6.70 | 5.40 | 4.80 | 4.70 | 4.75 | 4.00 | 5.55 | 4.30 | 5.20 | 5.40 |
| 31 | 5.45 | ..... | 6.65 | ..... | 4.75 | ..... | 4.55 | 4.00 | ..... | 4.30 | ..... | 5.30 |

*Rating table for South Branch of Shenandoah River at Front Royal, Va., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 4.0 | 360 | 6.4 | 3,100 | 10.0 | 9,580 | 16.0 | 20,380 |
| 4.2 | 470 | 6.6 | 3,460 | 10.5 | 10,480 | 16.5 | 21,280 |
| 4.4 | 605 | 6.8 | 3,820 | 11.0 | 11,380 | 17.0 | 22,180 |
| 4.6 | 750 | 7.0 | 4,180 | 11.5 | 12,280 | 17.5 | 23,080 |
| 4.8 | 915 | 7.2 | 4,540 | 12.0 | 13,180 | 18.0 | 23,980 |
| 5.0 | 1,100 | 7.4 | 4,900 | 12.5 | 14,080 | 18.5 | 24,880 |
| 5.2 | 1,300 | 7.6 | 5,260 | 13.0 | 14,980 | 19.0 | 25,780 |
| 5.4 | 1,520 | 7.8 | 5,620 | 13.5 | 15,880 | 19.5 | 26,680 |
| 5.6 | 1,760 | 8.0 | 5,980 | 14.0 | 16,780 | 20.0 | 27,580 |
| 5.8 | 2,050 | 8.5 | 6,880 | 14.5 | 17,680 | | |
| 6.0 | 2,380 | 9.0 | 7,780 | 15.0 | 18,580 | | |
| 6.2 | 2,740 | 9.5 | 8,680 | 15.5 | 19,480 | | |

*Estimated monthly discharge of South Branch Shenandoah River at Front Royal, Va.*

[Drainage area, 1,569 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 8,680 | 1,355 | 3,676 | 2.34 | 2.70 |
| February | 27,580 | 1,300 | 4,751 | 3.03 | 3.16 |
| March | 33,880 | 3,190 | 7,844 | 5.00 | 5.76 |
| April | 10,480 | 1,520 | 3,698 | 2.36 | 2.63 |
| May | 3,280 | 872 | 1,558 | .99 | 1.14 |
| June | 1,005 | 605 | 822 | .52 | .58 |
| July | 1,640 | 470 | 709 | .45 | .52 |
| August | 750 | 360 | 527 | .34 | .39 |
| September | 2,380 | 275 | 475 | .30 | .33 |
| October | 2,380 | 410 | 835 | .53 | .61 |
| November | 2,830 | 470 | 756 | .48 | .54 |
| December | 6,160 | 1,410 | 3,140 | 2.00 | 2.31 |
| The year | 33,880 | 275 | 2,399 | 1.53 | 20.67 |

SHENANDOAH RIVER AT MILLVILLE, W. VA.

This river, formed by the junction of the North Fork and the South Fork at Riverton, Va., flows in a northeasterly direction into West Virginia, where it empties into the Potomac at Harpers Ferry.

Observations of the height of Potomac River at the junction of Shenandoah River have been made by the Weather Bureau at Harpers Ferry, W. Va. The gage is on the west face and north end of the second abutment of the old railroad bridge from the West Virginia side of the river. It is of Portland cement, 15 inches wide, plastered on the face of the pier extending to 32 feet, and continued on the iron upright of the bridge to 36 feet. The top surface of the 6-by-6-inch-square capstone corresponds to the 32-foot mark on the gage. The elevation is 235.5 feet above mean sea level.

A station was established at Millville, W. Va., April 15, 1895, on Shenandoah River, 4 miles above its mouth. A vertical gage was placed in the river and fastened to a tree, a deep notch being cut in the tree opposite the 8-foot mark. The gage is referred to a bench mark consisting of a copper bolt driven in the foot of a large sycamore tree on the left bank of the river 150 feet below the gage rod, at an elevation of 6.78 feet above the zero mark on the gage. Measurements are made from a cable stretched across the river. The old cable was carried away by the flood of 1896, and a new three-fourths inch galvanized iron-wire cable was put in place on June 23, 1897. The cable, about 500 feet in length, is supported on either bank by a large sycamore tree, and is securely anchored on both sides. The channel is straight, current swift and unobstructed. The banks are low and subject to overflow. The observer is W. R. Nicewarner.

The following discharge measurement was made during 1902 by E. G. Paul.

August 17: Gage height, 0.7 feet; discharge, 811 second-feet.

*Daily gage height, in feet, of Shenandoah River at Millville, W. Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 7.40 | 3.10 | 14.25 | 3.75 | 2.20 | 1.45 | 1.30 | 0.90 | 0.65 | 0.90 | 0.80 | 2.70 |
| 2 | 5.30 | 2.85 | 9.00 | 3.40 | 2.15 | 1.40 | 1.20 | 1.50 | .65 | .85 | .80 | 2.45 |
| 3 | 4.50 | 3.00 | 7.20 | 3.20 | 2.20 | 1.35 | 1.15 | 1.90 | .60 | .80 | .80 | 3.10 |
| 4 | 4.00 | 3.00 | 5.70 | 3.10 | 2.25 | 1.30 | 1.10 | 1.70 | .60 | .70 | .80 | 3.20 |
| 5 | 3.50 | 2.80 | 5.00 | 2.90 | 2.10 | 1.30 | 1.05 | 1.30 | .60 | .90 | .75 | 4.50 |
| 6 | 3.25 | 2.50 | 4.50 | 2.80 | 2.05 | 1.30 | 1.10 | 1.20 | .65 | 1.00 | .75 | 3.40 |
| 7 | 3.00 | 2.80 | 4.20 | 2.60 | 2.00 | 1.40 | 1.10 | 1.10 | .60 | .80 | .70 | 3.70 |
| 8 | 2.85 | 2.70 | 4.20 | 2.80 | 4.00 | 1.25 | 1.05 | 1.05 | .55 | .75 | .70 | 3.20 |
| 9 | 2.75 | [a]2.20 | 5.50 | 6.00 | 2.70 | 1.20 | 1.05 | 1.00 | .60 | 1.10 | .70 | 2.90 |
| 10 | 2.60 | [a]2.20 | 7.80 | 6.90 | 2.40 | 1.20 | 1.00 | .90 | .55 | .90 | .65 | 2.65 |
| 11 | 2.50 | [a]2.10 | 8.00 | 7.20 | 2.10 | 1.15 | .95 | .80 | .55 | 1.00 | .65 | 2.60 |
| 12 | 2.40 | [a]2.20 | 7.40 | 6.20 | 2.00 | 1.10 | .90 | .80 | .55 | 1.00 | .60 | 2.35 |
| 13 | 2.25 | [a]2.10 | 7.20 | 5.60 | 2.00 | 1.10 | .90 | .80 | .50 | 1.20 | .65 | 2.80 |
| 14 | 2.40 | [a]2.00 | 7.00 | 5.00 | 1.95 | 1.00 | .90 | .80 | .50 | 1.75 | .70 | 3.40 |
| 15 | 2.20 | [a]2.10 | 6.00 | 4.40 | 1.90 | 1.10 | .80 | .80 | .55 | 1.55 | .65 | 3.40 |
| 16 | 2.10 | 1.50 | 5.00 | 3.90 | 1.80 | 1.20 | .80 | .75 | .55 | 1.30 | .60 | 3.40 |
| 17 | 2.00 | 1.90 | 5.20 | 3.60 | 1.70 | 1.20 | .80 | .70 | .50 | 1.15 | .65 | 4.40 |
| 18 | 1.90 | 2.00 | 5.90 | 3.40 | 1.70 | 1.10 | .80 | .70 | .50 | 1.00 | .80 | 4.30 |
| 19 | 1.85 | 2.00 | 5.00 | 3.20 | 1.75 | 1.60 | .75 | .85 | .50 | .95 | .80 | 4.00 |
| 20 | 1.80 | 1.70 | 4.40 | 3.00 | 1.80 | 1.40 | .75 | .80 | .55 | .90 | .90 | 3.50 |
| 21 | 1.90 | 1.00 | 4.10 | 2.80 | 1.75 | 1.20 | .80 | .80 | .60 | .85 | .80 | 3.10 |
| 22 | 3.20 | 2.40 | 3.80 | 2.70 | 1.65 | 1.20 | .80 | .80 | .60 | .80 | .90 | 2.90 |
| 23 | 3.40 | 4.05 | 3.50 | 2.60 | 1.60 | 1.10 | .80 | .80 | .60 | .75 | 1.00 | 2.70 |
| 24 | 2.90 | 3.90 | 3.20 | 2.50 | 1.60 | 1.10 | .75 | .80 | .55 | .70 | 1.00 | 2.50 |
| 25 | 2.50 | 4.70 | 3.10 | 2.40 | 1.60 | 1.20 | .75 | .80 | .55 | .70 | 1.00 | 2.30 |
| 26 | 2.30 | [b] | 2.95 | 2.30 | 1.60 | 1.20 | .80 | .75 | .60 | .70 | 1.20 | 2.20 |
| 27 | 2.50 | [b] | 2.80 | 2.25 | 2.20 | 1.15 | 1.00 | .70 | .60 | .65 | 2.00 | 2.10 |
| 28 | 3.60 | 11.00 | 2.75 | 2.20 | 1.75 | 1.10 | .90 | .70 | .60 | .90 | 2.50 | 2.10 |
| 29 | 4.40 | ..... | 3.00 | 2.20 | 1.60 | 1.30 | 1.30 | .70 | .65 | .85 | 2.40 | 2.10 |
| 30 | 3.60 | ..... | 3.80 | 2.20 | 1.55 | 1.40 | 1.30 | .65 | 1.00 | .80 | 2.10 | 1.90 |
| 31 | 3.30 | ..... | 3.90 | ..... | 1.50 | ..... | 1.40 | .65 | ..... | .80 | ..... | 1.80 |

[a] Backed by ice.

[b] Flood; no measurement.

