Water-Supply and Irrigation Paper No. 166 Series P, Hydrographic Progress Reports, 42

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

REPORT

OF

PROGRESS OF STREAM MEASUREMENTS

FOR

THE CALENDAR YEAR 1905

PREPARED UNDER THE DIRECTION OF F. H. NEWELL

PART II.—Hudson, Passaic, Raritan, and Delaware River Drainages

BY

R. E. HORTON, N. C. GROVER, and JOHN C. HOYT

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INTRODUCTION.

ORGANIZATION AND SCOPE OF WORK.

The hydrographic work of the United States Geological Survey includes the collection of facts concerning and the study of conditions affecting the behavior of water from the time it reaches the earth as rain or snow until it joins the oceans or great navigable rivers. These investigations became a distinct feature of the work of the Survey in the fall of 1888, when an instruction camp was established at Embudo, N. Mex. The first specific appropriation for gaging streams was made by the act of August 18, 1894, which contained an item of $12,500 "for gauging the streams and determining the water supply of the United States, including the investigation of underground currents and artesian wells in the arid and semi-arid sections." (28 Stat. L., p. 398.)

Since that time appropriations have been gradually increased, as shown by the following table:

Annual appropriations for hydrographic surveys, fiscal year ending June 30, 1895 to 1906.

1895	$12,500	1901	$100,000
1896	20,000	1902	100,000
1897	50,000	1903	200,000
1898	50,000	1904	200,000
1899	50,000	1905	200,000
1900	50,000	1906	200,000

As a result of the increased appropriations, the work has been greatly extended, and at the same time it has been more thoroughly systemized by the adoption of standard methods and by grouping the States into districts, in each of which a district hydrographer and a corps of assistants carry on a comprehensive study of the hydrographic resources.

The chief features of the hydrographic work are the collection of data relating to the flow of surface waters and the study of the conditions affecting this flow. There is also collected information concerning river profiles, duration and magnitude of floods, water power, etc., which may be of use in hydrographic studies. This work includes the study of the hydrography of every important river basin in the United States, and is of direct value in the commercial and agricultural development of the country.

In order to collect the material from which estimates of daily flow are made, gaging stations are established. The selection of a site for a gaging station and the length of time it is maintained depend largely upon the physical features and the needs of each locality.

If the water is to be used for power, special effort is made to obtain information concerning the minimum flow; if water is to be stored, the maximum flow receives special attention. In all sections of the country permanent gaging stations are maintained for general statistical purposes, to show the conditions existing through long periods. They are also used as primary stations, and their records, in connection with short series of measurements, serve as bases for estimating the flow at other points in the drainage basin.

During the calendar year 1905 the division of hydrography has continued measuring the flow of streams on the same general lines as in previous years. Many new and improved methods have been introduced, by which the accuracy and value of the results have been increased. Approximately 800 regular gaging stations were maintained during the year, and an exceptionally large number of miscellaneous measurements and special investigations were made. The "Report of Progress of Stream Measurements," which contains the results of this work, is published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 165–178, as follows:

No. 165. Atlantic coast of New England drainage.
No. 166. Hudson, Passaic, Raritan, and Delaware river drainages.
No. 167. Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.
No. 168. Santee, Savannah, Ogeechee, and Altamaha rivers and eastern Gulf of Mexico drainages.
No. 169. Ohio and lower eastern Mississippi river drainages.
No. 170. Great Lakes and St. Lawrence River drainages.
No. 171. Hudson Bay and upper eastern and western Mississippi River drainages.
No. 172. Missouri River drainage.
No. 173. Meramec, Arkansas, Red, and lower western Mississippi river drainages.
No. 174. Western Gulf of Mexico and Rio Grande drainages.
No. 175. Colorado River drainage.
No. 176. The Great Basin drainage.
No. 177. The Great Basin and Pacific Ocean drainages in California.
No. 178. Columbia River and Puget Sound drainages.

These papers embody the data collected at the regular gaging stations, the results of the computations based upon the observations, and such other information as may have a direct bearing on the study of the subject, and include, as far as practicable, descriptions of the basins and the streams draining them.

For the purpose of introducing uniformity into the reports for the various years, the drainages of the United States have been divided into eleven grand divisions, which have been again divided into secondary divisions, as shown in the following list. The Progress Report has been made to conform to this arrangement, each part containing the data for one or more of the secondary divisions. The secondary divisions have in most cases been redivided, and the facts have been arranged, as far as practicable, geographically.

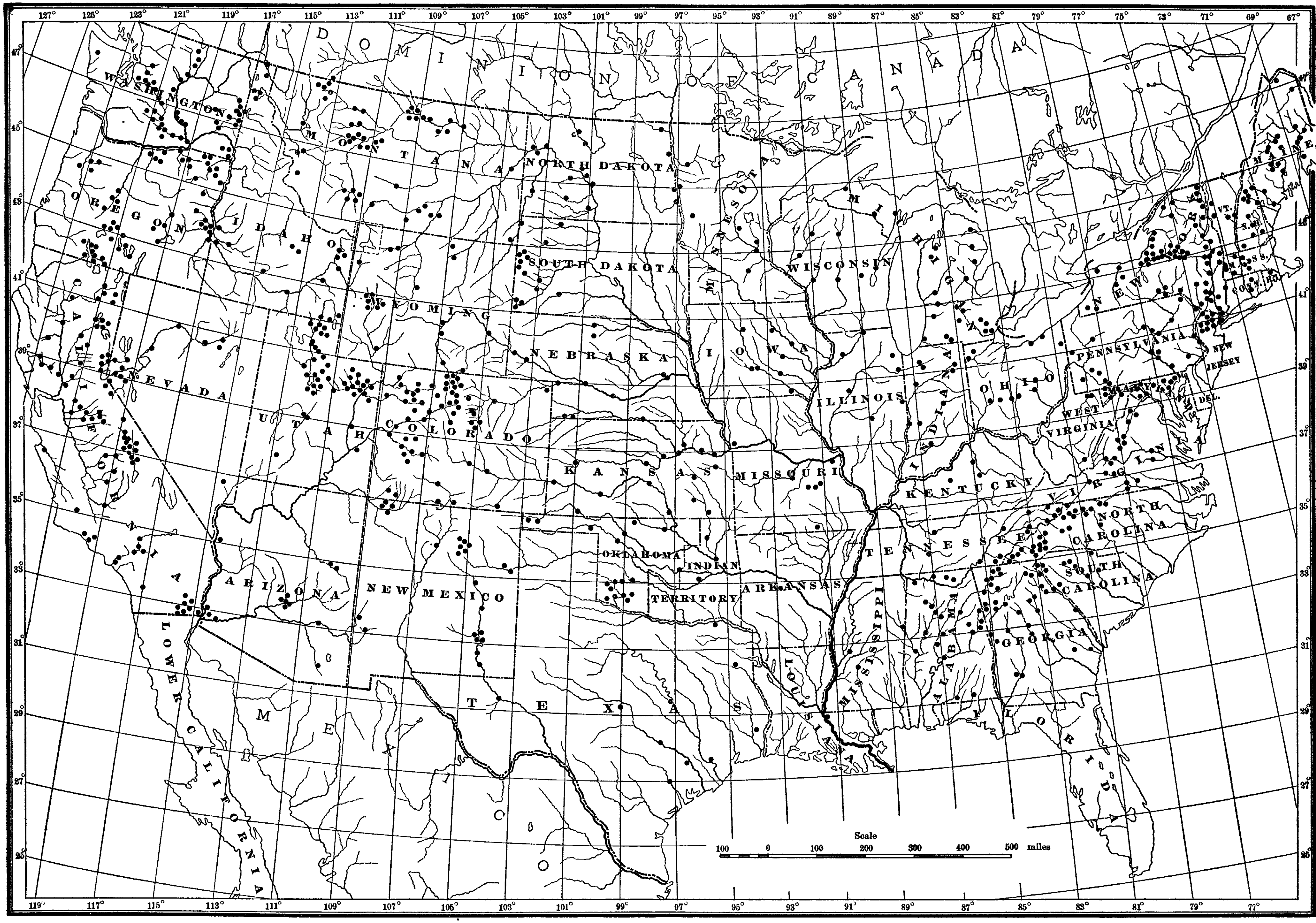
List of drainage basins in the United States.

NORTHERN ATLANTIC DRAINAGE BASINS.

St. John.
St. Croix.
Penobscot.
Kennebec.
Androscoggin.
Presumpscot.
Saco.
Merrimac.
Connecticut.
Blackstone.
Thames.
Housatonic.
Hudson.
Passaic.
Raritan.
Delaware.
Susquehanna.
Potomac.
Minor Chesapeake Bay.
Minor northern Atlantic.

SOUTHERN ATLANTIC DRAINAGE BASINS.

James.
Chowan.
Roanoke.
Tar.
Neuse.
Cape Fear.
Great Pedee (Yadkin).
Santee.
Savannah.
Ogeechee.
Altamaha.
Minor southern Atlantic.



MAP OF THE UNITED STATES, SHOWING LOCATION OF PRINCIPAL RIVER STATIONS MAINTAINED DURING 1905.

EASTERN GULF OF MEXICO DRAINAGE BASINS.

Suwanee.
Apalachicola.
Mobile.
Pearl.
Minor eastern Gulf of Mexico.

EASTERN MISSISSIPPI RIVER DRAINAGE BASINS.

Lower eastern Mississippi.
Ohio.
Upper eastern Mississippi.

ST. LAWRENCE RIVER DRAINAGE BASINS.

Lake Superior.
Lake Michigan.
Lake Huron.
Lake St. Clair.
Lake Erie.
Niagara River.
Lake Ontario.
Lake Champlain (Richelieu River).
Minor St. Lawrence.

WESTERN MISSISSIPPI RIVER DRAINAGE BASINS.

Upper western Mississippi.
Missouri.
Meramec.
Lower western Mississippi.
Arkansas.
Red.

WESTERN GULF OF MEXICO DRAINAGE BASINS.

Sabine.
Neches.
Trinity.
Brazos.
Colorado (of Texas).
Guadelupe.
San Antonio.
Nueces.
Rio Grande.
Minor western Gulf of Mexico.

COLORADO RIVER DRAINAGE BASIN.

THE GREAT BASIN.

Wasatch Mountains.
Humboldt.
Sierra Nevada.
Minor streams in Great Basin.

PACIFIC COAST DRAINAGE BASINS.

Southern Pacific.
San Francisco Bay.
Northern Pacific.
Columbia.
Puget Sound.

HUDSON BAY DRAINAGE BASINS.

DEFINITIONS.

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

"Second-foot" is an abbreviation for cubic foot per second and is the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West and is defined by statute in each State in which it is used. In most States the California miner's inch is used, which is the fiftieth part of a second-foot.

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

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

"Acre-foot" is equivalent to 43,560 cubic feet and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot. One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION OF TABLES.

For each regular gaging station are given as far as available the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of estimated monthly and yearly discharges and run-off, based upon all the facts obtained to date.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station, and they also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

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

The table of daily gage heights gives the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. At most stations the gage is read in the morning and in the evening.

The rating table gives discharges in second-feet corresponding to each stage of the river as given by the gage heights.

In the table of estimated monthly discharge, the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest, and it is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. Upon this the computations for the two remaining columns, which are defined above, are based.

In the computations for the tables of this report the following general and special rules have been used:

Fundamental rules for computation.

1. The highest degree of precision consistent with the rational use of time and money is imperative.
2. All items of computation should be expressed by at least two and not more than four significant figures.
3. Any measurement in a vertical velocity, mean velocity, or discharge curve whose per cent of error is five times the average per cent of error of all the other measurements should be rejected.
4. In reducing the number of significant figures, or the number of decimal places, by dropping the last figure, the following rules apply:

(*a*) When the figure in the place to be rejected is less than 5, drop it without changing the preceding figure. Example: 1,827.4 becomes 1,827.

(*b*) When the figure in the place to be rejected is greater than 5, drop it and increase the preceding figure by 1. Example: 1,827.6 becomes 1,828.

(*c*) When the figure in the place to be rejected is 5, and it is preceded by an even figure, drop the 5. Example: 1,828.5 becomes 1,828.

(*d*) When the figure in the place to be rejected is 5, and it is preceded by an odd figure, drop the 5 and increase the preceding figure by 1. Example: 1,827.5 becomes 1,828.

Special rules for computation.

1. Rating tables are to be constructed as closely as the data on which they are based will warrant. No decimals are to be used when the discharge is over 50 second-feet.

2. Daily discharges shall be applied directly to the gage heights as they are tabulated.

3. Monthly means are to be carried out to one decimal place when the quantities are below 100 second-feet. Between 100 and 10,000 second-feet the last figure in the monthly mean shall be a significant figure. This also applies to the yearly mean.

4. Second-feet per square mile and depth in inches for the individual months shall be carried out to at least three significant figures, except in the case of decimals where the first significant figure is preceded by one or more naughts (0), when the quantity shall be carried out to two significant figures. Example: 1.25; .125; .012; .0012. The yearly means for these quantities are always to be expressed in three significant figures and at least two decimal places.

CONVENIENT EQUIVALENTS.