*Rating table for Shenandoah River at Millville, W. Va., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 0.4 | 540 | 2.8 | 4,160 | 5.2 | 10,960 | 7.6 | 18,640 |
| .6 | 740 | 3.0 | 4,600 | 5.4 | 11,600 | 7.8 | 19,280 |
| .8 | 940 | 3.2 | 5,060 | 5.6 | 12,240 | 8.0 | 19,920 |
| 1.0 | 1,140 | 3.4 | 5,540 | 5.8 | 12,880 | 8.5 | 21,520 |
| 1.2 | 1,370 | 3.6 | 6,050 | 6.0 | 13,520 | 9.0 | 23,120 |
| 1.4 | 1,650 | 3.8 | 6,600 | 6.2 | 14,160 | 9.5 | 24,720 |
| 1.6 | 1,950 | 4.0 | 7,190 | 6.4 | 14,800 | 10.0 | 26,320 |
| 1.8 | 2,260 | 4.2 | 7,790 | 6.6 | 15,440 | 10.5 | 27,920 |
| 2.0 | 2,600 | 4.4 | 8,410 | 6.8 | 16,080 | 11.0 | 29,520 |
| 2.2 | 2,960 | 4.6 | 9,040 | 7.0 | 16,720 | | |
| 2.4 | 3,340 | 4.8 | 9,680 | 7.2 | 17,360 | | |
| 2.6 | 3,740 | 5.0 | 10,320 | 7.4 | 18,000 | | |

*Estimated monthly discharge of Shenandoah River at Millville, W. Va.*

[Drainage area, 2,995 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 18,000 | 2,260 | 4,998 | 1.67 | 1.93 |
| February | 29,520 | 1,140 | 6,503 | 2.17 | 2.26 |
| March | 39,920 | 4,055 | 11,551 | 3.86 | 4.45 |
| April | 17,360 | 2,960 | 6,423 | 2.14 | 2.39 |
| May | 7,190 | 1,800 | 2,613 | .87 | 1.00 |
| June | 1,725 | 1,140 | 1,425 | .48 | .54 |
| July | 1,650 | 890 | 1,122 | .37 | .43 |
| August | 2,430 | 790 | 1,089 | .36 | .42 |
| September | 1,140 | 640 | 728 | .24 | .27 |
| October | 2,180 | 790 | 1,095 | .37 | .43 |
| November | 3,540 | 740 | 1,209 | .40 | .45 |
| December | 8,720 | 2,260 | 4,653 | 1.55 | 1.79 |
| The year | 39,920 | 640 | 3,618 | 1.21 | 16.36 |

## POTOMAC RIVER AT POINT OF ROCKS, MD.

This station was established February 17, 1895, at the toll bridge over the Potomac River at Point of Rocks. It has been described and results of measurements have been given in the various annual reports and in the Water-Supply and Irrigation Papers containing reports of the operations at river stations. More or less difficulty has been experienced with the wire gage, due to its stretching, and no record of this lengthening has been noted. A thorough study of the changes of the gage have been made in this office, based on measurements and on a study of the average depth of soundings, with the result that it has been found necessary to modify the gage heights in order to refer them to a common datum. This has also necessitated a revision of the rating table. In some cases it has been impossible to reduce the measurements to the known datum, and it has therefore been thought best to discard them and to publish here only such gage heights and discharge measurements as could be reduced to a common datum and on which reliance can be placed as giving a correct estimate of the discharge.

As originally placed the gage was located in the third span of the bridge from the north shore. The next year (1896) the wire became rusted and broke frequently, and a new wire gage was placed in the east side of the first span of the bridge, but it was referred to a different datum. During 1897 there was a further change in the length of the gage, which was not recorded, and therefore it has been necessary to discard the records during those two years—that is, 1896 and 1897.

On January 25, 1898, the gage wire was compared with the bench mark, and the observations since that date have been referred to this datum. The bench mark to which the gage has been referred is a copper bolt in a large capstone on the lower wing wall of the north abutment, about 10 feet from the north end of the first iron truss, and 41.30 feet above the datum of the gage. The length of the cable of the wire gage is 44.22 feet. The measurements of 1895 are considered correct within themselves, but there was a difference between the datum of that gage and that of the present standard of 0.4 foot, making it necessary to deduct that amount from the gage readings of 1895 in order to reduce them to the present datum.

On September 2, 1902, a standard chain-and-weight gage was installed at this station to take the place of the wire gage then in use, and is referred to a horizontal scale board graduated to feet and tenths, inclosed in lock box, which is secured by bolts to the end rail of the lower side of the bridge near the left bank. The length of the chain from the zero to the extreme end of the weight is 44.22 feet.

*Daily gage height, in feet, of Potomac River at Point of Rocks, Md.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 11.70 | 3.70 | 22.50 | 5.70 | 2.70 | 1.80 | 1.70 | 1.70 | 1.00 | 1.20 | 1.00 | 2.70 |
| 2 | 7.20 | 3.50 | 29.00 | 5.00 | 2.60 | 1.80 | 1.80 | 1.60 | .90 | 1.20 | 1.00 | 2.80 |
| 3 | 5.60 | 3.30 | 16.10 | 4.50 | 2.60 | 1.70 | 1.90 | 1.90 | .90 | 1.10 | 1.00 | 2.90 |
| 4 | 4.80 | 3.20 | 10.20 | 4.10 | 2.60 | 1.60 | 1.90 | 1.90 | .90 | 1.00 | 1.00 | 3.40 |
| 5 | 4.20 | 2.80 | 8.10 | 4.00 | 2.50 | 1.60 | 1.80 | 2.00 | .90 | 1.10 | 1.00 | 5.50 |
| 6 | 3.80 | 2.40 | 6.70 | 3.80 | 2.50 | 1.50 | 1.80 | 1.80 | .90 | 1.20 | 1.00 | 4.40 |
| 7 | 3.50 | 2.50 | 5.80 | 4.00 | 2.50 | 1.50 | 1.70 | 1.70 | .80 | 1.20 | .90 | 4.20 |
| 8 | 3.20 | 2.60 | 6.70 | 6.45 | 2.40 | 1.50 | 1.70 | 1.70 | .80 | 1.10 | .90 | 4.00 |
| 9 | 3.10 | 2.50 | 7.40 | 16.40 | 3.10 | 1.40 | 1.60 | 1.60 | .80 | 1.10 | .90 | 3.80 |
| 10 | 3.00 | 2.50 | 8.50 | 14.30 | 2.70 | 1.40 | 1.60 | 1.50 | .80 | 1.10 | .90 | 3.50 |
| 11 | 2.80 | 3.50 | 12.00 | 12.90 | 2.50 | 1.40 | 1.60 | 1.40 | .80 | 1.10 | .90 | 3.20 |
| 12 | 2.70 | 4.00 | 12.40 | 12.20 | 2.30 | 1.40 | 1.50 | 1.30 | .80 | 1.40 | .90 | 3.60 |
| 13 | 2.50 | 4.20 | 14.00 | 11.50 | 2.20 | 1.30 | 1.50 | 1.30 | .70 | 1.60 | 1.00 | 4.90 |
| 14 | 2.30 | 4.40 | 13.80 | 9.30 | 2.10 | 1.40 | 1.50 | 1.20 | .70 | 1.90 | 1.00 | 7.20 |
| 15 | 2.10 | 5.20 | 12.00 | 7.80 | 2.10 | 1.40 | 1.40 | 1.20 | .70 | 2.00 | 1.00 | 6.80 |
| 16 | 2.10 | 5.40 | 10.20 | 6.50 | 2.00 | 1.40 | 1.40 | 1.20 | .70 | 2.10 | 1.00 | 5.70 |
| 17 | 2.10 | 5.50 | 8.20 | 5.90 | 1.90 | 1.30 | 1.30 | 1.20 | .70 | 2.00 | 1.00 | 7.20 |
| 18 | 2.10 | 5.20 | 10.60 | 5.30 | 1.90 | 1.30 | 1.30 | 1.20 | .70 | 1.80 | 1.00 | 9.90 |
| 19 | 2.10 | 4.80 | 8.70 | 4.90 | 1.90 | 1.30 | 1.30 | 1.20 | .70 | 1.60 | 1.00 | 8.00 |
| 20 | 2.10 | 4.50 | 6.60 | 4.60 | 2.60 | 1.30 | 1.30 | 1.20 | .70 | 1.40 | 1.00 | 5.90 |
| 21 | 2.30 | 4.50 | 5.50 | 4.00 | 2.00 | 1.30 | 1.30 | 1.10 | .70 | 1.20 | .90 | 5.20 |
| 22 | 3.00 | 5.60 | 4.50 | 3.50 | 2.00 | 1.30 | 1.40 | 1.10 | .70 | 1.10 | .90 | 4.80 |
| 23 | 6.70 | 7.00 | 4.10 | 3.30 | 1.90 | 1.30 | 1.40 | 1.10 | .70 | 1.00 | .90 | 5.00 |
| 24 | 5.20 | 4.10 | 3.80 | 3.00 | 1.90 | 1.30 | 1.30 | 1.10 | .70 | .90 | .90 | 5.20 |
| 25 | 3.20 | 4.40 | 3.60 | 2.90 | 1.90 | 1.20 | 1.20 | 1.20 | .90 | .90 | 1.30 | 4.80 |
| 26 | 3.00 | 17.75 | 3.50 | 2.80 | 2.00 | 1.40 | 1.20 | 1.20 | .80 | .90 | 1.50 | 4.20 |
| 27 | 3.50 | 26.90 | 3.50 | 2.90 | 2.20 | 1.50 | 1.10 | 1.10 | .80 | .80 | 1.90 | 3.60 |
| 28 | 5.20 | 19.00 | 3.60 | 2.80 | 2.00 | 1.40 | 1.10 | 1.10 | .80 | 1.00 | 3.00 | 3.50 |
| 29 | 5.00 | ..... | 3.70 | 2.70 | 1.90 | 1.40 | 1.10 | 1.20 | .80 | 1.00 | 3.50 | 3.00 |
| 30 | 4.50 | ..... | 4.30 | 2.70 | 1.90 | 1.40 | 1.70 | 1.10 | 1.00 | 1.10 | 2.80 | 2.60 |
| 31 | 4.20 | ..... | 6.40 | ..... | 1.90 | ..... | 1.80 | 1.00 | ..... | 1.10 | ..... | 2.80 |