1 second-foot equals 50 California miner's inches.
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet deep, 13.572 inches deep.
1 second-foot for one year equals 0.000214 cubic mile; equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot falling 10 feet equals 1.136 horsepower.
100 California miner's inches equal 15 United States gallons per second.
100 California miner's inches equal 77 Colorado miner's inches.
100 California miner's inches for one day equal 4 acre-feet.
100 Colorado miner's inches equal 2.60 second-feet.
100 Colorado miner's inches equal 19.5 United States gallons per second.
100 Colorado miner's inches equal 130 California miner's inches.
100 Colorado miner's inches for one day equal 5.2 acre-feet.
100 United States gallons per minute equal 0.223 second-foot.
100 United States gallons per minute for one day equal .44 acre-feet.
1,000,000 United States gallons per day equal 1.55 second-feet.
1,000,000 United States gallons equal 3.07 acre-feet.
1,000,000 cubic feet equal 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 inch equals 2.54 centimeters.
1 foot equals 0.3048 meter.
1 yard equals 0.9144 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 1,760 yards; equals 5,280 feet; equals 63,360 inches.
1 square yard equals 0.836 square meter.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet; equals 4,840 square yards.
1 acre equals 209 feet square, nearly.
1 square mile equals 259 hectares.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons; equals 0.804 bushel.
1 cubic foot of water weighs 62.5 pounds.
1 cubic yard equals 0.7646 cubic meter.
1 cubic mile equals 147,198,000,000 cubic feet.
1 cubic mile equals 4,667 second-feet for one year.
1 gallon equals 3.7854 liters.
1 gallon equals 8.36 pounds of water.
1 gallon equals 231 cubic inches (liquid measure).
1 pound equals 0.4536 kilogram.
1 avoirdupois pound equals 7,000 grains.
1 troy pound equals 5,760 grams.
1 meter equals 39.37 inches. Log. 1.5951654.
1 meter equals 3.280833 feet. Log. 0.5169842.
1 meter equals 1.093611 yards. Log. 0.0388629.
1 kilometer equals 3,281 feet; equals five-eighths mile, nearly.
1 square meter equals 10,764 square feet; equals 1,196 square yards.

1 hectare equals 2.471 acres.
1 cubic meter equals 35.314 cubic feet; equals 1.308 cubic yards.
1 liter equals 1.0567 quarts.
1 gram equals 15.43 grains.
1 kilogram equals 2.2046 pounds.
1 tonneau equals 2,204.6 pounds.
1 foot per second equals 1.097 kilometers per hour.
1 foot per second equals 0.68 mile per hour.
1 cubic meter per minute equals 0.5886 second-foot.
1 atmosphere equals 15 pounds per square inch; equals 1 ton per square foot; equals 1 kilogram per square centimeter.
Acceleration of gravity equals 32.16 feet per second every second.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.8 feet.
$1\frac{1}{3}$ horsepower equals about 1 kilowatt.

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

Quick formula for computing discharge over weirs: Cubic feet per minute equals $0.4025\, l \sqrt{h^3}$; l=length of weir in inches; h=head in inches flowing over weir, measured from surface of still water.

To change miles to inches on map:

Scale 1 : 125,000, 1 mile=0.50688 inch.
Scale 1 : 90,000, 1 mile=0.70400 inch.
Scale 1 : 62,500, 1 mile=1.01376 inches.
Scale 1 : 45,000, 1 mile=1.40800 inches.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geol. Survey) and No. 95 (Accuracy of Stream Measurements). In order that persons using this report may readily become acquainted with the general methods employed, the following brief description is given.

Streams may be divided, with respect to their physical conditions, into three classes: (1) Those with permanent beds; (2) those with beds which change only during extreme low or high water; (3) those with constantly shifting beds. In estimating the daily flow special methods are necessary for each class. The data upon which these estimates are based and the methods of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir; (3) by measurements of the velocity of the current and of the area of the cross section. The method chosen for any case depends upon the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v=c\sqrt{rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir method.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining flow. If dams are suitably situated and constructed they may be utilized for obtaining reliable estimates of flow. The conditions necessary to insure good results may be divided into two classes—(1) those relating to the physical characteristics of the dam itself, and (2) those relating to the diversion and use of the water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests, which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q=c\,b\,h^{3/2}$, or some similar standard weir formula, are known (see Water-Supply Paper No. 150); (*f*) either no flashboards or exceptional care in reducing leakage through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, a dam is built for purposes of power or navigation, and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such estimates the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured, either by a weir, a current meter, or a simple system of water wheels which are of standard make, or which have been rated as meters under working conditions and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the estimates of flow will not involve, for a critical stage of considerable duration, the use of a head, on a broad-crested dam, of less than 6 inches. Moreover, when all other conditions are

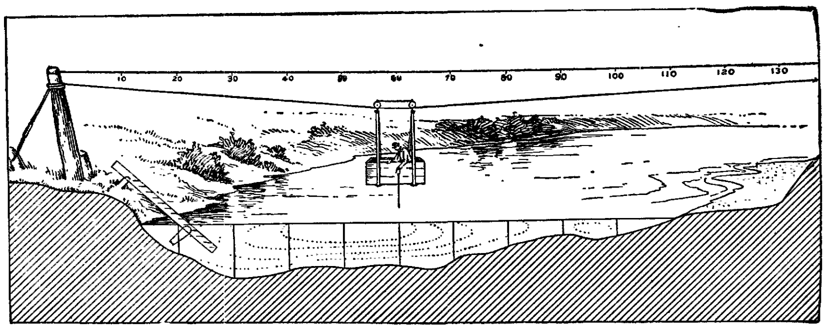


FIG. 1.—Cable station, showing section of river, car, gage, etc.

good, the cooperation of the owners or operators of the plant is still essential if reliable results are to be obtained.

A gaging station at a weir or dam has the general advantage of continuity of record through the periods of ice and floods, and the disadvantages of uncertainty of coefficient to be used in the weir formula, and of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water flowing past a certain section of a stream at a given time is termed a discharge measurement. This quantity is the product of two factors—the mean velocity and the area of the cross section. The mean velocity is a function of surface slope, wetted perimeter, roughness of bed, and the channel conditions at, above, and below the gaging section. The area depends upon the contour of the bed and the fluctuations of the surface. The two principal ways of measuring the velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging stations for determining discharge by velocity measurements in order that the data may have the required degree of accuracy. Their essential requirements are practically the same whether the velocity is determined by meters or floats. They are located as far as possible where the channel is straight both above and below the gaging section; where there are no cross currents, backwater or boils; where the bed of the stream is reasonably free from large projections of a permanent character, and where the banks are high and subject to overflow only at flood stages. The station must be so far removed from the effects of tributary streams and dams or other artificial obstructions that the gage height shall be an index of the discharge.

There are generally pertinent to a gaging station certain permanent or semipermanent structures which are usually referred to as "equipment." These are a gage for determining the fluctuations of the water surface, bench marks to which the datum of the gage is referred, permanent marks on a bridge or a tagged line indicating the points of measurement, and where the current is swift, some appliance (generally a secondary cable) to hold the meter in position in the water. As a rule, the stations are located at bridges if the channel conditions are satisfactory, as from them the observations can more readily be made and the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In case of flood measurements, good results can be obtained by observing the velocity of floating cakes of ice or debris. In case of all surface float measurements coefficients must be used to reduce the observed velocity to the mean velocity. The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

In measuring velocity by a float, observation is made of the time taken by the float to pass over the "run," a selected stretch of river from 50 to 200 feet long. In each discharge measurement a large number of velocity determinations are made at different points across the stream, and from these observations the mean velocity for the whole section is determined. This may be done by plotting the mean positions of the floats as indicated by the distances from the bank as ordinates, and the corresponding times as abscissas. A curve through these points shows the mean time of run at any point across the stream, and the mean time for the whole stream is obtained by dividing the area bounded by this curve and its axis by the width. The length of the run divided by the mean time gives the mean velocity.

The area used in float measurements is the mean of the areas at the two ends of the run and at several intermediate sections.

The essential parts of the current meters in use are a wheel of some type, so constructed that the impact of flowing water causes it to revolve, and a device for recording or indicating the number of revolutions. The relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter. This rating is done by drawing the meter through still water for a given distance at different speeds, and noting the number of revolutions for each run. From these data a rating table is prepared which gives the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They may, however, be classed in two general types; those in which the wheel is made up of a series of cups, as the Price, and those having a screw propeller wheel, as the Haskell. Each meter has been developed for use under some special condition. In the case of the small Price meter, which has been largely developed and has been extensively used by the United States Geological Survey, an attempt has been made to get an instrument which could be used under practically all conditions.

Current-meter measurements may be made from a bridge, cable, a boat, or by wading, and gaging stations may be classified in accordance with such use. Fig. 1 shows a typical cable station.

In making the measurement an arbitrary number of points are laid off on a line perpendicular to the thread of the stream. The points at which the velocity and depth are observed are known as measuring points, and are usually fixed at regular intervals, varying from 2 to 20 feet, depending upon the size and conditions of the stream. Perpendiculars dropped from the measuring points divide the gaging section into strips. For each strip or pair of strips the mean velocity, area, and discharge are determined independently, so that conditions existing in one part of the stream may not be extended to parts where they do not apply.

There are in general use three classes of methods of measuring velocity with current meters—multiple-point, single-point, and integration.

The three principal multiple-point methods in general use are the vertical velocity-curve, 0.2 and 0.8 depth, and top, bottom, and mid-depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually from 0.5 to 1 foot apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve among the resulting points, the vertical velocity curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the area bounded by this velocity curve and its axis by the depth. On account of the length of time required to make a complete measurement by this method, its use is limited to the determination of coefficients for purposes of comparison and to measurements under ice.

In the second multiple-point method the meter is held successively at 0.2 and 0.8 of the depth, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. Assuming that the vertical velocity-curve is a common parabola with horizontal axis, the mean of the velocities at 0.22 and 0.79 of the depth will give (closely) the mean velocity in the vertical. Actual observations under a wide range of conditions show that this second multiple-point method gives the mean velocity very closely for open-water conditions where the depth is over 5 feet and the bed comparatively smooth, and moreover the indications are that it will hold nearly as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid-depth, at 0.5 foot below the surface, and at 0.5 foot above the bottom, and the mean velocity is determined by dividing by 6 the sum of the top velocity, four times the mid-depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity, or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in the majority of measurements. A large number of vertical velocity-curve measurements taken on many streams and under varying conditions show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending upon the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is especially adapted for flood measurements, or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface, and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point in the vertical is measured twice. It is well adapted for measurements under ice and as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river, which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable, or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected.

They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at various points of measurement, the measuring section is divided into elementary strips, as shown in fig. 1, and the mean velocity, area, and discharge are determined separately for either a single or a double strip. The total discharge and the area are the sums of those for the various strips, and the mean velocity is obtained by dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, owing to diversity and instability of conditions during the winter period, and also to lack of definite information in regard to the laws of flow of water under ice. The method now employed is to make frequent discharge measurements during the frozen periods by the vertical velocity-curve method, and to keep an accurate record of the conditions, such as the gage height to the surface of the water as it rises in a hole cut in the ice, the thickness and character of the ice, etc.

From these data an approximate estimate of the daily flow can be made by constructing a rating curve (really a series of curves) similar to that used for open channels, but considering in addition to gage heights and discharge, varying thickness of ice. Such data as are available in regard to this subject are published in Water-Supply Paper No. 146, pages 141–148.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of estimating run-off, depending upon whether or not the bed of the stream is permanent.

For stations on streams with permanent beds the first step in computing the run-off is the construction of the rating table, which shows the discharge corresponding to any stage of the stream. This rating table is applied to the record of stage to determine the amount of water flowing. The construction of the rating table depends upon the method used in measuring flow.

For a station at a weir or dam, the basis for the rating table is some standard weir formula. The coefficients to be used in its application depend upon the type of dam and other conditions near its crest. After inserting in the weir formula the measured length of crest and assumed coefficient, the discharge is computed for various heads, and the rating table constructed.

The data necessary for the construction of a rating table for a velocity-area station are the results of the discharge measurements, which include the record of stage of the river at the time of measurement, the area of the cross section, the mean velocity of the current and the quantity of water flowing, and a thorough knowledge of the conditions at and in the vicinity of the station.

The construction of the rating table depends upon the following laws of flow for open permanent channels: (1) The discharge will remain constant so long as the conditions at or near the gaging station remain constant. (2) Neglecting the change of slope due to the rise and fall of the stream, the discharge will be the same whenever the stream is at a given stage. (3) The discharge is a function of and increases gradually with the stage.

The plotting of results of the various discharge measurements, using gage heights as ordinates, and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. For the development of these curves there should be, therefore, a sufficient number of discharge measurements to cover the range of the stage of the stream. Fig. 2 shows a typical rating curve with its corresponding mean velocity and area curves.

As the discharge is the product of two factors, the area and the mean velocity, any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is always concave toward the horizontal axis or on a straight line, unless the banks of the stream are overhanging.

The form of the mean velocity curve depends chiefly upon the surface slope, the roughness of the bed, and the cross section of the stream. Of these the slope is the principal factor. In accordance with the relative change of these factors the curve may be either a straight line, convex or concave toward either axis, or a combination of the three. From a careful study of the conditions at any gaging station the form which the vertical velocity curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. This curve, under normal conditions, is concave toward the horizontal axis and is generally parabolic in form.

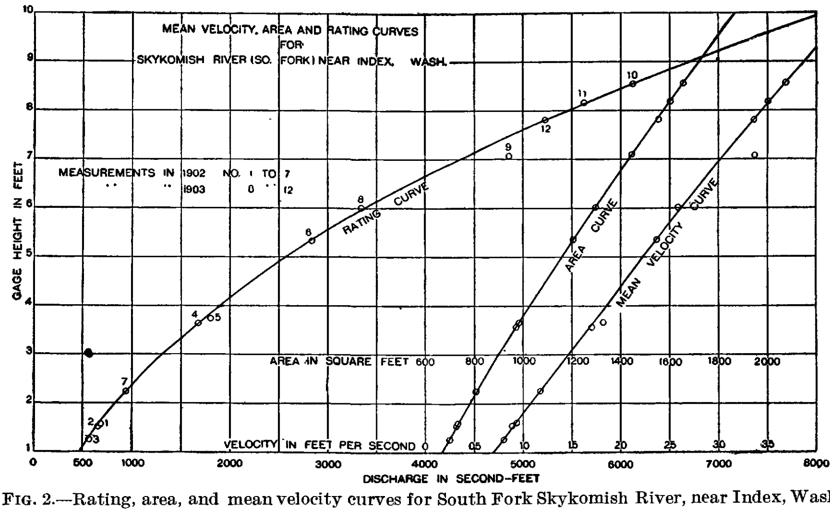


FIG. 2.—Rating, area, and mean velocity curves for South Fork Skykomish River, near Index, Wash.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, estimates can be obtained by its use. In case of velocity-area stations frequent discharge measurements must be made if the estimates are to be other than rough approximations. For stations with beds which shift slowly or are materially changed only during floods, rating tables can be prepared for periods between such changes, and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days, and the discharges for intervening days obtained either by interpolation modified by gage height, or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report, Part IV, page 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in estimating flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Most of the measurements presented in this paper have been obtained through local hydrographers. Acknowledgment is 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 alphabetically by States, gives the names of the district hydrographers and others who have aided in furnishing and preparing the data contained in this report:

New Jersey.—District hydrographer N. C. Grover,[a] assisted by members of the computing section.