*Rating table for Potomac River at Point of Rocks, Md., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 0.2 | 455 | 2.6 | 8,835 | 5.0 | 22,700 | 7.4 | 40,275 |
| .4 | 570 | 2.8 | 9,870 | 5.2 | 24,040 | 7.6 | 41,935 |
| .6 | 900 | 3.0 | 10,925 | 5.4 | 25,380 | 7.8 | 43,610 |
| .8 | 1,356 | 3.2 | 11,990 | 5.6 | 26,720 | 8.0 | 45,290 |
| 1.0 | 1,906 | 3.4 | 13,075 | 5.8 | 28,080 | 8.5 | 49,490 |
| 1.2 | 2,556 | 3.6 | 14,180 | 6.0 | 29,485 | 9.0 | 53,690 |
| 1.4 | 3,286 | 3.8 | 15,305 | 6.2 | 30,920 | 9.5 | 57,940 |
| 1.6 | 4,106 | 4.0 | 16,450 | 6.4 | 32,410 | 10.0 | 62,190 |
| 1.8 | 5,005 | 4.2 | 17,620 | 6.6 | 33,930 | 10.5 | 66,440 |
| 2.0 | 5,925 | 4.4 | 18,830 | 6.8 | 35,460 | 11.0 | 70,690 |
| 2.2 | 6,855 | 4.6 | 20,080 | 7.0 | 37,000 | | |
| 2.4 | 7,825 | 4.8 | 21,370 | 7.2 | 38,615 | | |

*Estimated monthly discharge of Potomac River at Point of Rocks, Md.*

[Drainage area, 9,654 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 76,640 | 6,385 | 19,079 | 1.98 | 2.28 |
| February | 205,840 | 7,825 | 31,942 | 3.31 | 3.44 |
| March | 223,690 | 13,625 | 54,746 | 5.67 | 6.54 |
| April | 116,590 | 9,350 | 32,232 | 3.34 | 3.73 |
| May | 11,455 | 5,465 | 7,072 | .73 | .84 |
| June | 5,005 | 2,556 | 3,413 | .35 | .39 |
| July | 5,465 | 2,221 | 3,706 | .38 | .44 |
| August | 5,925 | 1,906 | 3,210 | .33 | .38 |
| September | 1,906 | 1,122 | 1,351 | .14 | .16 |
| October | 6,385 | 1,356 | 2,906 | .30 | .35 |
| November | 13,625 | 1,616 | 3,011 | .31 | .35 |
| December | 61,340 | 8,835 | 21,382 | 2.22 | 2.56 |
| The year | 223,690 | 1,122 | 15,338 | 1.59 | 21.46 |

## MONOCACY RIVER NEAR FREDERICK, MD.

Monocacy River rises in the south-central part of Pennsylvania and flows in a southerly direction through Frederick County, Md., entering Potomac River near the Montgomery County line. A station was established by E. G. Paul, August 4, 1896, at the county iron bridge on the turnpike, 4 miles northeast of Frederick, on the road leading from Frederick to Mount Pleasant, Md., and about 2,000 feet above the mouth of Israel Creek and 3,000 feet below the mouth of Tuscarora Creek, as shown on the Frederick atlas sheet. The drainage area is 665 square miles at this point and 1,000 square miles at the mouth. The gage is attached to the floor timber on the lower side of the bridge. The length of the wire is 35.20 feet. The bench mark is a cross cut in the top face of the capstone on the lower retaining wall of the bridge abutment on the right bank of the stream, and is 29.17 feet above gage datum.

On September 3, 1902, the wire gage in use at this station was replaced by a standard chain and weight gage, referred to a horizontal scale board graduated to feet and tenths, inclosed in a lock box, which is secured to the floor timber on the lower side of the bridge 100 feet from the right bank, by lag bolts. The length of the chain from the zero to the extreme end of the weight is 35.20 feet.

The stream at this station has two channels, being divided by a small, low island, which serves as a foundation for the middle pier of the bridge. The right channel is measured from the lower side of the bridge, and the left channel from the upper side, as these sections are freer from rocks than a continuous section on either side of the bridge. The stream is subject to high water and sudden floods, owing to the character of its upper watershed. The observer is E. L. Derr, a farmer near Frederick, Md.

The following discharge measurement was made during 1902 by E. G. Paul:

September 4; Gage height, 374 feet; discharge, 100 second-feet.

*Daily gage height, in feet, of Monocacy River near Frederick, Md.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 8.50 | 5.90 | 25.20 | 7.00 | 5.20 | 4.30 | 6.90 | 5.20 | 3.70 | 4.60 | 5.10 | 9.50 |
| 2 | 8.20 | 5.90 | 14.50 | 6.90 | 5.10 | 4.30 | 6.40 | 4.50 | 3.70 | 6.00 | 5.00 | 7.90 |
| 3 | 7.10 | 5.90 | 10.90 | 10.50 | 5.10 | 4.30 | 4.90 | 4.20 | 3.70 | 5.10 | 4.90 | 16.00 |
| 4 | 6.00 | 8.50 | 10.20 | 8.50 | 5.00 | 4.20 | 4.80 | 4.10 | 3.70 | 4.20 | 4.70 | 8.60 |
| 5 | 7.90 | 8.50 | 9.60 | 8.30 | 4.90 | 4.20 | 4.80 | 4.10 | 3.90 | 4.50 | 4.60 | 8.20 |
| 6 | 8.20 | 8.10 | 9.20 | 8.00 | 4.90 | 4.10 | 4.80 | 4.20 | 3.70 | 7.10 | 4.50 | 7.90 |
| 7 | 8.10 | 7.90 | 9.10 | 7.90 | 4.80 | 4.10 | 4.80 | 4.20 | 3.60 | 5.20 | 4.40 | 7.80 |
| 8 | 7.50 | 7.80 | 8.90 | 7.50 | 4.80 | 4.10 | 4.60 | 4.10 | 3.60 | 5.10 | 4.60 | 7.80 |
| 9 | 5.90 | 7.40 | 9.90 | 17.90 | 4.70 | 4.10 | 4.50 | 4.00 | 3.60 | 5.00 | 4.50 | 7.50 |
| 10 | 5.50 | 6.90 | 15.20 | 16.90 | 4.70 | 4.10 | 4.40 | 4.00 | 3.60 | 4.90 | 4.50 | 7.40 |
| 11 | 5.40 | 6.50 | 15.50 | 8.20 | 4.70 | 4.10 | 4.30 | 4.00 | 3.60 | 5.50 | 4.50 | 7.90 |
| 12 | 5.40 | 6.50 | 12.20 | 7.50 | 4.60 | 4.00 | 4.20 | 4.00 | 3.52 | 12.80 | 4.40 | 9.20 |
| 13 | 5.30 | 6.50 | 14.50 | 7.30 | 4.60 | 7.10 | 4.10 | 3.90 | 3.50 | 8.10 | 4.40 | 11.50 |
| 14 | 5.30 | 6.30 | 10.10 | 6.90 | 4.60 | 5.50 | 4.00 | 3.90 | 3.50 | 6.50 | 4.40 | 9.50 |
| 15 | 5.20 | 6.10 | 10.00 | 6.50 | 4.60 | 4.20 | 4.00 | 3.80 | 3.50 | 5.10 | 4.30 | 8.20 |
| 16 | 5.10 | 5.90 | 9.50 | 6.30 | 4.60 | 4.20 | 3.90 | 3.80 | 3.50 | 4.90 | 4.20 | 15.30 |
| 17 | 4.90 | 5.90 | 14.60 | 6.10 | 4.50 | 4.20 | 3.90 | 3.80 | 3.50 | 4.70 | 4.20 | 14.50 |
| 18 | 4.90 | 5.90 | 10.20 | 5.90 | 4.50 | 4.10 | 3.90 | 3.80 | 3.50 | 4.60 | 4.20 | 8.50 |
| 19 | 4.90 | 5.90 | 8.40 | 5.80 | 4.50 | 4.10 | 4.10 | 3.80 | 3.50 | 4.50 | 4.60 | 8.20 |
| 20 | 4.90 | 6.10 | 8.10 | 5.70 | 4.50 | 4.10 | 4.10 | 3.80 | 3.60 | 4.40 | 4.50 | 9.50 |
| 21 | 7.20 | 10.20 | 7.90 | 5.60 | 4.50 | 4.20 | 5.20 | 3.70 | 3.60 | 4.30 | 4.40 | 10.50 |
| 22 | 18.05 | 14.40 | 7.40 | 5.50 | 4.50 | 4.20 | 4.30 | 3.70 | 3.60 | 4.20 | 4.30 | 17.10 |
| 23 | 7.10 | 9.60 | 7.10 | 5.40 | 4.50 | 4.10 | 4.20 | 3.70 | 3.50 | 4.20 | 4.20 | 14.20 |
| 24 | 6.90 | 9.40 | 6.90 | 5.30 | 4.40 | 4.10 | 4.10 | 3.60 | 3.50 | 4.20 | 4.20 | 8.40 |
| 25 | 6.10 | 10.50 | 6.50 | 5.30 | 4.40 | 4.10 | 4.10 | 3.60 | 3.80 | 4.10 | 4.20 | 7.50 |
| 26 | 6.90 | 24.03 | 6.30 | 5.20 | 4.40 | 5.90 | 4.00 | 3.60 | 4.00 | 4.10 | 5.90 | 7.20 |
| 27 | 11.15 | 21.40 | 6.00 | 5.10 | 4.50 | 5.60 | 4.00 | 3.60 | 9.10 | 4.10 | 9.40 | 6.90 |
| 28 | 7.50 | 19.35 | 6.00 | 5.00 | 4.50 | 5.10 | 3.90 | 4.10 | 5.10 | 13.70 | 7.90 | 6.50 |
| 29 | 6.90 | ..... | 5.90 | 5.20 | 4.40 | 4.50 | 3.90 | 3.90 | 4.90 | 9.50 | 5.90 | 6.40 |
| 30 | 6.50 | ..... | 5.60 | 5.20 | 4.30 | 4.50 | 4.50 | 3.70 | 4.80 | 5.50 | 5.90 | 6.20 |
| 31 | 6.20 | ..... | 6.20 | ..... | 4.30 | ..... | 5.50 | 3.70 | ..... | 5.30 | ..... | 5.50 |