New York.—District hydrographer R. E. Horton,[b] assisted by C. C. Covert. Records have been furnished by the following: E. A. Fisher, city engineer, and John F. Skinner, special assistant engineer, Rochester, N. Y.; T. P. Yates, Waverly, N. Y.; William S. Bacot, Utica, N. Y.; International Paper Company, Fort Edward, N. Y.; Schroon River Pulp and Paper Company, Warrensburg, N. Y.; Duncan Company, R. P. Bloss, Mechanicsville, N. Y.; George Beebe, deputy city engineer, Syracuse, N. Y. Special acknowledgment is made of the interest and assistance of Hon. H. A. Van Alstyne, State engineer, and Henry C. Allen, special deputy State engineer.

Pennsylvania.—District hydrographer N. C. Grover, assisted by members of the computing section. Special acknowledgment is due to John E. Codman for the records of flow of the streams in the vicinity of Philadelphia.

HUDSON RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The principal sources of Hudson River lie in the wildest portion of the Adirondack Mountains, in Essex County, northeastern New York. A number of branches, any one of which might possibly be considered the main stream, form its upper waters; but if the highest collected and permanent body of water be assumed as the true head, then the source of the Hudson becomes Lake Tear-of-the-Clouds, which lies at an elevation of 4,322 feet above tide, in the center of the triangle formed by Mounts Marcy and Skylight and Gray Peak.

The river flows rather irregularly southward until it reaches the northern boundary of Saratoga County, when it makes a sharp turn and flows eastward for about 12 miles by general course, passing through the mountains and forming, as it cuts across the rocky strata, several falls of great height and beauty. At Sandy Hill, just below Glens Falls, it makes another abrupt turn and flows southward, continuing in this direction until it empties into New York Bay.

From Lake Tear-of-the-Clouds to the mouth of the river the distance by water is probably about 300 miles. The total area drained is 13,366 square miles. The river is tidal to Troy, which is also at the head of navigation.

The headwater region is mountainous in character, in general heavily wooded, and dotted with numerous lakes and ponds. The rocks, belonging to the oldest formation and mainly granitic, are either bare or covered only with a layer of spruce duff, humus, and forest litter. The river emerges from the mountain region a few miles west of Glens Falls, and thence to Troy the topography is moderately rolling and the surface soil is chiefly sand. Below Troy the river follows the great depression which extends almost due north and south between New York Bay and the St. Lawrence, flowing in an open valley bordered by well-cultivated lands, which rise with moderate slope from the stream. The Catskill Mountain region is reached 20 or 30 miles below Albany, and thence to the mouth of the river the immediate valley is flanked by high hills, the Highlands of Orange County and the precipitous Palisades being especially noticeable.

The fall in the upper portion of the course is very rapid, amounting to about 64 feet per mile from Lake Tear-of-the-Clouds to North Creek, a distance of about 52 miles. From the mouth of North Creek to the mouth of the Sacondaga the descent is nearly 14 feet per

[a] The office of the district hydrographer for New Jersey and Pennsylvania is at the United States Geological Survey, 1330 F street NW., Washington, D. C.
[b] The office of the district hydrographer for New York is 75 Arcade, Utica, N. Y.

mile, distributed among rapids which diminish in frequency as the Sacondaga is approached. In the succeeding 26 miles to Fort Edward the river descends 418 feet more, but of this 175 feet is comprised within the three abrupt pitches at Palmer, Glens, and Bakers falls, while most of the remainder occurs in the rapids between Jessups Landing and the oxbow above Glens Falls. Between Glens Falls and Troy nearly the entire fall of the river is utilized for the development of water power.

The tributaries of the Hudson are numerous, and many of them are large and important. Indian River, Schroon River, and the Sacondaga unite with the main stream above Glens Falls, and between the latter point and Troy it receives Batten Kill, Fish Creek, Hoosic River, and the Mohawk. The tributaries below Troy include Catskill, Esopus, and Rondout creeks, and Wallkill River from the west, and Kinderhook Creek, Jansen Kill, Wappinger Creek, Fishkill Creek, and Croton River from the east.

Mohawk River, the largest of the tributary streams, rises in the sandy hills south of Booneville, in western New York, about 40 miles from the east end of Lake Ontario. Its uppermost tributaries are fed by large springs, and in addition the stream receives considerable water brought in from the adjacent Black River drainage basin for the supply of the Black River and Erie canals.

The Mohawk flows southward until it reaches the city of Rome, at which point it turns to the east, flowing across the State in a course a little east of south until it enters the Hudson at Cohoes, a few miles above Troy. It has a length by actual course of 140 to 145 miles, and a drainage area, measured at the mouth, of 3,468 square miles.

The immediate valley of the Mohawk is broad and open, at many places a mile or two in width, from which there is a rise, usually gradual but sometimes abrupt, to hills which attain altitudes several hundred feet above the stream. Toward the mouth of the river the valley becomes more contracted and the meadows disappear. The flats which border the stream have a rich alluvial soil, finely adapted to the raising of grass, grains, and broom corn; the more elevated lands are covered with sandy and gravelly loam.

Above Rome the Mohawk flows through a deep gorge in shale rock; from Rome eastward to Little Falls the valley is deeply filled with alluvial deposits, and the flood plains on either side become submerged during freshets, thus acting to some extent as storage reservoirs. At Little Falls the river cuts through a rocky gorge, whose walls rise precipitously 500 or 600 feet.

Below Rome, the fall of the river is small and rather uniform, being made up of long quiet reaches with slight riffles; but at Little Falls this uniformity is broken, and the stream descends in a succession of falls about 45 feet in 2,500. The average fall between Rome and the lower aqueduct at Crescent, a distance of 110.7 miles, is 2.43 feet per mile; thence to the level of slack water above Troy dam there is a farther descent of 149.5 feet in 4.4 miles, but of this 105 feet is included within the improved power at Cohoes.

The principal tributaries of the Mohawk below the source are, successively, Oriskany, West Canada, East Canada, and Schoharie creeks.

The Erie Canal runs parallel to the Mohawk through most of its course below Rome and derives a part of its water supply from the river. Feeder dams for purposes of diversion are located on the river at Delta, Rome, Little Falls, Rocky Rift, and Rexford Flats. A dam at Oriskany Creek also diverts into the canal a portion of the flow of that tributary, as well as waters brought into the Mohawk basin from storage reservoirs located in the upper drainage basin of Chenango River near Hamilton, N. Y. There is also a diversion dam near the mouth of Schoharie Creek, the largest tributary of the Mohawk.

The annual precipitation in the Hudson River basin, as determined by observations at twelve or more stations, is about 37 inches, but the amount is undoubtedly much greater in the elevated country near the headwaters.

The flow of the upper Hudson is controlled to some extent during the dry season by the use of Indian Lake storage reservoir, and the facilities for storage works in this part of the basin are unsurpassed. The entire region is dotted with ponds and lakes, many of them of large size and fed from extensive drainage areas. Saratoga Lake serves as a regulator of Fish Creek, and there is a small reservoir at the headwaters of the Hoosic. Storage is also extensively developed in the basin of Croton River for the purpose of supplying the city of New York with water. The flow of the Mohawk above the gaging stations at Little Falls and Dunsbach Ferry is modified during the season of canal navigation, extending from about May 1 to December 1.

Except that of the Delaware, the basin of the Hudson contains a greater population in proportion to its size than any other important river basin in the United States. This population is largely concentrated along the great highway of traffic which follows the valley of the Mohawk from the west and then continues down the lower Hudson.

HUDSON RIVER AT FORT EDWARD, N. Y.

This station was established in 1895, in connection with the upper Hudson storage surveys. It is located at the dam of the International Paper Company. The drainage area of the Hudson above Fort Edward is 2,800 square miles, which is 62 per cent of that above the Mechanicsville gaging station, the principal intervening tributaries, Hoosic River and Batten Kill, having drainage areas of 730 and 460 square miles, respectively.

The dam is of framed timber on slate-rock foundation and leaks but little. The crest is straight, very nearly level, and 587.6 feet long. The crest-gage zero stands at the level of the lip of the dam proper. A new and accurate profile of the crest of the dam, obtained in 1903, has been used to determine the discharge since that date.

Flashboards from 15 to 18 inches high are usually maintained on the dam. A record is kept of the height of the flashboards and of the times of their setting and removal. When the flashboards are off the dam the flow is computed by means of coefficients derived from the United States Geological Survey experiments on a model dam of similar cross section; with the flashboards on, the flow is computed by the Francis formula for the thin-edged weir.[a]

In the winter of 1896–97 a flood spillway was cut around the south end of the dam, and the water flows over this when it reaches the level of the crest of the flashboards. The profile of the spillway is very irregular and causes some uncertainty in calculating the flow at times of high water.

During the dry season but little water passes over the dam, the entire flow being employed to drive the turbines, of which there are 62 in the adjoining mill. These are nearly all of modern types, which have been tested at the Holyoke flume. A record is kept of the daily run of each, in hours, as well as of the working head, which is usually 19 feet. The discharge through the turbines is taken from diagrams expressing the flow as a function of the working head and number of wheel-hours run.

In the navigation season water is diverted from the Hudson at the Glens Falls feeder dam, 7 miles above Fort Edward, for the supply of the Champlain Canal.

Information concerning the Hudson at Fort Edward is contained in the annual reports of the State engineer and surveyor of New York, and in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 35, p 58; 47, p 75; 65 p 48, 82, p 100; 97 pp 221–222; 125, pp 19–20.
Discharge: WS 47, p 39.
Discharge, daily: WS 47, p 76; 65 p 49; 82, p 101; 125, p 23.
Discharge, high-water: WS 65, p 50.
Discharge, monthly: Ann 22, iv, p 107; WS 35, p 24; 65, p 49–50; 82, p 102; 125, p 23.
Hydrograph: Ann 22, iv, p 108.

[a] Water-Sup. and Irr. Paper No. 150, U. S. Geol. Survey, 1906.

Daily discharge, in second-feet, of Hudson River at Fort Edward, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,660	2,479	2,070	38,907	11,420	3,279	9,089	8,544	1,841	3,908	4,228	5,928
2	4,323	2,429	2,282	36,435	11,005	3,415	9,560	8,026	2,409	5,093	4,897	3,424
3	3,898	1,984	2,171	30,865	8,313	1,143	14,611	6,505	4,219	3,824	6,255	6,247
4	3,566	2,589	1,908	24,235	9,469	3,390	17,047	5,495	10,263	3,759	3,924	9,639
5	3,028	2,284	1,759	23,445	8,095	3,162	16,681	2,682	17,943	3,623	6,725	8,506
6	2,913	2,251	2,326	26,355	5,572	2,778	14,775	3,701	18,279	3,508	7,024	8,506
7	2,244	2,281	2,160	27,215	7,660	2,663	12,700	4,085	16,958	1,197	6,758	8,631
8	2,109	2,420	2,370	22,785	6,795	4,897	9,846	3,873	14,754	2,180	7,776	7,606
9	3,968	2,568	2,350	19,520	7,073	8,087	9,112	3,007	11,715	3,757	7,457	5,049
10	3,596	2,459	2,055	15,765	6,795	12,007	9,461	3,007	9,810	2,506	7,442	6,486
11	3,604	2,004	1,714	15,375	6,605	9,112	8,147	3,007	9,083	3,007	4,479	5,179
12	3,214	2,133	544	17,185	6,175	7,804	5,311	2,057	7,922	2,756	2,099	3,529
13	3,118	2,257	2,084	18,045	5,779	7,121	5,520	2,771	8,337	5,894	5,829	4,221
14	1,288	2,472	2,055	17,705	6,177	8,525	4,604	3,649	7,537	6,510	5,530	3,823
15	2,188	2,534	2,077	16,065	5,789	7,865	2,110	3,007	6,424	6,130	5,591	3,823
16	3,755	2,523	2,250	17,940	6,175	6,362	4,418	3,759	3,257	6,027	5,059	1,335
17	3,058	2,428	2,245	13,985	5,789	3,521	4,437	5,495	4,647	4,986	5,272	1,702
18	3,058	1,790	1,713	11,555	5,428	11,393	3,512	7,537	7,274	4,364	2,773	2,913
19	2,988	941	444	9,725	4,880	12,035	4,397	4,443	10,811	4,325	4,219	2,663
20	2,713	2,232	3,318	8,095	2,471	12,466	4,222	4,012	12,397	4,574	4,840	3,279
21	1,884	2,307	4,615	7,888	5,060	15,868	4,199	3,472	13,969	4,979	3,372	3,665
22	2,660	2,192	4,496	15,200	5,428	17,986	1,980	3,122	11,138	6,247	3,007	4,009
23	3,093	2,162	4,590	16,990	4,325	16,833	2,773	3,007	10,380	6,666	3,411	2,498
24	3,003	2,397	4,392	16,345	4,325	13,952	1,739	3,007	9,221	5,561	3,372	5,772
25	2,693	1,948	2,734	14,745	3,665	11,078	3,122	3,007	8,549	4,503	1,383	9,099
26	2,462	1,633	4,523	11,420	3,665	11,245	3,122	1,487	6,958	4,503	3,741	4,487
27	2,502	2,307	6,737	11,140	2,009	13,572	3,122	1,702	6,108	4,093	3,513	3,665
28	1,964	2,215	7,603	9,725	5,462	14,470	3,007	2,349	5,378	1,596	3,722	3,415
29	1,567	....	9,482	8,405	5,147	12,993	1,237	1,911	4,938	5,201	3,257	3,415
30	2,511	....	12,884	9,810	3,529	11,620	237	1,747	2,521	5,112	4,212	2,605
31	2,511	....	35,578	....	3,339	....	7,361	1,246	....	4,075	....	5,891

Estimated monthly discharge of Hudson River at Fort Edward, N. Y., for 1905.

[Drainage area, 2,800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	4,323	1,288	2,843	1.02	1.18
February	2,589	941	2,222	.794	.827
March	35,578	444	4,436	1.58	1.82
April	38,907	7,888	17,762	6.34	7.07
May	11,420	2,009	5,917	2.11	2.43
June	17,986	1,143	9,021	3.22	3.59
July	17,047	237	6,499	2.32	2.68
August	8,544	1,246	3,701	1.32	1.52
September	18,279	1,841	8,829	3.15	3.51
October	6,666	1,197	4,338	1.55	1.79
November	7,776	1,383	4,686	1.67	1.86
December	9,639	1,335	5,028	1.80	2.08
The year	38,907	237	6,271	2.24	30.36

HUDSON RIVER AT MECHANICSVILLE, N. Y.

A record of the flow of Hudson River at Mechanicsville has been kept by the Duncan Company since December, 1888. The record includes two daily readings of the depth on the crest of the dam, and a continuous record of the run of the water wheels in the adjoining paper mill. The accompanying tables, computed by Mr. R. P. Bloss, the engineer of the company, show the daily and monthly mean flow at Mechanicsville.

The dam of the West Virginia Pulp and Paper Company at Mechanicsville was raised during 1904, a concrete crest and apron being added, so that the dam has now a rounded or ogee profile. A discharge curve has been calculated, using coefficients of discharge derived from United States Geological Survey experiments on models of dams of ogee cross section by Robert E. Horton.

Information concerning the Hudson at Mechanicsville is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: Ann 19, iv, pp. 117–118; WS 35, pp 58–59; 47, p 77; 65, pp 50–51; 82, p 102; 97, p 218; 125, pp 22–23.
Discharge: WS 47, p 39.
Discharge, daily: WS 35, pp 59–61; 47, pp 78–79; 65, p 52; 82, p 103; 97, p 218; 125, p 23.
Discharge, monthly: Ann 19, iv, pp 119–122; 20, iv, p 81; 22, iv, pp 109–110; WS 35, p 24; 65, pp 52–53; 82, p 104; 97, p 219; 125, p 23.
Discharge, yearly: Ann 20, iv, p 47.
Hydrographs: Ann 19, iv, p 118; 20, iv, p 80; 21, iv, p 72; 22, iv, p 111; WS 75, p 23.

Daily discharge, in second-feet, of Hudson River at Mechanicsville, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1....	4,410	5,770	5,770	16,812	29,022	5,616	....	....	2,828	14,518	7,754	3,583
2....	3,970	4,730	4,930	20,678	28,403	5,610	....	....	2,919	14,993	6,708	3,529
3....	5,550	4,320	6,030	19,274	26,387	5,596	....	....	3,016	13,621	6,065	2,939
4....	5,450	4,370	11,180	17,637	25,354	4,518	....	....	3,062	10,327	5,867	2,943
5....	5,350	3,560	9,130	18,449	22,656	2,949	....	....	5,800	9,508	5,636	3,812
6....	5,250	3,980	7,968	19,974	20,861	4,965	....	....	5,672	8,889	5,042	2,993
7....	4,330	5,500	6,732	22,700	18,275	6,377	....	....	5,200	....	5,722	2,927
8....	4,910	15,130	16,468	24,412	14,522	7,349	....	....	4,578	....	4,987	3,243
9....	4,930	9,910	14,544	32,127	14,437	21,636	....	....	5,231	....	4,773	3,654
10....	6,920	8,020	11,611	....	13,159	20,255	....	....	4,665	....	4,916	2,907
11....	5,870	7,680	10,560	36,305	12,286	15,050	....	....	5,573	....	4,213	2,884
12....	5,780	7,770	9,305	34,358	11,388	12,748	....	....	5,012	....	3,913	3,685
13....	4,730	7,270	8,827	31,054	8,728	11,719	....	....	4,499	....	3,623	2,951
14....	4,840	8,060	8,653	26,537	8,512	9,350	....	....	3,258	....	5,335	3,746
15....	4,550	7,380	7,880	22,377	6,897	7,787	....	2,578	15,000	....	4,230	3,333
16....	5,840	5,410	7,378	19,549	8,487	6,825	....	2,851	14,610	....	4,337	3,193
17....	7,140	5,580	6,910	....	11,037	5,845	....	2,739	9,095	....	4,018	3,177
18....	5,640	5,500	6,162	16,039	11,817	5,529	....	2,548	7,539	....	4,210	2,726
19....	5,510	4,270	5,754	15,429	10,362	4,395	....	2,564	7,542	....	3,637	3,346
20....	5,850	5,320	7,266	14,473	12,257	4,966	....	2,578	6,269	....	3,012	2,983
21....	4,600	6,660	7,585	12,921	11,817	4,015	....	....	5,491	....	4,453	3,540
22....	3,390	7,310	7,682	11,756	11,369	3,913	....	12,368	5,470	....	4,831	3,255
23....	9,310	11,850	9,792	11,198	11,245	3,899	2,608	12,914	4,938	....	3,999	2,993
24....	12,970	9,780	13,754	10,700	9,237	3,968	....	12,926	4,511	....	4,131	2,996
25....	9,340	7,770	14,062	13,984	8,600	3,667	....	10,603	5,642	....	3,660	2,874
26....	6,800	6,700	22,844	16,836	9,087	2,509	2,630	8,929	7,990	....	4,374	3,657
27....	5,790	6,290	23,362	17,962	8,867	3,074	2,619	7,058	10,412	14,145	3,359	4,622
28....	5,190	6,450	20,450	22,387	7,959	3,427	2,630	....	10,439	12,353	3,860	11,973
29....	4,770	6,550	17,471	25,572	6,338	2,844	....	5,440	9,309	10,646	4,156	8,055
30....	5,070	....	16,058	29,131	6,700	2,585	....	4,400	14,239	....	4,432	6,708
31....	5,910	....	16,583	....	6,934	....	....	3,388	....	8,796	....	6,341

Daily discharge, in second-feet, of Hudson River at Mechanicsville, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1....	5,340	3,288	2,966	48,877	13,063	4,466	10,394	10,194	4,068	....	......	......
2....	6,868	3,903	2,966	44,936	12,466	4,430	8,326	9,940	4,066	6,965	......	......
3....	6,662	3,800	2,966	38,229	12,112	4,346	14,444	8,610	4,506	6,586	......	......
4....	4,791	2,927	2,951	31,254	11,105	3,590	13,265	7,025	13,839	6,284	......	......
5....	4,948	....	3,574	28,584	11,504	4,623	11,374	5,911	19,544	5,932	......	......
6....	5,875	4,193	3,067	31,678	11,130	4,719	14,932	4,004	20,704	5,463	......	......
7....	10,572	3,885	2,951	33,585	9,254	4,273	12,695	5,840	19,846	5,167	......	......
8....	10,200	3,175	2,951	33,010	10,259	4,203	10,621	4,911	17,573	3,118	......	......
9....	8,877	3,256	2,951	23,784	9,573	6,959	8,503	5,195	15,110	6,158	......	......
10....	7,619	3,435	3,028	22,110	9,972	13,724	8,494	5,676	11,274	5,181	......	......
11....	6,362	3,476	3,018	21,670	9,386	9,955	7,655	5,608	11,855	4,749	......	......
12....	6,659	4,564	3,846	25,231	8,620	7,928	6,209	7,018	10,564	5,185	......	......
13....	8,624	3,333	2,982	24,481	8,361	7,632	5,922	4,455	11,462	5,344	......	......
14....	7,630	3,710	2,981	24,031	7,539	8,053	5,594	5,812	10,535	8,189	......	......
15....	5,538	3,264	2,982	22,550	8,327	8,186	5,430	5,191	8,853	6,464	......	......
16....	6,984	3,532	2,951	21,612	7,577	7,173	3,638	6,551	7,432	7,374	......	......
17....	5,896	4,027	2,951	18,715	8,736	5,888	5,746	7,396	5,870	6,370	......	......
18....	6,461	3,705	3,291	16,804	7,576	5,709	4,568	8,379	10,617	5,772	......	......
19....	6,461	5,204	10,067	13,776	7,707	11,067	4,721	5,874	15,721	5,612	......	......
20....	6,526	3,309	10,714	12,186	7,356	10,867	5,444	4,981	18,214	5,918	......	......
21....	5,421	2,927	8,967	11,714	5,487	14,426	5,302	6,546	19,708	7,530	......	......
22....	4,484	3,380	7,166	15,652	7,355	20,395	4,974	5,055	18,703	6,463	......	......
23....	5,263	3,105	7,067	17,326	6,396	18,664	2,715	4,828	15,835	8,232	......	......
24....	4,950	2,954	6,994	18,208	5,678	15,422	4,573	4,623	11,297	7,374	......	......
25....	5,004	3,095	19,276	17,378	5,429	11,915	4,429	4,357	12,294	6,770	......	......
26....	4,276	4,168	17,788	15,450	5,056	12,407	3,587	2,524	10,278	5,836	......	......
27....	4,112	3,080	24,161	13,925	5,195	14,109	3,632	2,168	8,810	5,836	......	......
28....	4,721	2,996	23,881	13,477	4,184	14,932	3,839	3,656	8,037	5,533	......	......
29....	4,168	....	24,631	11,715	6,203	14,123	3,749	3,520	7,516	4,119	......	......
30....	4,213	....	32,103	11,209	6,007	12,364	3,638	3,436	6,823	6,346	......	......
31....	3,517	....	42,838	....	4,692	....	6,562	5,265	....	6,128	......	......

NOTE.—Discharges given from July 1 to August 22, 1904, are minimum when all water passed through wheels. On days during that period for which there is no record the discharge was in excess of 2,800 second-feet.

Estimated monthly discharge of Hudson River at Mechanicsville, N. Y., for 1904 and 1905.

[Drainage area, 4,500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1904.					
January	12,970	3,390	5,805	1.29	1.49
February	15,130	3,560	6,858	1.52	1.64
March	23,362	4,930	11,055	2.46	2.84
April (28 days)	36,305	10,700	20,737	4.61	4.80
May	29,022	6,338	13,323	2.96	3.41
June	21,636	2,509	6,765	1.50	1.67
July (4 days)	2,630	2,608	2,622	.583	.087
August (15 days)	12,926	2,548	6,259	1.39	.775
September	15,000	2,828	6,660	1.48	1.65
October (10 days)	14,993	8,889	11,780	2.62	.974
November	7,754	3,012	4,644	1.03	1.15
December	11,973	2,726	3,922	.872	1.00
1905.					
January	10,572	3,517	6,097	1.35	1.56
February	5,204	2,927	3,544	.788	.810
March	42,838	2,951	9,388	2.09	2.41
April	48,877	11,209	22,748	5.06	5.65
May	13,063	4,184	8,171	1.82	2.10
June	20,395	3,590	9,552	2.12	2.37
July	14,932	2,715	6,935	1.54	1.78
August	10,194	2,168	5,631	1.25	1.44
September	20,704	4,066	12,032	2.67	2.98
October 2-31	8,232	3,118	6,067	1.35	1.51

CHAMPLAIN CANAL AT FORT EDWARD AND MECHANICSVILLE, N. Y.

About 7 miles above Fort Edward, at the Glens Falls feeder dam, water is diverted from the Hudson for the supply of the Champlain Canal, and the recorded flow of the river at Fort Edward and Mechanicsville does not, therefore, represent the total natural yield of the drainage basin at those points.

Measurements of flow of Champlain Canal were made during 1905, as follows: August 29, at Saratoga Street Bridge, Mechanicsville, by E. F. Weeks, discharge 84 second-feet; at Notre Dame Street Bridge, Fort Edward, by E. F. Weeks, discharge 78 second-feet. A measurement made at the latter place on September 25, 1905, showed a discharge of 138 second-feet.

FISH CREEK AT BURGOYNE, N. Y.

Fish Creek forms the outlet of Saratoga Lake and has a length of 8 miles below the limit of slack water from the lake. It descends 100 feet in the lower 4 miles of its course, the greater portion of this fall being concentrated at Victory Mills, and enters the Hudson at Schuylerville, where power is developed. It has a total drainage area of 235.8 square miles, as shown by the following table:

Drainage area of Fish Creek. [a]

Point of measurement.	Area in square miles.	
	Place to place.	Total.
	Sq. miles.	*Sq. miles.*
Kayaderosseras Creek above Middle Grove	43.8	43.8
Middle Grove to Ballston Springs	65.8	109.6
Ballston Springs to mouth	85.1	194.7
Saratoga Lake water surface	6.8	....
Total direct drainage [b]	41.1	235.8

[a] From United States Geological Survey topographic maps, Saratoga, Schuylerville, Schenectady, Glens Falls, Luzerne, and Broadalbin sheets.
[b] Above Brandt's bridge.

A temporary gage was established at Burgoyne station on August 25, 1904, and discontinued June 30, 1905. The gage was attached to the right-hand abutment of Brandt's bridge, and observations of stage were taken once each day by G. R. Warner. Current-meter measurements were made from the bridge. The discharge is not a continuous function of the stage of the stream, however, owing to the fact that grass and aquatic plants growing in the channel cause the velocity to vary with the season. The channel is occasionally cleared of this growth by the water-power users in order to facilitate the flow.

Discharge measurement of Fish Creek at Burgoyne, N. Y., by Horton and Mott, September 25, 1905; gage height, 2.48 feet; discharge, 683 second-feet.