*Rating table for Monocacy River near Frederick, Md., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 3.6 | 45 | 6.2 | 1,192 | 10.0 | 4,460 | 16.5 | 10,050 |
| 3.8 | 90 | 6.4 | 1,364 | 10.5 | 4,890 | 17.0 | 10,480 |
| 4.0 | 150 | 6.6 | 1,536 | 11.0 | 5,320 | 17.5 | 10,910 |
| 4.2 | 210 | 6.8 | 1,708 | 11.5 | 5,750 | 18.0 | 11,340 |
| 4.4 | 270 | 7.0 | 1,880 | 12.0 | 6,180 | 18.5 | 11,770 |
| 4.6 | 340 | 7.2 | 2,052 | 12.5 | 6,610 | 19.0 | 12,200 |
| 4.8 | 420 | 7.4 | 2,224 | 13.0 | 7,040 | 19.5 | 13,060 |
| 5 0 | 500 | 7.6 | 2,396 | 13.5 | 7,470 | ..... | ..... |
| 5.2 | 600 | 7.8 | 2,568 | 14.0 | 7,900 | ..... | ..... |
| 5.4 | 700 | 8.0 | 2,740 | 14.5 | 8,330 | ..... | ..... |
| 5.6 | 800 | 8.5 | 3,170 | 15.0 | 8,760 | ..... | ..... |
| 5.8 | 900 | 9.0 | 3,600 | 15.5 | 9,190 | ..... | ..... |
| 6.0 | 1,020 | 9.5 | 4,030 | 16.0 | 9,620 | ..... | ..... |

*Estimated monthly discharge of Monocacy River near Frederick, Md.*

[Drainage area, 665 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 11,283 | 460 | 1,918 | 2.88 | 3.32 |
| February | 16,500 | 960 | 3,645 | 5.48 | 5.71 |
| March | 17,532 | 800 | 4,398 | 6.61 | 7.62 |
| April | 11,254 | 500 | 2,206 | 3.32 | 3.70 |
| May | 600 | 240 | 358 | .54 | .62 |
| June | 1,966 | 180 | 338 | .51 | .57 |
| July | 1,794 | 120 | 351 | .53 | .61 |
| August | 600 | 45 | 137 | .21 | .24 |
| September | 3,686 | 27 | 215 | .32 | .36 |
| October | 7,642 | 180 | 1,135 | 1.71 | 1.97 |
| November | 3,944 | 210 | 567 | .85 | .95 |
| December | 10,566 | 750 | 3,835 | 5.77 | 6.65 |
| The year | 17,532 | 27 | 1,592 | 2.39 | 32.32 |

## JAMES RIVER BASIN.

James River, like the Potomac, rises among mountain ridges, having a general northeasterly and southwesterly trend, the tributaries flowing along narrow valleys and finally uniting to cut the mountains transversely, the waters escaping in a southeasterly direction toward the sea. The main stream is formed by the junction of Jackson and Cowpasture rivers, both of these rising in the central part of the western border of Virginia. The river and the water powers along it are fully described by Prof. George F. Swain in his report of the Water Powers of the Middle Atlantic Watershed, pages 13–33, contained in Vol. XVI of the Tenth Census.

Records of measurements have been kept as in previous years on North (of James) River at Glasgow, Va.; on James River at Buchanan, Va., Holcomb Rock, Va., and at Cartersville, Va., and on the Appomattox River at Mattoax, Va.

The description of the stations, together with the records for 1902, are given in the following pages.

### NORTH (OF JAMES) RIVER AT GLASGOW, VA.

This river rises on the western slope of the Shenandoah Mountains, and flows in a southeasterly direction across the valley between the Shenandoah and Blue Ridge ranges, emptying into James River about 17 miles south of Lexington, Va. Its drainage basin is largely under cultivation, except in the upper part, where it is mountainous and covered with forest growth. This station was established at the East Glasgow County bridge, about 1 mile above the mouth of North River, by C. C. Babb and D. C. Humphreys, on August 21, 1895. The height of water is observed by means of a wire gage, the board being placed on the guard rail on the lower side of the bridge, and graduated in feet and tenths. This gage is referred to a bench mark at the top of the top chord of the bridge over the gage pulley at an elevation of 32.24 feet. The distance from the end of the weight to the marker of the gage is 27.86 feet. The measurements of discharge are made from the bridge, the initial point for soundings being on the left bank. The channel is straight for about 600 feet above and below the station; the current rather sluggish, but with sufficient velocity for measurements. There is a dam on the North River 10 miles above the station, but its influence on the flow is scarcely noticeable. The right bank is high, but the left bank is subject to overflow in very high water. The bed is of rock and gravel and fairly permanent. The observer is B. G. Baldwin, a merchant of Glasgow, Va.

The following discharge measurements were made during 1902 by D. C. Humphreys:

June 25: Gage height, 1.90 feet; discharge, 907 second-feet.
July 10: Gage height, 0.83 feet; discharge, 201 second-feet.
August 20: Gage height, 0.61 feet; discharge, 132 second-feet.

*Daily gage height, in feet, of North (of James) River at Glasgow, Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 5.20 | 3.00 | 9.00 | 2.85 | 1.40 | 1.00 | 1.30 | 1.05 | 0.50 | 0.65 | 0.60 | 1.90 |
| 2 | 4.60 | 2.70 | 4.85 | 2.55 | 1.35 | 1.00 | 1.15 | [a]1.00 | .51 | .60 | .55 | 2.20 |
| 3 | 3.30 | 2.70 | 4.15 | 2.20 | 1.50 | .98 | .95 | 1.00 | .50 | [b].60 | .70 | 2.40 |
| 4 | 2.65 | 2.60 | 3.60 | 2.10 | 1.50 | .98 | .85 | .95 | .51 | [b].65 | .70 | 2.80 |
| 5 | 2.55 | 2.45 | 3.45 | 2.00 | 1.48 | .95 | .82 | .95 | .51 | 1.12 | .65 | 2.75 |
| 6 | 2.45 | 2.25 | 3.00 | 2.00 | 1.48 | .95 | .80 | .90 | .50 | 1.35 | .55 | 2.15 |
| 7 | 2.20 | 2.15 | 2.80 | 2.50 | 1.45 | .90 | .80 | .90 | .50 | .95 | .60 | 1.90 |
| 8 | 2.10 | 2.00 | 2.80 | 2.85 | 1.45 | .90 | .80 | .85 | .50 | .75 | .70 | 1.85 |
| 9 | 2.00 | 1.85 | 3.85 | 3.75 | 1.50 | .90 | .80 | .85 | .52 | .70 | .72 | 1.80 |
| 10 | 1.90 | 1.65 | 4.90 | 3.85 | 1.40 | .90 | .78 | .80 | .50 | .70 | .72 | 1.60 |
| 11 | 1.82 | 1.60 | 4.00 | 3.50 | 1.35 | .90 | .75 | .80 | .50 | .70 | .70 | 1.50 |
| 12 | 1.70 | 1.58 | 3.60 | 3.30 | 1.30 | 1.00 | .75 | .75 | .50 | 1.40 | .70 | 1.50 |
| 13 | 1.65 | 1.52 | 4.00 | 3.80 | 1.28 | 2.25 | .72 | .75 | .50 | 1.20 | .65 | 1.60 |
| 14 | 1.60 | 1.50 | 3.50 | 3.00 | 1.25 | 1.30 | .70 | .70 | .50 | 1.00 | .65 | 1.60 |
| 15 | 1.55 | 1.50 | 3.15 | 2.35 | 1.25 | 1.15 | .68 | .70 | .51 | .90 | .65 | 2.00 |
| 16 | 1.52 | 1.45 | 3.00 | 2.25 | 1.20 | 1.12 | .65 | .70 | .50 | .85 | .70 | 2.60 |
| 17 | 1.50 | 1.42 | 3.50 | 2.20 | 1.15 | 1.10 | .65 | .70 | .50 | .80 | 1.10 | 4.30 |
| 18 | 1.45 | 1.50 | 3.00 | 2.10 | 1.12 | 1.05 | .62 | .70 | .50 | .75 | 1.00 | 3.10 |
| 19 | 1.42 | 1.45 | 2.65 | 2.00 | 1.10 | 1.00 | .62 | .70 | .50 | .72 | .95 | 2.60 |
| 20 | 1.40 | 1.40 | 2.45 | 1.90 | 1.25 | 1.00 | .60 | .61 | .50 | .70 | .90 | 2.20 |
| 21 | 1.45 | 2.30 | 2.40 | 1.80 | 1.15 | .95 | .60 | .55 | .50 | .62 | .85 | 2.00 |
| 22 | 1.50 | 2.10 | 2.35 | 1.75 | 1.10 | .95 | .58 | .50 | .52 | .58 | .80 | 2.00 |
| 23 | 1.45 | 1.49 | 2.30 | 1.70 | 1.10 | .92 | .58 | .50 | .55 | .65 | .80 | 1.85 |
| 24 | 1.48 | 2.50 | 2.25 | 1.65 | 1.10 | .92 | .55 | .51 | .50 | .58 | .80 | 1.75 |
| 25 | 1.42 | 10.20 | 2.20 | 1.60 | 1.10 | 1.90 | .58 | .50 | .56 | .55 | .80 | 1.60 |
| 26 | 2.60 | 7.50 | 2.10 | 1.55 | 1.15 | 1.15 | .60 | .52 | .60 | .52 | 1.80 | 1.60 |
| 27 | 3.90 | 5.60 | 2.00 | 1.50 | 1.10 | 1.15 | .60 | .52 | .60 | .62 | 2.20 | 1.50 |
| 28 | 4.10 | 12.58 | 1.90 | 1.48 | 1.08 | 1.10 | .60 | .51 | .60 | .72 | 1.80 | 1.45 |
| 29 | 3.50 | ..... | 1.85 | 1.45 | 1.08 | 1.10 | .62 | .50 | .57 | .75 | 1.90 | 1.40 |
| 30 | 3.25 | ..... | 2.15 | 1.40 | 1.05 | 1.10 | .70 | .50 | .56 | .80 | 2.10 | 1.40 |
| 31 | 3.00 | ..... | 3.30 | ..... | 1.05 | ..... | 1.18 | .51 | ..... | .79 | ..... | 1.30 |

[a] Interpolated August 2 to 19, inclusive. [b] Interpolated.