Daily gage height, in feet, of Fish Creek at Burgoyne, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1.1	.9	.15	8.1	1.6	0.05	17	1.8	.5	.8	3.4	.9	:0
2	1.15	.8	.1	8.0	1.52	.0	18	1.75	.5	.9	3.1	.9	.05
3	1.45	.85	.1	7.6	1.45	.0	19	1.8	.9	1.0	2.9	.85	.03
4	1.45	.9	.15	7.0	1.3	.0	20	1.85	.9	1.0	2.7	.75	−.04
5	1.3	.8	1.8	6.6	1.36	−.08	21	1.7	.95	.9	2.6	.73	−.08
6	1.3	.8	1.1	6.3	1.25	−.17	22	1.3	.95	.9	2.5	.6	.0
7	1.35	.9	.2	6.1	1.3	−.04	23	1.2	1.0	.85	2.4	.7	.1
8	1.5	.9	.2	5.9	1.2	.0	24	1.2	1.0	.95	2.3	.35	.05
9	1.9	.9	.3	4.6	1.15	.0	25	1.1	.9	1.1	2.2	.35	.4
10	1.95	.95	.3	4.3	1.15	.0	26	1.1	.2	1.2	2.13	.3	.22
11	1.9	.9	.35	4.1	1.1	−.05	27	1.0	.2	1.5	1.92	.2	.2
12	1.9	.8	.75	4.1	1.0	−.08	28	.9	.3	2.5	1.8	.18	......
13	1.95	.75	.8	4.0	1.05	.3	29	.9	......	3.6	1.73	.15	.28
14	1.95	.8	.85	3.9	.95	.1	30	.85	......	5.0	1.65	.1	.29
15	1.95	.7	.85	3.7	.9	.05	31	1.0	......	6.75	......	.05	......
16	1.9	.55	.8	3.5	.95	.02							

KAYADEROSSERAS CREEK NEAR SARATOGA LAKE, N. Y.

Kayaderosseras Creek, the chief tributary of Saratoga Lake, drains the highland region lying north and west of the lake and has its source in the range of hills which rises about 800 feet above the general plateau and trend northwest and southeast. The area of the basin, measured at the mouth of the creek, is 194.7 square miles. The topography of the main plateau is moderately rolling, the soil is sandy, and tributaries are sparse, with few marsh or lake areas.

A measurement of the discharge of this creek was made by Robert E. Horton and D. L. Mott on September 25, 1905, at the first bridge above Saratoga Lake. The water surface was 7.93 feet below the top of the upper horizontal tie board, 5 feet from the left-hand end of the bridge, upstream side. The area of the cross section was 301 square feet; the discharge 250 second-feet.

INDIAN RIVER AT INDIAN LAKE, NEW YORK.

A record of the stage of water in Indian Lake reservoir, located in the upper Hudson River basin, as described in preceding reports, has been continued. The reservoir gates were open during the greater portion of the year, the closed period extending from April 1 to July 26. The reported stage of water in the reservoir is shown in the accompanying table.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 47, pp 71–72; 65, pp 42–44; 82, p 98; 97, p 222; 125, p 24.
Stage of water: 47, p 72; 65, p 44; 82, p 99; 97, p 223; 125, p 24.

Stage of water, in feet, in Indian Lake reservoir, New York, for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	17.16	13.16	7.84	10.66	26.33	31.04	35.12	34.5	33.62	33.58	32.58
2	16.92	12.92	7.66	11.46	26.66	31.08	35.58	34.42	33.5	33.42	32.51
3	16.79	12.66	7.46	12.04	27.0	31.04	36.0	34.25	33.84	33.25	32.42
4	16.62	12.46	7.25	12.75	27.33	31.21	35.96	34.08	35.08	33.0	32.33
5	16.42	12.25	7.04	13.5	27.62	31.33	35.66	34.08	36.08	32.92	32.25
6	16.42	12.08	6.84	14.42	27.92	31.42	35.33	34.08	36.16	32.75	32.21
7	16.46	11.88	6.66	15.08	28.16	31.5	35.16	34.08	36.0	32.5	32.16
8	16.46	11.66	6.50	15.58	28.37	31.75	35.0	34.08	35.84	32.25	32.12
9	16.33	11.46	6.33	15.58	28.58	32.0	34.84	34.0	35.66	32.08	32.08
10	16.21	11.25	6.08	16.33	28.75	32.16	34.58	34.0	35.5	32.16	31.96
11	16.12	11.04	5.84	16.66	28.92	32.37	34.42	34.0	35.33	32.25	32.84
12	16.0	10.84	5.58	17.33	29.04	32.58	34.25	34.04	35.16	32.5	31.66
13	15.92	10.66	5.33	18.0	29.16	32.75	34.16	34.08	35.0	32.71	31.54
14	15.84	10.5	5.08	18.58	29.29	32.92	34.25	34.08	34.92	32.92	31.42
15	15.75	10.33	4.84	18.92	29.46	33.0	34.16	34.08	34.84	33.0	31.58
16	15.66	10.16	4.58	19.16	29.58	33.08	34.21	34.12	34.75	33.08	31.66
17	15.58	10.0	4.33	19.33	29.71	33.75	34.16	34.08	34.66	33.16	31.71
18	15.42	9.84	4.33	19.5	29.84	34.33	34.08	34.04	34.84	33.29	31.75
19	15.25	9.58	4.33	19.71	30.0	34.66	34.16	34.0	35.08	33.5	31.75
20	15.08	9.42	4.33	19.92	30.08	35.08	34.16	33.96	35.25	33.79	31.75
21	15.0	9.25	4.33	20.5	30.16	35.33	34.16	33.0	35.29	34.0	31.75
22	14.92	9.08	4.33	21.66	30.25	35.5	34.16	33.96	35.29	34.08	31.75
23	14.84	8.92	4.84	22.5	30.33	35.46	34.21	33.96	35.16	34.21	31.79
24	14.71	8.71	5.08	23.0	30.42	35.42	34.08	33.96	35.12	34.33	31.84
25	14.58	8.5	5.5	23.42	30.5	35.25	34.08	33.96	34.84	34.37	31.88
26	14.46	8.33	5.84	23.84	30.58	35.46	34.08	33.92	34.71	34.42	31.92
27	14.33	8.16	6.21	24.33	30.66	35.42	34.08	33.92	34.5	34.33	31.96
28	14.08	8.0	6.66	24.75	30.75	35.42	34.08	33.92	34.25	33.92	32.0
29	13.84	......	7.29	25.33	30.84	35.33	34.04	33.92	34.0	33.54	32.08
30	13.58	......	8.33	25.88	30.92	35.25	34.25	33.84	33.75	33.16	32.25
31	13.42	......	9.42	......	31.0	......	34.5	33.75	......	32.84	......

HOOSIC RIVER AT BUSKIRK, N. Y.

Hoosic River has its sources on the west slope of the Hoosac Mountains in Vermont and Massachusetts. Two head branches, one flowing southward, the other northward along the west slope of this range, unite at North Adams, Mass., and the stream then flows northwestward, entering the Hudson 3 miles north of Mechanicsville. Above Buskirk the drainage basin is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the steep rock slopes. The ridges are sparsely wooded. The soil in the valleys is generally firm and tenacious. The general elevation of the valley at the junction of the headwaters is 1,000 feet. Numerous dams, affording power for textile, agricultural implement, and other industries are scattered throughout the length of the stream from North Adams to Schaghticoke. The drainage basin contains no important lakes and but one storage reservoir, at Farnam, near the head of South Branch.

South of Hoosic River the State boundary follows the Taconic Ridge, which forms the divide between the Hoosic in Massachusetts and the Little Hoosic in New York.

A gaging station was established September 25, 1903, at the highway bridge in Buskirk village. The channel is straight near the gaging station. The banks are high and seldom overflow. The current is exceptionally smooth, but is rather slow during low water. A standard chain gage is attached to the covered wooden highway bridge. The length of the chain is 28.17 feet. The gage is read twice each day by Bert C. Henry. A bench mark is located on the upstream corner of the left abutment; elevation, 36.03 feet above gage datum.

Information concerning this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905, and in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, pp. 219–220; 125, pp. 24–25.
Discharge: 97, p. 220; 125, p. 25.
Gage heights: 97, p. 221; 125, p. 26.

Discharge measurements of Hoosic River at Buskirk, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 28	H. R. Beebe	144	1,095	5.52	7.00	6,035
March 29	do	144	1,091	5.63	6.98	6,141
August 8	C. C. Covert	127	421	1.19	2.18	499
August 9	do	125	404	1.03	1.92	417

Daily gage height, in feet, of Hoosic River at Buskirk, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	3.68	2.95	7.25	2.62	1.79	2.26	3.14	3.0	2.22	2.0	3.7
2	2.82	3.5	2.9	5.5	2.58	1.77	2.14	2.44	2.52	2.2	1.78	3.28
3	3.05	3.4	2.98	4.88	2.55	1.87	2.78	2.32	5.02	2.25	1.72	8.3
4	2.92	3.38	2.88	4.72	2.6	1.69	2.28	2.14	5.85	2.4	1.88	7.45
5	4.38	3.48	2.88	5.08	2.42	1.75	2.18	2.14	5.25	2.28	2.05	4.85
6	4.35	3.48	2.95	5.78	2.45	1.87	2.11	1.72	4.05	2.25	2.05	4.3
7	5.32	3.62	3.0	4.92	2.45	2.17	2.08	2.22	3.6	2.08	2.4	3.92
8	5.4	3.58	2.9	4.3	2.58	1.99	1.97	2.12	3.25	1.98	2.32	3.55
9	4.1	3.45	3.0	3.6	2.52	2.02	1.87	1.88	3.15	1.9	2.3	3.4
10	3.6	3.52	3.18	3.9	2.45	1.82	1.97	1.9	2.65	1.92	2.1	3.05
11	3.38	3.42	3.18	5.32	2.35	1.72	1.95	2.6	2.62	1.88	2.08	2.9
12	3.62	3.38	3.42	5.9	2.4	1.69	1.93	3.72	2.52	2.65	1.95	2.92
13	4.6	3.4	3.35	4.95	2.38	1.77	1.77	3.02	2.48	2.48	2.02	2.82
14	3.82	3.32	3.4	4.45	2.33	1.82	1.93	2.55	2.95	2.2	1.98	2.82
15	3.15	3.3	3.28	4.3	2.35	1.86	1.7	2.4	2.72	2.05	1.88	2.55
16	3.35	3.32	3.32	3.78	2.58	1.68	1.7	3.38	2.52	2.1	1.9	2.65
17	3.25	3.38	3.38	3.7	2.45	1.54	1.87	3.45	2.45	2.1	1.95	2.5
18	3.0	3.5	3.85	3.38	2.48	1.66	1.77	3.18	4.0	2.02	1.95	2.68
19	2.78	3.32	8.65	3.12	2.45	2.08	1.83	2.55	4.8	2.15	2.0	2.5
20	2.68	3.35	5.45	3.0	2.3	2.18	1.87	2.18	3.98	2.48	1.95	2.45
21	2.8	3.3	4.12	3.48	2.38	2.98	1.75	2.32	4.22	2.62	1.85	2.5
22	2.52	3.2	3.55	3.68	2.18	5.31	1.67	2.22	3.38	2.2	1.85	3.15
23	2.58	3.1	3.52	3.2	2.05	3.91	1.53	2.2	3.12	2.28	1.75	3.25
24	4.8	3.02	3.7	3.1	2.05	3.28	1.65	2.12	2.88	2.2	1.78	2.9
25	4.55	3.12	9.85	3.02	2.0	2.66	1.83	1.98	2.75	2.25	1.68	2.62
26	4.0	3.02	6.7	2.78	1.85	3.44	1.9	2.02	2.68	2.05	1.7	2.48
27	4.12	3.12	7.95	2.8	2.02	3.44	1.83	1.98	2.55	2.05	1.95	2.5
28	4.32	2.92	7.15	2.65	1.95	3.01	1.8	2.05	2.4	2.0	1.88	2.45
29	4.28	....	7.12	2.55	1.82	2.66	1.67	1.95	2.4	1.88	2.78	2.65
30	3.95	....	8.72	2.78	1.37	2.44	4.77	2.0	2.3	2.07	5.78	3.22
31	3.75	....	8.95	....	1.45	....	4.02	4.1	....	2.0	....	2.62

NOTE.—River frozen entirely across from January 24 to March 18, inclusive. During this period the gage was read to the surface of the water through a hole in the ice. The following comparative readings were also made:

Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*
February 1	3.7	3.85	0.6
February 4	3.4	3.6	.75
February 11	3.45	3.6	1.0
February 18	3.7	3.85	1.5
February 25	3.15	3.4	1.5
March 4	2.9	3.05	1.8
March 11	3.15	3.2	1.9
March 18	3.75	3.75	1.9

Station rating table for Hoosic River at Buskirk, N. Y., from September 25, 1903, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.40	140	2.50	704	3.60	1,614	4.60	2,735
1.50	176	2.60	769	3.70	1,716	4.70	2,860
1.60	216	2.70	837	3.80	1,822	4.80	2,985
1.70	260	2.80	909	3.90	1,930	4.90	3,110
1.80	308	2.90	985	4.00	2,040	5.00	3,240
1.90	359	3.00	1,065	4.10	2,150	5.50	3,905
2.00	412	3.10	1,149	4.20	2,265	6.00	4,600
2.10	467	3.20	1,236	4.30	2,380	7.00	6,080
2.20	524	3.30	1,326	4.40	2,495	8.00	7,630
2.30	582	3.40	1,419	4.50	2,615	9.00	9,230
2.40	642	3.50	1,515				

The above table is applicable only for open-channel conditions. It is based on 11 discharge measurements made during 1903-1905. It is fairly well defined between gage heights 1.6 feet and 7 feet. The table has been extended beyond these limits

Estimated monthly discharge of Hoosic River at Buskirk, N. Y., 1903-1905.

[Drainage area, 579 square miles.]