*Rating table for North (of James) River at Glasgow, Va., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 0.0 | 25 | 2.2 | 1,260 | 4.4 | 4,860 | 7.5 | 11,145 |
| .2 | 50 | 2.4 | 1,500 | 4.6 | 5,239 | 8.0 | 12,170 |
| .4 | 100 | 2.6 | 1,770 | 4.8 | 5,628 | 8.5 | 13,195 |
| .6 | 150 | 2.8 | 2,050 | 5.0 | 6,030 | 9.0 | 14,220 |
| .8 | 200 | 3.0 | 2,350 | 5.2 | 6,438 | 10.0 | 16,270 |
| 1.0 | 270 | 3.2 | 2,760 | 5.4 | 6,846 | 11.0 | 18,320 |
| 1.2 | 380 | 3.4 | 3,090 | 5.6 | 7,254 | 12.0 | 20,370 |
| 1.4 | 500 | 3.6 | 3,430 | 5.8 | 7,662 | 13.0 | 22,420 |
| 1.6 | 660 | 3.8 | 3,770 | 6.0 | 8,070 | 14.0 | 24,470 |
| 1.8 | 840 | 4.0 | 4,130 | 6.5 | 9,095 | ..... | ..... |
| 2.0 | 1,020 | 4.2 | 4,490 | 7.0 | 10,120 | ..... | ..... |

*Estimated monthly discharge of North (of James) River at Glasgow, Va.*

[Drainage area, 831 square miles.]

| Month | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 6,438 | 500 | 1,666 | 2.00 | 2.31 |
| February | 13,400 | 500 | 2,628 | 3.16 | 3.29 |
| March | 14,220 | 885 | 2,881 | 3.47 | 4.00 |
| April | 3,860 | 500 | 1,519 | 1.83 | 2.04 |
| May | 580 | 297 | 419 | .50 | .58 |
| June | 1,320 | 235 | 340 | .41 | .46 |
| July | 440 | 137 | 194 | .23 | .27 |
| August | 297 | 125 | 181 | .22 | .25 |
| September | 150 | 125 | 129 | .15 | .17 |
| October | 500 | 125 | 210 | .25 | .29 |
| November | 1,260 | 137 | 324 | .39 | .44 |
| December | 4,680 | 440 | 1,140 | 1.37 | 1.58 |
| The year | 14,220 | 125 | 969 | 1.16 | 15.68 |

## JAMES RIVER AT BUCHANAN, VA.

This river rises in the Allegheny Mountains, on the western border of Virginia, and flows in an easterly direction across the State into Chesapeake Bay. The upper part of its drainage area is mountainous and largely covered with forests, while in the eastern part of the State the river flows through a flat and cultivated area. Measurements of flow are made at Buchanan, in Botetourt County, and at Cartersville, 50 miles above Richmond. The station at Buchanan was established by C. C. Babb and D. C. Humphreys, August 18, 1895. It is about 20 miles above the mouth of North River and one-half mile above the mouth of Purgatory Creek, as shown on the Natural Bridge topographic atlas sheet. The area as far as this point is mapped on the Natural Bridge, Staunton, Monterey, Lewisburg, Dublin, Christiansburg, and Roanoke sheets. The United States Weather Bureau had maintained a gage here for about two years before measurements were made by the Geological Survey. The wire gage is suspended from the steel highway bridge, which crosses the river on two spans. On April 3, 1897, the zero of this gage was lowered 2 feet to avoid negative readings. The gage is referred to a scale divided into feet and tenths, and to two bench marks. First, the top of the upper end of the third floor beam from left bank is 30 feet above the zero of the

gage. Second, the top of a stone post under the southwest corner of the porch of the Chesapeake and Ohio Railroad passenger station is 24.68 feet above zero of gage. A third bench mark is on a permanent ledge of rock on the left bank about 500 feet above the bridge, and at an elevation of 17.48 feet above the zero of the gage. The initial point of soundings is on the left bank, upper side of the bridge, marked with the end pin of the truss. The channel is straight, the flow fairly swift, and without obstructions. The bed is rocky; banks high and not subject to overflow. The observer is U. H. Hyde, a telegraph operator for the Chesapeake and Ohio Railroad, at Buchanan, Va.

The following discharge measurements were made during 1902 by D. C. Humphreys:

July 19: Gage height, 2.12 feet; discharge, 519 second-feet.
August 25: Gage height, 1.90 feet; discharge, 365 second-feet.

*Daily gage height, in feet, of James River at Buchanan, Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 7.35 | 6.15 | 19.05 | 5.40 | 3.00 | 2.60 | 3.15 | 2.20 | 2.00 | 2.20 | 2.10 | 3.80 |
| 2 | 6.20 | 5.80 | 9.05 | 4.95 | 3.00 | 2.60 | 2.85 | 2.45 | 2.00 | 2.20 | 2.10 | 4.55 |
| 3 | 5.40 | 5.70 | 7.50 | 4.65 | 3.00 | 2.60 | 2.65 | 2.40 | 2.00 | 2.20 | 2.10 | 5.25 |
| 4 | 4.95 | 5.45 | 6.25 | 4.50 | 3.00 | 2.60 | 2.50 | 2.40 | 2.00 | 2.20 | 2.10 | 5.35 |
| 5 | 4.55 | 5.00 | 5.60 | 4.60 | 3.00 | 2.50 | 2.50 | 2.30 | 2.00 | 2.65 | 2.10 | 5.00 |
| 6 | 4.25 | 4.50 | 5.25 | 4.50 | 2.90 | 2.50 | 2.40 | 2.30 | 2.00 | 2.55 | 2.10 | 5.10 |
| 7 | 4.05 | 4.20 | 5.00 | 4.50 | 2.90 | 2.50 | 2.40 | 2.30 | 2.00 | 2.35 | 2.00 | 4.40 |
| 8 | 3.90 | 3.95 | 5.20 | 5.00 | 2.90 | 2.50 | 2.30 | 2.30 | 1.90 | 2.20 | 2.00 | 3.95 |
| 9 | 3.80 | 3.85 | 6.30 | 5.90 | 2.90 | 2.40 | 2.40 | 2.20 | 1.90 | 2.10 | 2.00 | 3.65 |
| 10 | 3.65 | 3.70 | 7.10 | 5.80 | 2.90 | 2.40 | 2.50 | 2.20 | 1.90 | 2.10 | 2.00 | 3.45 |
| 11 | 3.50 | 3.60 | 6.60 | 5.75 | 2.90 | 2.40 | 2.50 | 2.20 | 1.90 | 2.25 | 2.00 | 3.30 |
| 12 | 3.40 | 3.50 | 6.55 | 5.55 | 2.80 | 2.50 | 2.40 | 2.10 | 1.90 | 2.45 | 2.00 | 3.20 |
| 13 | 3.30 | 3.40 | 6.70 | 5.25 | 2.80 | 2.80 | 2.40 | 2.10 | 1.90 | 2.50 | 2.00 | 3.20 |
| 14 | 3.15 | 3.30 | 8.00 | 4.90 | 2.80 | 3.10 | 2.30 | 2.10 | 1.90 | 2.50 | 2.00 | 4.25 |
| 15 | 3.00 | 3.20 | 7.50 | 4.45 | 2.80 | 2.95 | 2.30 | 2.20 | 1.90 | 2.40 | 2.00 | 4.45 |
| 16 | 3.00 | 3.20 | 7.05 | 4.25 | 2.70 | 2.80 | 2.30 | 2.30 | 1,90 | 2.40 | 2.00 | 4.45 |
| 17 | 3.00 | 3.20 | 8.65 | 4.05 | 2.70 | 2.70 | 2.20 | 2.20 | 1.90 | 2.30 | 2.00 | 6.35 |
| 18 | 3.00 | 3.10 | 7.40 | 3.90 | 2.70 | 2.60 | 2.10 | 2.20 | 1.90 | 2.30 | 2.65 | 6.10 |
| 19 | 3.00 | 3.10 | 5.95 | 3.80 | 2.70 | 2.50 | 2.10 | 2.10 | 1.90 | 2.20 | 3.30 | 4.95 |
| 20 | 2.90 | 3.20 | 5.35 | 3.70 | 2.70 | 2.40 | 2.10 | 2.10 | 1.90 | 2.10 | 2.85 | 4.30 |
| 21 | 2.90 | 3.30 | 4.90 | 3.60 | 2.70 | 2.40 | 2.10 | 2.10 | 1.90 | 2.10 | 2.55 | 3.95 |
| 22 | 2.90 | 3.50 | 4.55 | 3.50 | 2.60 | 2.40 | 2.10 | 2.00 | 1.90 | 2.10 | 2.40 | 4.15 |
| 23 | 2.90 | 3.75 | 4.25 | 3.40 | 2.60 | 2.40 | 2.10 | 2.00 | 1.90 | 2.10 | 2.30 | 4.25 |
| 24 | 2.90 | 4.20 | 4.10 | 3.40 | 2.70 | 2.40 | 2.10 | 2.00 | 1.90 | 2.10 | 2.20 | 3.95 |
| 25 | 2.90 | 10.10 | 4.00 | 3.30 | 2.70 | 2.40 | 2.10 | 2.00 | 1.90 | 2.00 | 2.45 | 3.75 |
| 26 | 3.30 | 14.40 | 3.85 | 3.30 | 2.80 | 3.00 | 2.10 | 2.00 | 2.05 | 2.00 | 3.80 | 3.65 |
| 27 | 5.05 | 9.55 | 3.70 | 3.20 | 2.90 | 2.90 | 2.10 | 2.00 | 2.10 | 2.00 | 4.55 | 3.25 |
| 28 | 8.40 | 15.35 | 3.70 | 3.10 | 2.90 | 2.80 | 2.10 | 2.00 | 2.15 | 2.30 | 4.10 | 3.00 |
| 29 | 6.15 | ..... | 5.60 | 3.10 | 2.80 | 2.80 | 2.10 | 2.00 | 2.30 | 2.30 | 3.50 | 3.25 |
| 30 | 5.70 | ..... | 8.05 | 3.10 | 2.80 | 2.90 | 2.10 | 2.00 | 2.30 | 2.20 | 3.15 | 3.15 |
| 31 | 6.55 | ..... | 6.20 | ..... | 2.70 | ..... | 2.20 | 2.00 | ..... | 2.20 | ..... | 3.00 |