Month.	Discharge in second-feet			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
September 25-30	401	238	310	0.535	0.119
October	5,108	238	983	1.70	1.96
November	1,854	339	626	1.08	1.20
December	4,544	339	1,143	1.97	2.27
1904.					
January 24-31	1,996	661	970	1.68	.500
February 1-19	7,460	484	1,635	2.82	1.99
March 24-31	8,046	1,496	3,141	5.42	1.61
April	4,208	1,115	2,171	3.75	4.18
May	2,472	642	1,165	2.01	2.32
June	13,680	434	1,528	2.64	2.94
July	654	169	322	.556	.641
August	1,065	158	290	.501	.578
September	3,986	172	584	1.01	1.13
October	4,194	473	951	1.64	1.89
November	756	308	531	.917	1.02
December	4,890	456	1,297	2.24	2.58
1905.					
January 1-23	3,770	717	1,591	2.75	2.35
March 19-31	10,630	1,535	5,678	9.81	4.74
April	6,468	736	2,244	3.88	4.33
May	783	130	576	.995	1.15
June	3,648	192	694	1.20	1.34
July	2,948	188	512	.884	1.02
August	1,737	270	725	1.25	1.44
September	4,390	582	1,420	2.45	2.73
October	803	349	509	.879	1.01
November	4,292	251	537	.927	1.03
December	8,110	673	1,533	2.65	3.06

NOTE.—River frozen January 1-23, February 20 to March 23, 1904, and January 24 to March 18, 1905; no estimate made.

MOHAWK RIVER AT LITTLE FALLS, N. Y.

This gaging station is located at the lower (Gilbert's) dam at Little Falls, N. Y. The dam is of masonry, having the form of a circular arc, and furnishes power for the Astoronga Knitting Mill and the mill of the Little Falls Paper Company. In the Astoronga Knitting Mill are two turbines, built by T. H. Risdon & Co., Mount Holly, N. J. In the mill of the paper company are three Camden turbines and one 60-inch Day turbine, built in Little Falls.

There are three dams at Little Falls. The upper one is a State dam, diverting water for the supply of the Erie Canal; the lower two are used for water-power development. The gage record kept at the lower dam shows the amount of water flowing downstream from Little Falls, but does not include the diversion at the State dam above the gaging station, and hence does not represent the total yield from the tributary drainage area of 1,306 square miles.

In calculating the discharge for 1905 use has been made of the experiments of the United States Geological Survey at Cornell University in 1903 on flow over dams.

Information concerning this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905, and in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 35, p 51; 47, p 52; 65, p 162; 82, p 92; 97, p 196; 125, pp 26–27.
Discharge: WS 47, pp 39, 52–53; 65, pp 162, 163.
Discharge, daily: WS 35, p 51; 47, pp 54–55; 65, p 163; 82, p 93; 125, pp 27–28.
Discharge, flood: WS 47, p 53; 65, p 165.
Discharge, low-water: WS 47, p 54; 65, p 165.
Discharge, monthly: Ann 22, iv, p 94; WS 35, p 24; 65, p 164; 82, p 94; 125, pp 28–29.
Hydrographs: Ann 21, iv, p 67; 22, iv, p 95.

Daily discharge, in second-feet, of Mohawk River at Little Falls, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,519	1,137	1,063	18,334	5,238	1,142	1,725	3,229	2,170	986	3,809	5,325
2	4,375	1,178	1,096	13,521	3,885	1,027	3,648	1,728	1,397	1,027	5,310	3,569
3	4,258	1,137	1,094	9,623	2,665	1,178	7,514	1,716	5,133	2,426	4,037	13,650
4	4,183	1,067	1,099	8,722	3,231	903	7,351	1,300	15,171	2,180	3,695	10,989
5	3,959	651	651	12,051	2,839	1,184	4,568	1,029	18,287	1,028	3,454	8,709
6	3,579	995	1,024	12,932	4,460	1,668	2,696	1,028	11,325	1,280	4,311	6,714
7	2,047	1,098	1,059	11,245	5,603	2,175	2,117	3,735	7,758	929	6,328	5,808
8	2,155	1,136	1,060	8,446	3,520	3,137	1,731	2,358	6,059	1,030	6,178	4,012
9	3,585	1,134	1,060	6,053	3,208	3,260	1,792	1,518	3,744	892	5,155	3,050
10	2,098	1,062	1,214	5,515	2,513	3,196	1,525	1,265	2,522	953	3,953	2,854
11	1,786	1,029	1,065	7,056	1,926	613	1,229	1,179	2,125	827	3,159	2,045
12	1,795	770	511	9,347	2,074	2,640	1,583	1,727	2,936	4,245	2,912	2,126
13	3,472	1,031	921	8,371	1,599	2,407	1,438	3,642	3,521	5,434	2,767	2,126
14	3,414	1,026	885	8,351	1,801	2,169	2,223	2,936	2,472	4,950	3,005	2,076
15	2,403	1,061	921	6,847	2,122	1,518	2,823	1,972	1,866	3,597	2,407	1,074
16	2,157	1,043	886	5,150	1,862	1,270	1,863	5,233	1,938	2,665	2,181	980
17	1,944	1,173	921	3,715	1,267	1,278	1,576	5,081	1,792	2,138	2,229	789
18	1,621	1,132	889	3,009	1,349	3,753	1,716	3,536	4,651	2,031	2,176	1,283
19	1,874	730	1,923	2,588	1,926	4,381	1,757	2,002	5,981	2,024	2,211	1,351
20	1,921	1,173	5,109	2,701	1,820	4,381	2,518	1,681	5,049	5,973	1,863	1,658
21	1,649	1,173	5,211	4,224	1,337	6,965	1,975	1,399	4,821	5,620	1,480	4,758
22	1,310	1,079	5,203	10,223	1,521	7,306	1,511	1,273	3,545	3,964	1,437	6,393
23	1,481	1,079	5,429	7,380	1,273	6,244	1,118	1,142	2,756	3,359	1,523	5,577
24	1,438	1,079	4,954	5,613	1,298	5,201	1,182	992	2,016	2,778	1,667	3,452
25	1,384	1,251	6,308	4,584	1,141	3,597	1,298	917	1,665	2,411	2,105	3,452
26	1,384	730	9,180	4,680	1,026	6,076	1,300	786	1,608	2,082	2,267	2,312
27	1,099	1,132	14,921	5,060	1,313	6,075	1,072	571	1,436	1,870	2,172	2,349
28	1,197	1,132	20,883	4,829	1,488	6,154	1,027	797	1,301	1,736	1,973	2,013
29	900	....	14,219	4,825	1,332	3,342	958	960	1,272	1,748	4,712	2,285
30	1,178	....	18,341	6,281	1,204	2,1[illegible]5	809	1,222	1,112	1,399	7,694	3,768
31	1,176	....	19,629	....	1,300	....	4,346	2,869	....	1,441	....	4,670

Estimated monthly discharge of Mohawk River at Little Falls, N. Y., for 1905.

[Drainage area, 1,306 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	4,519	900	2,301	1.76	2.03
February	1,251	651	1,051	.805	.838
March	20,883	511	4,798	3.67	4.23
April	18,334	2,588	7,376	5.65	6.30
May	5,603	1,026	2,230	1.71	1.97
June	7,306	613	3,214	2.46	2.74
July	7,514	809	2,258	1.73	1.99
August	5,233	571	1,962	1.50	1.73
September	18,287	1,112	4,248	3.25	3.63
October	5,973	827	2,420	1.85	2.13
November	7,694	1,437	3,272	2.51	2.80
December	13,656	789	3,910	2.99	3.45
The year	20,883	511	3,253	2.49	33.84

MOHAWK RIVER AT DUNSBACH FERRY BRIDGE, NEW YORK.

This station was established March 12, 1898, for the primary purpose of checking a system of levels for the United States Board of Engineers on Deep Waterways, by D. J. Howell, civil engineer, who has furnished the earlier portion of the record. The station is located at the dam of the West Troy Water Company, one-fifth mile above Dunsbach Ferry Bridge, 9 miles from the mouth of the river. No record was kept from April 1, 1899, to August 1, 1900.

The dam is of masonry, with a flat granite crest 5.5 feet wide. It is in two sections, situated on opposite sides of an island of Hudson River shale. The left wing, at the upper end of the island, has a crest length of 380 feet; the right wing, 500 feet downstream, at the foot of the island, has a crest 280 feet long. The dam was rebuilt in 1903 and a new profile obtained.

During high water the current of the stream through the cross section of the channel leading to the lower dam has a velocity of several feet per second. The head due to this velocity has been added to the observed head as a correction for velocity of approach to the lower dam. The upper dam is situated 450 feet upstream from the crest gage.

The crest gage is attached to the timber cribbing 50 feet above the lower section of the dam, with its zero mark at an elevation of 172.00 feet referred to the United States Deep Waterways datum. Gage readings are taken twice daily at intervals of about twelve hours by Robert Wilson. The mean of the two daily readings is used in computing the flow.

The discharge over the dam has been calculated by means of the weir formula, using coefficients derived from the United States Geological Survey experiments.

In the pumping station adjoining the dam are two turbines of the old American type, one 66 inches and the other 75 inches in diameter. A new 54-inch Victor turbine was installed during 1902. The discharge is calculated from the recorded daily run of the water wheels and the working head. The turbines drive pumps taking water from the river for water-supply purposes at the rate of about 1,500,000 gallons per day, equivalent to a continuous flow of 2.25 second-feet.

Daily discharge, in second-feet, of Mohawk River at Dunsbach Ferry Bridge, New York, for 1905.

Day.	Jan.	Feb.[a]	Mar.[a]	Apr.	May.	June.[b]	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	8,440	1,980	841	38,440	8,440	2,760	6,680	5,490	4,620	2,760	3,720	12,270
2.....	8,720	1,790	841	32,780	8,720	2,760	7,430	5,060	4,190	2,930	7,400	8,360
3.....	9,560	1,790	896	30,020	5,920	2,710	10,960	3,590	5,060	3,760	7,680	16,660
4.....	7,180	1,790	951	25,820	5,270	2,600	11,240	2,930	17.080	3,980	6,170	35,030
5.....	5,490	1,680	896	20,350	5,270	2,430	10,120	2,270	27,480	3,980	5,700	21,700
6.....	4,840	1,610	951	22,250	6,170	3,260	7,430	1,760	25,820	3,590	5,490	14,610
7.....	5,060	1,590	951	27,070	6,680	4,620	4,620	2,600	27,080	2,930	7,430	17,780
8.....	8,440	1,640	951	25,020	7,180	6,170	3,760	5,700	10,680	2,430	10,960	9,480
9.....	11,550	1,760	951	12,800	6,930	5,920	3,760	3,430	8,440	2,270	10,400	7,420
10.....	10,960	1,870	1,180	13,730	5,880	4,840	3,590	2,600	6,170	2,100	8,190	6,090
11.....	7,940	1,640	1,640	13,420	5,410	3,980	3,260	2,100	5,060	2,100	6,420	5,620
12.....	5,700	1,520	1,520	21,860	4,540	5,700	3,430	2,100	4,410	3,430	5,700	5,490
13.....	5,490	1,330	1,410	20,300	4,540	5,490	3,260	2,930	6,420	10,120	5,490	5,060
14.....	5,270	1,330	1,520	17,760	4,190	4,620	2,760	4,620	6,170	9,280	5,060	5,060
15.....	5,060	1,410	1,640	13,420	4,190	3,980	3,260	4,620	4,840	8,190	4,840	4,620
16.....	4,620	951	1,760	11,860	4,840	3,430	4,840	6,170	3,980	6,420	4,620	4,410
17.....	4,410	951	1,870	10,120	4,840	3,100	4,840	13,730	3,430	4,840	4,190	3,760
18.....	3,980	867	1,870	8,190	4,190	3,100	2,760	8,720	5,700	4,190	3,590	3,260
19.....	3,760	1,100	2,100	7,680	3,760	3,430	4,430	5,700	14,040	4,410	3,100	3,100
20.....	3,590	1,180	13,110	6,680	3,760	6,420	2,760	3,430	12,170	8,440	3,100	3,260
21.....	3,430	1,410	14,350	6,420	3,760	6,680	3,430	2,930	12,480	9,280	2,930	4,410
22.....	4,100	1,300	12,800	7,680	3,590	15,370	2,930	2,760	9,560	8,190	2,760	7,180
23.....	4,100	1,180	16,060	10,400	3,260	12,480	2,600	2,600	6,930	6,680	2,760	13,420
24.....	2,930	1,050	15,030	11,860	3,100	10,400	2,100	2,270	5,490	5,700	2,600	10,120
25.....	2,760	951	17,760	10,120	3,000	7,940	2,100	2,100	4,620	5,060	2,430	9,280
26.....	2,680	902	39,900	8,190	2,930	6,420	2,100	1,870	3,760	4,410	2,720	7,430
27.....	2,680	757	36,540	8,440	2,760	14,350	2,270	1,760	3,430	3,760	3,180	6,420
28.....	2,730	778	44,890	8,190	2,760	11,240	2,020	1,720	3,100	3,430	3,900	5,060
29.....	3,050	....	39,400	8,440	2,760	9,280	1,870	1,640	3,100	3,430	4,540	5,270
30.....	3,040	....	41,380	8,720	2,760	6,930	1,870	1,640	2,760	3,100	15,980	8,720
31.....	3,020	....	41,380	....	2,600	....	1,640	2,680	....	3,930	....	8,190
Mean..	5,309	1,361	11,527	15,601	4,645	6,080	4,197	3,662	8,602	4,778	5,435	8,985

[a] Approximate. Some ice obstructions.
[b] Dam undergoing repairs. Flow slightly obstructed after June 6.

Estimated monthly discharge of Mohawk River at Dunsbach Ferry Bridge, New York, for 1905.