*Rating table for James River at Buchanan, Va., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 1.6 | 310 | 4.8 | 4,640 | 8.0 | 12,620 | 16.0 | 33,740 |
| 1.8 | 360 | 5.0 | 5,060 | 8.5 | 13,940 | 16.5 | 35,060 |
| 2.0 | 430 | 5.2 | 5,495 | 9.0 | 15,260 | 17.0 | 36,380 |
| 2.2 | 540 | 5.4 | 5,950 | 9.5 | 16,580 | 17.5 | 37,700 |
| 2.4 | 670 | 5.6 | 6,425 | 10.0 | 17,900 | 18.0 | 39,020 |
| 2.6 | 840 | 5.8 | 6,911 | 10.5 | 19,220 | 18.5 | 40,340 |
| 2.8 | 1,050 | 6.0 | 7,403 | 11.0 | 20,540 | 19.0 | 41,660 |
| 3.0 | 1,330 | 6.2 | 7,903 | 11.5 | 21,860 | 19.5 | 42,980 |
| 3.2 | 1,650 | 6.4 | 8,411 | 12.0 | 23,180 | 20.0 | 44,300 |
| 3.4 | 1,980 | 6.6 | 8,927 | 12.5 | 24,500 | 20.5 | 45,620 |
| 3.6 | 2,330 | 6.8 | 9,452 | 13.0 | 25,820 | 21.0 | 46,940 |
| 3.8 | 2,690 | 7.0 | 9,980 | 13.5 | 27,140 | 21.5 | 48,260 |
| 4.0 | 3,050 | 7.2 | 10,508 | 14.0 | 28,460 | 22.0 | 49,580 |
| 4.2 | 3,440 | 7.4 | 11,036 | 14.5 | 29,780 | 22.5 | 50,900 |
| 4.4 | 3,840 | 7.6 | 11,564 | 15.0 | 31,100 | | |
| 4.6 | 4,240 | 7.8 | 12,092 | 15.5 | 32,420 | | |

*Estimated monthly discharge of James River at Buchanan, Va.*

[Drainage area, 2,058 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 13,676 | 1,180 | 3,666 | 1.78 | 2.05 |
| February | 31,954 | 1,490 | 6,157 | 2.99 | 3.11 |
| March | 41,794 | 2,510 | 8,730 | 4.24 | 4.89 |
| April | 7,156 | 1,490 | 3,335 | 1.62 | 1.81 |
| May | 1,330 | 840 | 1,083 | .53 | .61 |
| June | 1,490 | 670 | 877 | .43 | .48 |
| July | 1,570 | 480 | 634 | .31 | .36 |
| August | 710 | 430 | 516 | .25 | .29 |
| September | 600 | 390 | 422 | .21 | .23 |
| October | 890 | 430 | 573 | .28 | .32 |
| November | 4,140 | 430 | 951 | .46 | .51 |
| December | 8,283 | 1,330 | 3,434 | 1.67 | 1.93 |
| The year | 41,794 | 390 | 2,532 | 1.23 | 16.59 |

JAMES RIVER AT CARTERSVILLE, VA.

Observations of the height of James River are made by the Weather Bureau at Lynchburg, Va., 48 miles below Buchanan and about 100 miles above Cartersville. The drainage area is given as 3,700 square miles. The gage is on the first pier of the Amherst bridge, at the foot of Ninth street, on the side facing Lynchburg, about 100 feet from the shore. The elevation is 494.7 feet above mean sea level. The highest water was about 27 feet on September 30, 1870, and the lowest −0.3 feet on September 12–15, 1895.

Gages were established on James River in 1893 by F. B. Isaacs, engineer for water power of the Chesapeake and Ohio Railway Company, at Ninemile Locks, Columbia, Scottsville, Lynchburg, Balcony Falls, Buchanan, Eagle Mountain, and Clifton Forge. Records of heights of water at these points were made twice daily from 1893 to 1897, and freshet reports were obtained for these years. The gages were not referred to any fixed datum, but the zero of each gage was set at what was considered ordinary low water in the river. During the latter part of 1899 records have been resumed, excepting at Scottsville, Balcony Falls, and Eagle Mountain, where the gages have been abandoned.

At Boshers dam, 9 miles above Richmond, is a gage where the height of water is recorded twice daily, showing the supposed head on the crest of dam. This crest, however, is so irregular that the coefficient of discharge has not been ascertained. Another complication exists in the fact that water is deflected into a canal, the quantity not being known.

Observations are maintained by the Weather Bureau at Richmond, Va., the gage being at the foot of Virginia street, near Fourteenth, immediately east of the Richmond and Danville Railroad bridge. It is a standard brass Weather Bureau gage embedded in the cement buttress. The elevation of the zero is 2.8 feet.

A gaging station was established January 1, 1899, by D. C. Humphreys, and is located at the highway bridge crossing the James at Cartersville, one-half mile from railroad station and 50 miles above Richmond, Va. The wire gage is attached to a horizontal gage rod fastened to the bridge and is referred to a bench mark, the top of the lower end of the fourth-floor beam from the right bank, which is 32.04 feet above the zero of the gage. The gage was verified June 23, 1899. The channel is straight for one-third of a mile above and 1 mile below the station, the current fairly swift, and the bottom somewhat sandy and shifting. The banks are high and not subject to overflow except in extreme high water. The observer is Julien I. Palmore, clerk in a store at Cartersville, Va.

The following discharge measurements were made during 1902 by D. C. Humphreys:

July 15: Gage height, 1.10 feet; discharge, 2,008 second-feet.
August 25: Gage height, 0.80 feet; discharge, 1,482 second-feet.

*Daily gage height, in feet, of James River, at Cartersville, Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 16.50 | 7.50 | 22.90 | 8.00 | 3.45 | 1.98 | 1.70 | 1.48 | 0.60 | 1.40 | 1.80 | 9.00 |
| 2 | 11.20 | 8.00 | 22.05 | 6.40 | 3.10 | 1.70 | 1.55 | 1.30 | .55 | 1.40 | 1.62 | 6.30 |
| 3 | 8.80 | 9.60 | 14.00 | 5.40 | 3.40 | 1.68 | 2.00 | 1.80 | .52 | 1.40 | 1.52 | 11.40 |
| 4 | 7.20 | 8.00 | 10.50 | 5.20 | 3.30 | 1.30 | 1.70 | 2.10 | .50 | 1.00 | 1.42 | 8.30 |
| 5 | 6.15 | 7.05 | 9.50 | 5.10 | 2.80 | 1.40 | 1.70 | 1.70 | .52 | 7.95 | 1.40 | 10.95 |
| 6 | 5.55 | 5.50 | 9.20 | 4.70 | 3.40 | 1.30 | 1.40 | 2.15 | .80 | 16.85 | 1.38 | 9.30 |
| 7 | 5.25 | 5.05 | 7.75 | 4.80 | 3.30 | 1.20 | 1.40 | 2.00 | .75 | 5.60 | 1.70 | 7.15 |
| 8 | 5.00 | 4.92 | 7.00 | 7.20 | 3.00 | 1.40 | 1.60 | 1.90 | .60 | 4.05 | 1.50 | 6.30 |
| 9 | 4.88 | 4.22 | 8.70 | 10.80 | 2.90 | 1.30 | 1.90 | 1.30 | 1.00 | 3.25 | 1.30 | 5.05 |
| 10 | 4.38 | 3.88 | 8.60 | 8.30 | 2.80 | 1.20 | 1.50 | 1.60 | 1.00 | 2.40 | 1.30 | 4.70 |
| 11 | 4.00 | 3.62 | 9.20 | 7.60 | 2.55 | 1.20 | 1.80 | 1.70 | .90 | 1.60 | 1.28 | 3.90 |
| 12 | 3.68 | 3.50 | 8.80 | 7.10 | 2.40 | 1.35 | 1.42 | 1.00 | .90 | 10.02 | 1.30 | 3.60 |
| 13 | 3.40 | 3.60 | 8.20 | 6.52 | 2.10 | 1.20 | 1.33 | 1.05 | .88 | 5.72 | 1.32 | 3.50 |
| 14 | 3.30 | 3.30 | 8.00 | 5.54 | 2.30 | 1.35 | 1.20 | 1.10 | .75 | 3.80 | 1.22 | 3.50 |
| 15 | 3.25 | 3.12 | 8.72 | 5.31 | 2.00 | 1.30 | 1.00 | 1.30 | .70 | 2.80 | 1.20 | 3.50 |
| 16 | 3.00 | 3.10 | 7.90 | 5.10 | 2.00 | 2.50 | 1.00 | 4.25 | .60 | 2.20 | 1.28 | 4.50 |
| 17 | 2.95 | 3.10 | 10.70 | 4.50 | 2.20 | 14.35 | 1.00 | 3.15 | .55 | 2.05 | 1.29 | 8.50 |
| 18 | 2.90 | 2.82 | 10.05 | 4.40 | 2.15 | 4.70 | 1.00 | 1.45 | .53 | 1.87 | 3.50 | 7.55 |
| 19 | 2.88 | 2.60 | 9.80 | 4.35 | 2.10 | 3.10 | 1.00 | 1.25 | .50 | 1.72 | 4.22 | 8.10 |
| 20 | 2.72 | 2.70 | 7.72 | 4.05 | 1.90 | 2.13 | 1.22 | 1.20 | .50 | 1.65 | 3.28 | 6.20 |
| 21 | 2.72 | 3.10 | 6.70 | 3.20 | 2.38 | 1.88 | 1.32 | 1.00 | .60 | 1.60 | 2.52 | 5.30 |
| 22 | 7.15 | 7.70 | 6.20 | 3.60 | 2.40 | 1.72 | 1.30 | 1.15 | 1.00 | 1.52 | 2.40 | 6.30 |
| 23 | 6.12 | 7.70 | 5.50 | 3.50 | 2.00 | 1.60 | 1.20 | 1.10 | .70 | 1.42 | 2.20 | 6.15 |
| 24 | 4.30 | 7.00 | 5.20 | 3.40 | 3.00 | 1.60 | 1.10 | .90 | .60 | 1.35 | 1.90 | 5.30 |
| 25 | 3.60 | 10.20 | 4.70 | 3.30 | 3.40 | 1.58 | 1.00 | .90 | .70 | 1.80 | 2.30 | 4.60 |
| 26 | 3.30 | 21.90 | 4.30 | 3.20 | 3.50 | 2.00 | .92 | .80 | 2.00 | 1.28 | 9.35 | 4.20 |
| 27 | 5.72 | 19.20 | 4.20 | 3.10 | 2.40 | 2.30 | .88 | .82 | 4.35 | 1.20 | 6.20 | 3.75 |
| 28 | 9.44 | 17.28 | 3.90 | 2.90 | 2.20 | 2.00 | .80 | .70 | 1.75 | 6.11 | 5.30 | 3.20 |
| 29 | 10.10 | ..... | 5.20 | 3.00 | 2.20 | 1.78 | .78 | .80 | 1.35 | 4.00 | 5.00 | 3.10 |
| 30 | 8.00 | ..... | 7.20 | 3.80 | 2.10 | 1.80 | .65 | .70 | 1.40 | 2.30 | 5.15 | 3.08 |
| 31 | 7.80 | ..... | 9.40 | ..... | 2.00 | ..... | 1.62 | .65 | ..... | 2.00 | ..... | 3.05 |

*Rating table for James River at Cartersville, Va., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 0.4 | 702 | 4.0 | 7,600 | 7.6 | 18,380 | 16.0 | 46,100 |
| .6 | 1,000 | 4.2 | 8,100 | 7.8 | 19,040 | 16.5 | 47,750 |
| .8 | 1,296 | 4.4 | 8,610 | 8.0 | 19,700 | 17.0 | 49,400 |
| 1.0 | 1,600 | 4.6 | 9,130 | 8.5 | 21,350 | 17.5 | 51,050 |
| 1.2 | 1,916 | 4.8 | 9,660 | 9.0 | 23,000 | 18.0 | 52,700 |
| 1.4 | 2,243 | 5.0 | 10,200 | 9.5 | 24,650 | 18.5 | 54,350 |
| 1.6 | 2,582 | 5.2 | 10,760 | 10.0 | 26,300 | 19.0 | 56,000 |
| 1.8 | 2,932 | 5.4 | 11,330 | 10.5 | 27,950 | 19.5 | 57,650 |
| 2.0 | 3,294 | 5.6 | 11,910 | 11.0 | 29,600 | 20.0 | 59,300 |
| 2.2 | 3,672 | 5.8 | 12,500 | 11.5 | 31,250 | 20.5 | 60,950 |
| 2.4 | 4,063 | 6.0 | 13,100 | 12.0 | 32,900 | 21.0 | 62,600 |
| 2.6 | 4,463 | 6.2 | 13,760 | 12.5 | 34,550 | 21.5 | 64,250 |
| 2.8 | 4,871 | 6.4 | 14,420 | 13.0 | 36,200 | 22.0 | 65,900 |
| 3.0 | 5,300 | 6.6 | 15,080 | 13.5 | 37,850 | 22.5 | 67,550 |
| 3.2 | 5,740 | 6.8 | 15,740 | 14.0 | 39,500 | 23.0 | 69,200 |
| 3.4 | 6,190 | 7.0 | 16,400 | 14.5 | 41,150 | 24.0 | 72,500 |
| 3.6 | 6,650 | 7.2 | 17,060 | 15.0 | 42,800 | 25.0 | 75,800 |
| 3.8 | 7,120 | 7.4 | 17,720 | 15.5 | 44,450 | ..... | ..... |

*Estimated monthly discharge of James River at Cartersville, Va.*

[Drainage area, 6,232 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 47,750 | 4,666 | 12,814 | 2.06 | 2.38 |
| February | 65,570 | 4,463 | 16,494 | 2.65 | 2.76 |
| March | 68,870 | 7,360 | 22,368 | 3.59 | 4.14 |
| April | 28,940 | 5,083 | 10,966 | 1.76 | 1.96 |
| May | 6,420 | 3,111 | 4,516 | .72 | .83 |
| June | 40,655 | 1,916 | 4,231 | .68 | .76 |
| July | 3,294 | 1,074 | 2,077 | .33 | .38 |
| August | 8,225 | 1,074 | 2,374 | .38 | .44 |
| September | 8,480 | 850 | 1,579 | .25 | .28 |
| October | 48,905 | 1,916 | 7,078 | 1.14 | 1.31 |
| November | 24,155 | 1,916 | 4,918 | .79 | .88 |
| December | 30,920 | 5,410 | 13,048 | 2.09 | 2.41 |
| The year | 68,870 | 850 | 8,539 | 1.37 | 18.53 |

## JAMES RIVER AT HOLCOMBS ROCK, VA.

This station was established by the Willson Aluminum Company, of Holcombs Rock, Va., in 1899, in connection with measurements to determine the horsepower available at that point. During 1899 the records were fragmentary, but at the commencement of 1900 daily records were taken, which have been furnished to the Geological Survey through the courtesy of George O. Seward, general manager of the company. The gage consists of a copper float 8 by 8 by 8 inches, with a vertical rod 1½ inches square attached to it, the rod, which extends up through the powerhouse floor, being graduated to tenths of a foot. The copper float is inclosed in a 12-inch by 12-inch by 12-foot box, which rests solidly on the bottom of the river. The box is perforated, so that the water in it will always stand at the same level as the water in the river, while the float, being inclosed, is not in danger of being broken by floating timber. The fluctuations of the river are read directly from the rod, which moves up or down with the float as it responds to the variations in the height of the river. Measurements of discharge are not made at this point.

*Daily gage height, in feet, of James River at Holcombs Rock, Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 9.50 | 5.80 | 19.00 | ..... | 1.90 | 1.60 | 1.80 | 1.15 | 0.90 | 1.35 | 0.80 | 2.60 |
| 2 | 7.50 | 5.25 | 16.40 | ..... | 1.80 | 1.50 | 1.45 | 1.20 | .90 | 1.55 | .90 | 3.45 |
| 3 | 5.50 | 5.80 | 8.10 | ..... | 1.95 | 1.50 | 1.30 | 1.00 | .90 | 2.05 | .85 | 4.25 |
| 4 | 4.75 | 5.15 | 6.05 | ..... | 1.90 | 1.40 | 1.20 | 1.15 | .90 | 2.25 | .90 | 4.90 |
| 5 | 4.00 | 4.10 | 5.10 | ..... | 2.00 | 1.40 | 1.20 | 1.10 | .90 | 2.25 | .95 | 4.70 |
| 6 | 3.55 | 3.70 | 4.50 | ..... | 1.80 | 1.40 | 1.20 | 1.20 | .90 | 2.10 | 1.15 | 4.65 |
| 7 | 3.28 | 3.35 | 4.35 | ..... | 1.80 | 1.30 | 1.25 | 1.20 | .90 | 1.55 | 1.05 | 3.65 |
| 8 | 3.10 | 3.20 | 4.80 | ..... | 2.00 | 1.30 | 1.00 | 1.10 | .90 | 1.10 | 1.00 | 3.00 |
| 9 | 2.85 | 3.05 | 5.85 | ..... | 2.00 | 1.30 | 1.20 | .95 | .90 | 1.15 | 1.15 | 2.55 |
| 10 | 2.75 | 2.55 | 7.20 | ..... | 1.80 | 1.20 | 1.15 | .45 | .90 | 1.10 | 1.25 | 2.30 |
| 11 | 2.60 | 2.35 | 6.80 | ..... | 1.80 | 1.20 | 1.25 | .95 | .85 | 1.05 | 1.05 | 2.10 |
| 12 | 2.45 | 2.30 | 6.40 | ..... | 1.70 | 1.20 | 1.10 | .80 | .85 | 1.65 | .80 | 1.95 |
| 13 | 2.30 | 2.20 | 6.20 | ..... | 1.70 | 1.65 | 1.05 | .85 | .85 | 1.90 | 1.00 | 2.05 |
| 14 | 2.10 | 2.10 | 6.60 | ..... | 1.70 | 1.60 | 1.00 | .95 | .00 | 1.20 | 1.00 | 2.25 |
| 15 | 2.00 | 2.00 | 6.20 | ..... | 1.60 | 1.50 | 1.10 | .95 | .60 | 1.10 | .90 | 3.35 |
| 16 | 2.00 | 1.90 | 4.95 | ..... | 1.50 | 1.80 | 1.10 | 1.10 | .80 | 1.20 | 1.00 | 3.30 |
| 17 | 2.00 | 1.90 | 4.55 | ..... | 1.50 | 1.65 | .90 | .55 | .75 | 1.10 | 1.05 | 5.50 |
| 18 | 2.00 | 1.90 | 3.90 | ..... | 1.50 | 1.35 | .85 | .60 | .75 | 1.00 | 1.00 | 6.25 |
| 19 | 1.90 | 1.80 | 3.55 | ..... | 1.30 | 1.40 | .95 | .95 | .80 | 1.10 | 1.00 | 4.25 |
| 20 | 1.90 | 1.70 | 3.40 | ..... | 1.30 | 1.35 | .00 | .85 | .85 | 1.20 | 1.40 | 3.40 |
| 21 | 1.95 | 2.15 | 3.00 | ..... | 1.55 | 1.20 | 1.20 | .75 | .00 | 1.15 | 1.55 | 2.80 |
| 22 | 2.00 | 2.60 | 3.10 | ..... | 1.55 | 1.20 | 1.10 | .75 | .95 | .90 | 1.25 | 2.90 |
| 23 | 1.95 | 2.70 | ..... | ..... | 1.55 | 1.35 | 1.00 | .70 | .80 | .90 | 1.30 | 3.00 |
| 24 | 1.85 | 3.35 | ..... | ..... | 1.55 | 1.15 | .90 | .60 | .85 | .80 | 1.15 | 3.15 |
| 25 | 1.80 | 10.50 | ..... | ..... | 1.60 | 1.15 | .80 | .90 | .85 | .85 | 1.50 | 2.45 |
| 26 | 1.95 | 13.00 | ..... | ..... | 1.70 | 1.55 | .80 | .75 | .85 | .75 | 2.05 | 2.20 |
| 27 | 6.85 | 10.30 | ..... | 1.90 | 1.70 | 1.60 | .00 | .80 | .95 | 1.05 | 3.65 | 2.00 |
| 28 | 8.20 | 11.90 | ..... | 1.90 | 1.80 | 1.40 | 1.00 | .80 | .55 | 1.10 | 3.05 | 1.95 |
| 29 | 6.40 | ..... | ..... | 1.90 | 1.65 | 1.50 | .80 | .80 | 1.05 | 1.20 | 2.40 | 1.75 |
| 30 | 5.10 | ..... | ..... | 1.90 | 1.60 | 1.60 | .95 | .90 | 1.10 | .90 | 2.05 | 1.80 |
| 31 | 5.75 | ..... | ..... | ..... | 1.60 | ..... | 1.15 | .65 | ..... | .80 | ..... | 1.70 |

APPOMATTOX RIVER AT MATTOAX, VA.