[Drainage area, 3,440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	11,550	2,680	5,309	1.54	1.78
February	1,980	757	1,361	.396	.412
March	44,890	841	11,530	3.35	3.86
April	38,440	6,420	15,600	4.53	5.05
May	8,720	2,600	4,645	1.35	1.56
June	15,370	2,430	6,080	1.77	1.98
July	11,240	1,640	4,197	1.22	1.41
August	13,730	1,640	3,662	1.06	1.22
September	27,480	2,760	8,602	2.50	2.79
October	10,120	2,100	4,778	1.39	1.60
November	15,980	2,430	5,435	1.58	1.76
December	35,030	3,100	8,985	2.61	3.01
The year	44,890	757	6,682	1.94	26.43

ORISKANY CREEK AT COLEMAN, N. Y.

A gaging station was established at Wood Road Bridge, 1 mile above the village of Oriskany, June 5, 1901. This station was discontinued November 30, 1904, a new station having been established at Coleman, 1 mile upstream, where a cableway was erected for use in making current-meter measurements during high water. Observations at the cable station were begun August 13, 1904.

The stream flows in a single channel. The bed is composed of gravel and bowlders. There is a flood plain at the left bank.

A staff gage is attached to piling and braced to trees along the bank. It is read twice each day by Peter Gambel. The bench mark is the top of a spike driven into the root of a basswood tree which supports the right-hand end of the cable; elevation, 8.83 feet above the zero of the gage.

A dam at Reeder's mills, one-fourth mile upstream from the cable station, affords opportunity for checking the freshet discharge and is also some protection against ice, which very seriously obstructs Oriskany Creek in winter.

Oriskany Creek receives the inflow from storage reservoirs at the head of Chenango River, in addition to the yield of its natural drainage area, which comprises about 140 square miles above the gaging station. During the navigation season the flow of the creek is diverted, as a whole or in part, at the State dam below the gaging station.

Information in regard to this station is contained in Water-Supply Paper No. 35 of United States Geological Survey: Description, p. 47; discharge, monthly, p. 24.

Discharge measurements of Oriskany Creek at Coleman, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
July 7	H. R. Beebe	75	121	2.13	1.18	258
August 26 a	R. E. Horton	70	94	1.14	.68	108
August 26 a	do	70	86	1.01	.55	87
September 1	C. C. Covert	79	123	1.89	1.34	234
September 1	C. J. Wood	72	123	1.82	1.28	225

a Wading below cable.

Daily gage height, in feet, of Oriskany Creek at Coleman, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	2.35	2.2	....	....	0.82	1.1	1.2	1.25	0.92	1.68	1.48
2	....	2.75	2.1	....	....	.85	2.32	1.08	1.02	.92	1.5	1.32
3	....	2.9	2.3	....	....	.68	2.25	.92	2.55	2.0	1.35	3.7
4	....	2.47	2.23	....	....	.72	1.55	.75	4.8	1.28	1.22	2.35
5	1.85	2.4	2.25	....	....	.85	1.5	.68	2.7	1.08	1.08	2.1
6	2.17	....	2.3	....	....	1.08	1.3	1.05	2.35	1.0	1.58	1.95
7	1.8	2.45	2.2	....	....	1.02	1.25	1.38	2.15	.9	1.7	1.8
8	1.73	2.57	2.33	....	....	1.55	1.05	1.0	1.85	.92	1.7	1.85
9	1.63	....	2.3	....	1.25	1.12	.98	.78	1.5	.9	1.6	1.78
10	1.55	2.53	2.27	....	1.15	.7	.9	.7	1.45	.9	1.35	1.72
11	1.73	2.57	2.23	....	1.1	1.05	.85	.75	1.4	.98	1.18	1.72
12	1.9	....	2.17	....	1.1	1.2	1.0	.62	2.45	3.0	1.18	1.48
13	3.35	....	2.17	....	.65	1.15	1.15	1.55	1.85	2.15	1.12	1.48
14	3.2	2.57	2.15	....	1.3	.92	1.32	1.02	1.6	1.72	1.15	1.45
15	3.25	2.5	2.1	....	1.68	.82	1.28	1.4	1.42	1.38	1.02	1.45
16	3.4	2.65	1.93	....	1.32	.75	.98	3.05	1.42	1.28	1.22	1.28
17	3.25	2.45	2.2	....	1.3	.88	.9	1.9	1.32	1.2	1.4	1.38
18	3.1	2.45	2.4	....	1.35	1.15	.72	1.38	2.05	1.15	1.28	1.48
19	3.15	2.47	6.35	....	1.35	1.72	1.08	1.08	1.62	2.1	1.28	1.28
20	2.95	2.5	5.7	....	1.2	2.3	.92	1.02	1.62	1.7	1.35	1.22
21	1.53	2.57	4.7	....	1.12	3.75	.78	1.02	1.4	1.5	1.22	1.65
22	1.5	2.37	4.3	....	1.05	2.8	.68	.95	1.32	1.38	1.05	3.38
23	1.45	2.33	3.95	....	1.05	1.82	.55	.88	1.22	1.32	1.05	2.15
24	1.53	2.3	5.35	....	1.05	1.45	.75	.8	1.12	1.25	1.1	1.98
25	2.03	2.35	7.6	....	.98	1.22	.72	.85	1.08	1.12	1.3	1.68
26	1.95	2.3	....	....	.98	4.4	.48	.58	1.02	1.1	1.22	1.78
27	2.1	2.23	....	....	1.08	2.35	.62	.78	1.05	1.1	1.22	1.62
28	2.45	2.27	....	....	.98	1.85	.65	.78	.98	1.02	1.18	1.58
29	2.43	....	....	....	.95	1.5	.5	.9	.82	1.05	2.12	2.22
30	2.27	....	....	....	.88	1.22	.62	1.45	.9	1.05	1.82	2.2
31	2.23	....	....	....	.82	....	1.55	1.88	....	1.02	....	1.78

NOTE.—Ice conditions January 1 to March 26, approximately; stream frozen entirely across most of the time. Thickness of ice varied from 0.1 to 1.3 feet.

ORISKANY CREEK AT STATE DAM, NEAR ORISKANY, N. Y.

Readings were taken from a reference point on the right-hand abutment of the State dam to determine the freshet discharge, beginning on the day when the ice left the stream in the spring of 1905, and continuing until the opening of the feeder gates for the supply of the Erie Canal. The dam is in good condition, and a discharge curve has been prepared from the data of a survey and profile.

A measurement of the leakage of this dam was made by means of the flow through a rectangular channel, August 26, 1905, and an allowance of 10 second-feet for leakage has been calculated in the discharge.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following publications of the United States Geological Survey (Ann = Annual Report; WS = Water-Supply Paper):

Description: WS 35, pp 47–48; 47, pp 45–46; 65, pp 145–146, 147–148; 82, p 79; 97, p 217; 125, pp 32–33.
Discharge: WS 47, pp 39, 46; 65, p 148; 82, pp 79–80; 97, p 217; 125, p 33.
Discharge, daily: WS 35, p 48; 47, pp 46–47; 125, p 34.
Discharge, monthly: Ann 22, iv, p 88; WS 35, p 24; 65, p 147; 125, p 35.
Gage heights: WS 65, p 149; 82, p 80; 125, pp 33–34.
Hydrographs: Ann 21, iv, p 66; 22, iv, p 89.

Daily discharge, in second-feet, of Oriskany Creek at State dam, near Oriskany, N. Y., during spring freshet season 1905.

Day.	Mar.	Apr.	Day.	Mar.	Apr.	Day.	Mar.	Apr.
1	....	1,080	12	....	....	23	590	....
2	....	340	13	....	....	24	1,500	....
3	....	130	14	....	....	25	3,100	....
4	....	105	15	....	....	26	1,580	....
5	....	1,080	16	....	....	27	1,300	....
6	....	905	17	....	....	28	1,080	....
7	....	960	18	....	....	29	520	....
8	....	300	19	1,530	....	30	1,030	....
9	....	....	20	1,120	....	31	1,250	....
10	....	....	21	960	....			
11	....	....	22	380	....			

STARCH FACTORY CREEK NEAR NEW HARTFORD, N. Y.

Starch Factory Creek is tributary to the Mohawk near Utica, N. Y. Its drainage basin, which includes Graefenberg Creek and reservoir, is shown on the Utica sheet of the United States Geological Survey topographic atlas, from which the following drainage areas have been taken:

Drainage areas of Starch Factory Creek.

	Square miles.
Above Graefenberg reservoir dam [a]	0.45
Above gaging weir	3.40
Above Savage reservoir dam	3.81
Above mouth	6.60

The region tributary to Starch Factory Creek consists of cleared farm land, chiefly sodded slopes, rising from the stream to the divide on either side in a distance of about a mile from the main stream, which flows in a gulf 300 feet below the level of the general plateau. A few small lateral creeks drain the more remote portions of the area.

A gaging weir was erected on this creek above the head of the former Savage reservoir May 26, 1903. The weir has a horizontal iron crest 6 feet in length, with end contractions. The weir gage is placed 6 feet upstream from the weir and is observed twice daily. The discharge is calculated by the Francis formula. In extreme freshets the discharge is observed at the masonry intake dam a short distance downstream.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 206; 125, p 35.
Discharge: 97, p 206.
Discharge, daily: 97, p 207; 125, p 36.
Discharge, monthly: 97, p 207; 125, p 37.

[a] The yield is developed from this area by tiling from springs.

Daily discharge, in second-feet, of Starch Factory Creek near New Hartford, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.02	0.76	0.66	16.20	2.45	1.43	....	13.32	1.77	1.16	8.24	2.49
2	17.50	.76	.66	10.40	2.39	1.55	....	13.32	1.28	1.40	3.26	3.26
3	6.04	.86	.66	9.63	2.52	1.68	....	13.32	28.30	2.33	2.94	25.20
4	4.16	.76	.66	12.45	3.54	1.19	....	9.01	159.00	2.64	2.94	9.12
5	3.62	.71	.66	32.10	2.60	.96	....	7.39	13.94	2.05	2.94	4.45
6	3.46	.66	.66	25.00	3.22	2.52	....	7.39	11.46	1.77	10.99	5.37
7	7.57	.66	.66	8.13	3.51	2.67	....	7.39	22.02	1.77	6.14	5.18
8	4.60	.66	.66	4.51	3.46	5.25	....	[a]15.40	9.12	1.77	5.37	5.56
9	2.52	.66	.66	7.05	4.97	2.67	[b]3.88	15.40	3.92	1.64	11.23	5.75
10	2.23	.66	.66	9.75	2.82	1.81	10.58	15.40	2.94	1.64	4.81	4.81
11	1.88	.71	.66	34.80	2.23	4.69	515.40	15.40	2.64	7.60	3.92	3.92
12	10.01	.71	.66	12.10	2.30	2.74	15.40	15.40	12.68	17.63	3.26	3.58
13	8.68	.71	.71	6.54	2.16	2.02	15.40	15.40	4.63	17.09	3.26	3.58
14	3.46	.71	.66	5.06	10.80	1.75	31.40	15.40	3.58	5.75	2.94	2.94
15	1.95	.71	.71	4.88	8.68	1.49	5.65	15.40	3.42	4.27	2.79	1.77
16	1.75	.71	.71	3.54	5.34	1.25	5.65	5.65	4.27	2.94	3.58	1.77
17	1.49	.66	.76	4.05	4.16	1.88	3.88	2.00	3.58	2.79	3.58	1.64
18	1.43	.71	2.67	3.54	5.15	2.52	2.77	10.00	9.12	2.64	4.27	1.77
19	1.75	.71	(d)	2.60	7.15	2.02	4.62	4.00	4.63	7.39	3.75	1.91
20	1.75	.66	24.00	2.90	3.62	11.00	4.62	4.00	7.81	5.75	2.64	2.19
21	1.55	.76	9.75	12.95	2.82	(d)	3.88	2.64	5.37	4.09	2.05	12.68
22	1.49	.71	6.23	5.53	2.30	....	3.88	2.33	3.58	3.92	2.05	(c)
23	1.31	.76	5.06	4.05	2.08	....	3.15	1.77	2.94	3.58	2.05	9.12
24	1.19	.71	15.63	3.64	1.88	....	8.03	1.52	2.64	3.26	2.33	5.37
25	1.13	.76	(c)	2.82	1.81	....	3.88	1.40	2.05	2.94	2.79	3.92
26	1.08	.71	(c)	2.52	2.45	....	3.15	1.40	1.64	2.64	2.79	3.26
27	1.08	.66	(c)	2.52	2.45	....	2.77	1.40	1.64	2 33	2.64	3.26
28	1.08	.66	(c)	2.52	2.16	....	2.77	1.05	1.64	2.05	2.33	3.75
29	1.02	....	(c)	2.23	2.16	....	2.77	1.64	1.64	1.91	[e]36.56	25.20
30	.96	....	(c)	2.30	1.81	....	12.19	4.63	1.52	1.91	5.37	8.90
31	.91	....	29.50	....	1.62	....	9.33	3.92	....	3.26	....	5.75

[a] Not including waste over spillway August 8-15.
[b] From record at intake dam July 9 to August 20.
[c] Exceeded capacity of weir.
[d] No record.
[e] Approximate.

Estimated monthly discharge of Starch Factory Creek near New Hartford, N. Y., for 1905.

[Drainage area, 3.40 square miles.]

Month.	Discharge in second-feet.				Run-off.		Rainfall.
	Maximum.	Minimum.	Mean.	Corrected mean.[a]	Second-feet per square mile.	Depth in inches.	Inches.
January	17.50	0.91	3.44	4.21	1.24	1.43	1.99
February	.86	.66	.71	1.48	.44	.458	.84
March (24 days)		.66	4.35	5.12	1.50	1.34	3.33
April	34.80	2.23	8.54	9.31	2.74	3.06	3.68
May	10.80	1.62	3.44	4.21	1.24	1.43	4.16
June (20 days)	11.00	.96	2.65	3.42	1.00	.744	10.00
July (23 days)	515.40	2.77	29.35	30.12	8.86	7.58	7.70
August	15.40	1.05	7.86	8.63	2.54	[b] 2.93	6.88
September	159.00	1.28	11.16	11.93	3.51	3.92	7.03
October	17.63	1.16	4.00	4.77	1.40	1.61	4.72
November	36.56	2.05	5.13	5.90	1.74	1.94	3.36
December (30 days)		1.64	5.91	6.68	1.96	2.19	3.36

[a] Including diversion to Graefenberg reservoir.
[b] This does not include waste over spillway August 8-15.