This station was established in August, 1900, at the crossing of the Southern Railway, 27 miles southwest of Richmond. The gage rod, which is on the guard rail of the bridge, is laid off to feet and tenths, graduations being indicated by brass nails. The zero of the rod is 58.1 feet from the west end of the bridge, on the upstream side. The outer rim of the pulley is 0.9 foot from the zero of the rod; the distance from the end of the weight to the pointer on the wire rope is 48.75 feet. When the gage reading is 1 foot the water level is 45.6 feet below the top surface of the upper chord of the bridge, upstream side, and at the zero of the gage.

The river here is straight for a considerable distance above the station, but there is an abrupt bend about 100 feet below the bridge. The river is very narrow, and at the low stage at which the gage was placed the current velocity is not very well distributed, there being practically no current for several feet next to the west bank. It was possible, however, to secure a good gaging, and old residents stated that the river was at the lowest stage it had reached in fourteen years. The Mattoax railroad station is located on the west bank of the river. and J. C. Carter, the station agent, is the observer.

The following measurements have been made during 1902 by B. S. Drane:

July 10: Gage height, 1.80 feet; discharge, 391 second-feet.
August 16: Gage height, 7.68 feet; discharge, 2,266 second-feet.
October 14: Gage height, 5.75 feet; discharge, 1,410 second-feet.
October 14: Gage height, 4.88 feet; discharge, 1,144 second-feet.
December 6: Gage height 13.10 feet; discharge, 4,857 second-feet.

*Daily gage height, in feet, of Appomattox River at Mattoax, Va.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1902. | | | | | | | | | | | | |
| 1 | 15.50 | 5.90 | 21.00 | 4.00 | 7.00 | 1.60 | 3.10 | 2.00 | 0.60 | 1.60 | 2.50 | 7.40 |
| 2 | 22.00 | 5.90 | 16.00 | 3.50 | 4.70 | 1.60 | 3.30 | 4.50 | .50 | 1.90 | 2.50 | 7.00 |
| 3 | 15.00 | 11.00 | 15.00 | 3.25 | 4.00 | 1.50 | 2.75 | 2.90 | .50 | 2.10 | 2.50 | 10.00 |
| 4 | 4.75 | 11.50 | 12.00 | 3.10 | 4.00 | 1.50 | 1.80 | 2.00 | .80 | 1.10 | 1.80 | 11.90 |
| 5 | 3.80 | 12.00 | 10.00 | 3.10 | 4.50 | 1.40 | 1.80 | 3.60 | 1.30 | 2.00 | 1.75 | 12.00 |
| 6 | 3.80 | 8.00 | 9.70 | 3.60 | 3.30 | 1.35 | 1.60 | 3.30 | 1.20 | 10.00 | 1.70 | 13.10 |
| 7 | 3.15 | 4.30 | 10.50 | 3.65 | 3.60 | 1.25 | 1.65 | 2.00 | 1.00 | 11.00 | 1.75 | 12.00 |
| 8 | 3.30 | 4.70 | 7.00 | 8.00 | 3.80 | 1.20 | 1.65 | 4.20 | .80 | 11.50 | 1.70 | 10.00 |
| 9 | 3.30 | 4.30 | 6.00 | 10.50 | 4.20 | 1.30 | 2.90 | 2.70 | .75 | 3.80 | 1.70 | 8.00 |
| 10 | 3.15 | 3.50 | 6.50 | 11.00 | 3.50 | 1.30 | 1.70 | 1.65 | 3.00 | 2.20 | 1.65 | 6.00 |
| 11 | 3.20 | 3.15 | 5.00 | 10.90 | 3.80 | 1.25 | 2.00 | 1.60 | 3.50 | 2.25 | 1.50 | 3.50 |
| 12 | 3.10 | 3.30 | 4.80 | 5.00 | 2.50 | 1.25 | 1.30 | 3.60 | 2.30 | 4.70 | 1.45 | 3.00 |
| 13 | 2.75 | 3.30 | 4.50 | 4.15 | 2.45 | 1.20 | 1.30 | 1.70 | 1.30 | 7.80 | 1.40 | 2.50 |
| 14 | 2.10 | 3.25 | 4.20 | 3.15 | 2.45 | 1.20 | 1.25 | 1.50 | 1.00 | 6.50 | 1.45 | 3.00 |
| 15 | 2.00 | 2.90 | 3.90 | 3.55 | 2.45 | 1.20 | 1.00 | 2.60 | .75 | 3.08 | 1.50 | 3.10 |
| 16 | 2.70 | 2.90 | 3.70 | 3.50 | 2.50 | 1.20 | .99 | 6.50 | .70 | 2.35 | 1.40 | 3.25 |
| 17 | 2.70 | 3.10 | 5.20 | 3.40 | 2.20 | 9.00 | .90 | 3.20 | .65 | 2.00 | 1.40 | 3.35 |
| 18 | 2.50 | 3.00 | 8.00 | 3.20 | 2.95 | 9.50 | .80 | 2.00 | .65 | 1.95 | 5.00 | 7.50 |
| 19 | 2.45 | 2.95 | 6.20 | 3.20 | 2.20 | 9.50 | .75 | 1.50 | .60 | 1.85 | 9.00 | 6.00 |
| 20 | 2.40 | 2.65 | 5.30 | 3.10 | 3.00 | 8.00 | .75 | 1.20 | .60 | 1.65 | 8.00 | 4.50 |
| 21 | 2.35 | 3.00 | 4.50 | 3.00 | 4.15 | 2.60 | .75 | 3.70 | .60 | 1.50 | 5.00 | 3.55 |
| 22 | 9.00 | 5.00 | 4.00 | 3.00 | 2.30 | 2.00 | 1.00 | 1.50 | .80 | 1.45 | 2.80 | 8.50 |
| 23 | 10.00 | 10.00 | 3.90 | 2.90 | 2.30 | 1.90 | 1.00 | 1.60 | 1.90 | 1.30 | 2.50 | 7.00 |
| 24 | 9.00 | 12.00 | 3.65 | 2.85 | 2.00 | 1.60 | 1.40 | 1.30 | 1.90 | 1.25 | 2.35 | 4.00 |
| 25 | 4.50 | 15.00 | 3.55 | 2.75 | 2.10 | 3.00 | .90 | 1.10 | 1.20 | 1.35 | 3.00 | 3.50 |
| 26 | 4.00 | 18.00 | 3.45 | 2.75 | 2.30 | 3.00 | .80 | 1.00 | 1.00 | 1.35 | 9.00 | 2.50 |
| 27 | 5.50 | 20.00 | 3.25 | 2.70 | 2.30 | 3.00 | .85 | 1.00 | 2.35 | 1.25 | 9.00 | 2.25 |
| 28 | 8.20 | 24.00 | 3.15 | 2.65 | 2.00 | 3.00 | .75 | .70 | 1.60 | 1.85 | 10.00 | 2.30 |
| 29 | 8.00 | ..... | 3.50 | 2.60 | 2.00 | 2.00 | .65 | .60 | 1.60 | 7.25 | 7.00 | 2.40 |
| 30 | 5.75 | ..... | 5.50 | 3.50 | 1.70 | 3.55 | 1.20 | .60 | 1.10 | 8.20 | 3.35 | 3.30 |
| 31 | 5.90 | ..... | 5.55 | ..... | 1.65 | ..... | 2.20 | .60 | ..... | 3.80 | ..... | 3.35 |

*Rating table for Appomattox River at Mattoax, Va., for 1902.*

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* | *Feet.* | *Second-feet.* |
| 0.4 | 140 | 4.2 | 875 | 7.8 | 2,288 | 16.5 | 6,675 |
| .8 | 180 | 4.4 | 935 | 8.0 | 2,380 | 17.0 | 6,965 |
| 1.0 | 200 | 4.6 | 995 | 8.5 | 2,615 | 17.5 | 7,255 |
| 1.2 | 224 | 4.8 | 1,065 | 9.0 | 2,850 | 18.0 | 7,555 |
| 1.4 | 251 | 5.0 | 1,135 | 9.5 | 3,090 | 18.5 | 7,855 |
| 1.6 | 282 | 5.2 | 1,205 | 10.0 | 3,330 | 19.0 | 8,170 |
| 1.8 | 316 | 5.4 | 1,275 | 10.5 | 3,575 | 19.5 | 8,485 |
| 2.0 | 350 | 5.6 | 1,345 | 11.0 | 3,820 | 20.0 | 8,815 |
| 2.2 | 390 | 5.8 | 1,415 | 11.5 | 4,065 | 20.5 | 9,145 |
| 2.4 | 430 | 6.0 | 1,490 | 12.0 | 4,310 | 21.0 | 9,490 |
| 2.6 | 473 | 6.2 | 1,576 | 12.5 | 4,555 | 21.5 | 9,835 |
| 2.8 | 519 | 6.4 | 1,662 | 13.0 | 4,805 | 22.0 | 10,195 |
| 3.0 | 565 | 6.6 | 1,748 | 13.5 | 5,055 | 22.5 | 10,555 |
| 3.2 | 615 | 6.8 | 1,834 | 14.0 | 5,315 | 23.0 | 10,930 |
| 3.4 | 665 | 7.0 | 1,920 | 14.5 | 5,575 | 24.0 | 11,695 |
| 3.6 | 715 | 7.2 | 2,012 | 15.0 | 5,845 | | |
| 3.8 | 765 | 7.4 | 2,104 | 15.5 | 6,115 | | |
| 4.0 | 815 | 7.6 | 2,196 | 16.0 | 6,395 | | |

*Estimated monthly discharge of Appomattox River at Mattoax, Va.*

[Drainage area, 745 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Second-feet per square mile. | Depth in inches. |
| 1902. | | | | | |
| January | 10,195 | 350 | 1,684 | 2.26 | 2.61 |
| February | 11,695 | 484 | 2,501 | 3.36 | 3.50 |
| March | 9,490 | 602 | 2,014 | 2.70 | 3.11 |
| April | 3,820 | 473 | 1,004 | 1.35 | 1.51 |
| May | 1,920 | 290 | 601 | .81 | .93 |
| June | 3,090 | 224 | 668 | .90 | 1.00 |
| July | 640 | 165 | 277 | .37 | .43 |
| August | 1,705 | 160 | 437 | .59 | .68 |
| September | 690 | 150 | 246 | .33 | .37 |
| October | 4,065 | 212 | 934 | 1.25 | 1.44 |
| November | 3,330 | 251 | 877 | 1.18 | 1.32 |
| December | 4,855 | 400 | 1,637 | 2.20 | 2.54 |
| The year | 11,695 | 150 | 1,073 | 1.44 | 19.44 |

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