Precipitation at Savage reservoir near Utica, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		0.08	0.07		0.04			0.27			0.71	
2							0.96	.02			.04	0.02
3	0.49		.10		.10	0.26	.61		1.21	1.15		1.40
4	.16			0.18	.27				.87		.03	.55
5	.04			.92		.13	.69		1.33			.03
6		.28		.28	.29	.41	.06	.07	.10		.26	
7	.20			.30	.34	.06	.14	1.20	.41		.30	
8	.09		.11			.61	.10		.51		.06	
9	.03	.18	.27		.25						.39	
10		.12									.04	
11		.08		.35		.35						
12	.39	.26		.36	.05	.17	2.19	1.15	.62	1.70		.03
13	.21	.04					.31	.65	.04	.57	.03	
14						.04	.46		.02	.18		
15				.09	.86		.54	.49			.28	
16								1.10	.33			
17			.07	.06	.06	.25	.03	.42		.02	.16	
18		.10			.33	.29			1.10	.67	.10	
19	.23		.30		.22	.44	.36			.34		
20	.03		.55			.49	.49	.04		.27	.63	
21				.45		.68		.21	.57			.55
22	.18		.95	.18		1.60				.10		.36
23						.04			.24	.12		.24
24							.44					.10
25	.12		.75	.02			.26			.03	.04	
26						1.82						
27					.52	.41		.10			.09	
28						1.54				.03		
29						.05	.02	.38		.07	.61	.18
30				.26	.21		.91	.37			.25	.12
31			.33					.91				
Total	2.17	1.14	3.50	3.45	3.54	9.64	8.57	7.38	7.35	5.25	4.02	3.58

[a] Precipitation observed at 8 a. m. and credited to day of observation.

SYLVAN GLEN CREEK NEAR NEW HARTFORD, N. Y.

New Hartford or Sylvan Glen Creek is the inflowing stream tributary to reservoir No. 4 of the Utica waterworks. The stream consists of two main branches, the larger flowing in a deep-cut, wooded shale valley, the smaller draining a shallow ravine and a marshy divide. The drainage basin, which lies at an elevation of from 700 to 1,500 feet above tide, is shown on the Utica and Oriskany sheets of the United States Geological Survey topographic atlas. It comprises chiefly woodland and pasture, with some tillage, and is 1.18 square miles in extent. The flow of this stream became very small in May, 1903, and it may cease altogether at times.

The weir now used, which is located at the mouth of the stream, was erected in January, 1904, by the Consolidated Water Company, of Utica, N. Y., by whom the record is furnished. The weir has a main crest 6 feet long, with two end contractions, and a central low-water notch 2 inches deep and 2 feet long, making a total length of 8 feet. The gage is placed 6 feet upstream and is read twice daily.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905, and in the following Water-Supply Papers of the United States Geological Survey:

Description, 97, p. 216; 125, p. 37.
Discharge, daily: 97, p. 216; 125, p. 38.
Discharge, monthly: 97, p. 216; 125, p. 39.
Rating table: 97, p. 217.

Daily discharge, in second-feet, of Sylvan Glen Creek near New Hartford, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.63	0.12	0.07	3.21	0.26	0.02	0.34	0.56	0.34	0.21	2.26	0.66
2	3.91	.12	.07	1.10	.22	.06	[a]40.50	.27	.46	.18	1.16	1.06
3	1.41	.11	.07	1.10	.22	.05	2.26	.15	6.26	1.92	.96	14.89
4	1.04	.07	.07	2.82	.36	.04	3.13	.05	[a]45.00	.56	.76	3.97
5	.68	.05	.07	7.32	.38	.04	2.42	.02	3.97	.38	.56	2.67
6	.55	.05	.07	7.32	.42	.18	1.42	13.49	2.75	.27	2.75	1.92
7	1.21	.05	.05	3.31	.83	.42	.56	.56	6.26	.21	1.42	1.59
8	1.26	.05	.05	1.85	.33	.76	.46	.27	2.09	.21	1.92	1.59
9	.77	.06	.06	1.33	.59	.20	.34	.18	.86	.21	1 42	1.59
10	.68	.07	.07	1.41	.35	.10	.21	.10	.76	.15	1.16	1.42
11	.55	.07	.07	13.31	.24	.56	[b]70.00	.46	.76	.42	.96	.96
12	1.70	.07	.07	2.41	.24	.31	2.09	.56	2.42	6.26	.76	.96
13	2.74	.07	.07	1.26	.21	.16	.46	1.16	.96	5.76	.76	.96
14	.72	.07	.06	.83	3.41	.09	1.26	.38	.76	1.92	.76	.76
15	([c])	.07	.06	.94	1.70	.04	.96	3.13	.66	.96	.66	.56
16	......	.07	.05	.72	.72	.02	.42	4.78	.96	.76	1.16	.42
17	......	.07	.07	.55	.55	.27	.31	1.42	.56	.56	.96	.27
18	......	.07	.26	.44	1.70	1.76	.21	.42	.75	.42	.96	.21
19	......	.07	28.90	.38	1.26	.34	1.16	.31	.96	3.97	.86	.27
20	......	.08	8.76	.42	.42	1.92	.27	.34	1.76	4.38	.76	.38
21	......	.10	4.01	4.12	.33	25.14	.15	.27	1.16	2.42	.56	10.20
22	......	.10	1.56	1.04	.27	6.00	.10	.27	.66	1.16	.42	8.24
23	......	.10	1.33	.59	.22	2.09	.08	.21	.56	.96	.38	2.75
24	......	.07	6.84	.42	.20	.96	.42	.21	.42	.76	.56	2.26
25	......	.08	35.10	.36	.14	.46	.21	.15	.34	.76	.76	1.59
26	......	.10	19.50	.33	.55	[a]40.00	.10	.10	.27	.56	.56	1.06
27	......	.07	19.50	.29	.27	23.94	.05	.10	.21	.56	.56	.96
28	......	.07	11.44	.26	.12	3.13	.05	.10	.21	.56	.38	.96
29	.15	......	15.68	.29	.06	1.06	.05	.21	.21	.42	7.50	6.75
30	.15	......	14.56	.29	.07	.56	1.42	2.09	.21	.42	1.16	2.42
31	.15	......	6.10	......	.05	......	1.06	.76	......	.96	......	1.42

[a] Approximate. [b] Approximate. Exceeded capacity of weir. [c] No record.

Estimated monthly discharge of Sylvan Glen Creek near New Hartford, N. Y., for 1905.

[Drainage area, 1.18 square miles.]

Month.	Discharge in second-feet.			Run-off.		Rainfall.[a]
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	Inches.
January (1-14, 29-31)	3.91	0.15	1.14	0.966	0.611	1.49
February	.12	.05	.076	.064	.068	.84
March	35.10	.05	5.63	4.77	5.50	3.33
April	13.31	.26	2.00	1.69	1.89	3.68
May	3.41	.05	.538	.456	.526	4.16
June	40.00	.02	3.69	3.13	3.49	10.00
July	70.00	.05	4.27	3.62	4.17	7.70
August	13.49	.10	1.05	.890	1.03	6.88
September	45.00	.21	2.78	2.36	2.63	7.03
October	6.26	.15	1.27	1.08	1.24	4.72
November	7.50	.38	1.19	1.01	1.13	3.36
December	14.89	.21	2.44	2.07	2.39	3.36

[a] Mean of Savage and Graefenberg records.

GRAEFENBERG CREEK NEAR NEW HARTFORD, N. Y.

This small catchment basin, having an area of 0.282 square mile, consists of cleared farm land, chiefly meadow and pasture, and lies between elevations 1,100 and 1,300 feet above tide, near the summit of the general plateau south of Mohawk River. The geologic strata backward from the Mohawk in this region are, successively, the Hudson River shale, Medina sandstone, and Clinton limestone. The Hudson River shale yields few permanent springs and but little ground water. The Graefenberg basin lies above the shale and a large part of its water is derived from springs, probably in the Clinton series, which are supplied from points outside the topographic basin and the yield of which has been developed by tile drainage. The measured discharge exceeds the precipitation on the basin. Sylvan Glen Creek, an adjacent drainage basin at a lower level and entirely within the Hudson River shale, sometimes becomes entirely dry in summer.

A gaging weir was erected above the inflow to Graefenberg reservoir June 7, 1903, and a standard rain gage was placed on the adjoining meadow slope, some distance from trees and structures. The weir is compound in form and has a crest length of 5 feet, with two end contractions and a central notch 2 feet long, 0.21 foot deeper. The discharge is calculated by the Francis formula. The flow of the stream is very steady. The gages are read by Richard Owen and the record is furnished by the Consolidated Water Company, of Utica, N. Y.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 213; 125, p 39.
Discharge, daily: 97, p 214.

Daily discharge, in second-feet, of Graefenberg Creek near New Hartford, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.24	0.68	2.51	1.87	0.78	0.57	0.96	1.29	0.81	0.78	1.33	1.00
2	1.92	.70	2.51	1.33	.78	.57	2.79	.91	.96	.78	1.00	2.27
3	.96	.70	2.51	1.29	.75	.57	1.19	.81	3.20	1.19	1.05	3.65
4	.84	.68	2.51	2.16	.91	.59	1.10	.75	2.99	.88	1.00	1.60
5	.72	.75	2.51	2.58	.81	.59	1.00	.72	1.60	.81	.91	1.38
6	.72	.77	2.51	2.27	.88	.68	.91	1.38	1.65	.78	1.60	1.29
7	1.24	.75	2.54	1.76	1.29	.91	.88	.96	2.10	.78	1.14	1.29
8	.81	.75	2.54	1.56	.84	.91	.81	.81	1.43	.78	1.38	1.29
9	.72	.73	2.51	1.94	.96	.62	.75	.75	1.14	.78	1.24	1.38
10	.68	.73	2.51	2.33	.78	.59	.72	.75	1.05	.78	1.10	1.29
11	.62	.72	2.51	2.99	.72	.75	.81	1.24	1.29	3.80	1.14	1.19
12	2.03	.72	2.51	1.70	.78	.68	1.00	1.70	1.76	2.16	1.10	1.19
13	.96	.72	2.51	1.33	.68	.59	1.60	1.43	1.24	1.76	1.05	1.10
14	.68	.68	2.51	1.19	1.65	.57	4.57	.96	1.05	1.19	1.10	1.10
15	.65	.70	2.51	1.24	1.24	.57	1.29	1.14	.96	1.05	1.00	1.00
16	.65	.66	2.51	1.14	1.43	.59	.96	2.33	.91	.96	1.00	1.00
17	.65	.66	2.54	1.10	.88	.62	.88	1.24	.85	.91	1.05	.91
18	.65	.68	3.20	.96	1.10	.85	.81	1.05	2.86	.89	1.05	.91
19	.75	.68	12.06	.91	1.19	.65	1.19	.91	1.14	1.24	1.10	1.00
20	.68	.68	2.99	1.05	.84	1.29	.78	.88	1.24	1.24	1.05	1.10
21	.65	.65	1.24	1.98	.78	7.45	.75	.88	1.05	1.05	.96	2.92
22	.65	.62	1.05	1.14	.75	1.60	.72	.81	1.00	1.05	.91	3.35
23	.62	.60	1.16	.96	.68	1.14	.72	.75	.96	1.05	.91	1.60
24	.64	.59	4.80	.91	.65	.91	1.10	.75	.91	.91	.89	1.38
25	.65	.62	11.73	.84	.62	.81	.81	.72	.85	.91	.96	1.29
26	.65	.62	7.16	.81	.81	7.45	.75	.72	.85	.85	.93	1.19
27	.68	.62	9.1	.81	.68	4.10	.68	.70	.85	.85	.96	1.19
28	.70	.62	5.59	.78	.65	1.76	.65	.68	.85	.85	.91	1.19
29	.68	......	6.71	.88	.59	1.24	.72	.75	.81	.85	3.20	3.35
30	.66	......	5.78	.81	.65	......	4.10	1.49	.78	.85	1.19	1.38
31	......	......	3.06	......	.57	......	1.70	.96	......	1.00	......	1.29
Mean	.825	.681	3.82	1.42	.862	1.39	1.22	1.01	1.30	1.09	1.14	1.52

Precipitation at Graefenberg reservoir near New Hartford, N. Y., for 1905.[a]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			0.02		0.20			0.47			0.54	
2	0.02	0.04					0.60				.03	0.01
3	.36	.04			.60	0.22	.45		1.20	1.09		1.27
4	.11			.12	.19				.87		.02	.61
5	.03		.05	.86		.60	.28		.93			.02
6	T.	.07	T.	.25	.21	.41	.04	.08	.08		.23	
7	.25	T.	T.	.12	.33	.50	.03	1.07	.40		.31	
8	.11	T.				.83	.10		.26		.04	
9	.04	.06	.09		.23						.25	
10	.01	.04	.11								.05	T.
11	T.	.02		.30		.35						
12	.48			.35	.50	.10	1.60	1.20	.64	1.88		.01
13	.09	.20					.26	.56	.03	.36	.01	
14		T.				.40	.46		.01	.07	.15	
15		T.		.60	1.01		.32	.34				
16		T.						1.03	.19	.01		
17		T.	.04	.50	.50	.25	.02	.13			.10	
18	T.	.05			.26	.20			.69		.09	
19	.15	.02	.28		.17	.28	.27			.41		
20	.02		.53			.80	.11	.01		.12		
21	T.			.33		.70			.34	.06		.54
22	.10		1.00	.16		1.59				.04		.31
23	T.					.01			.07	.08		.14
24							.46					.07
25	.04		.76	.08			.31		.01	.23	.03	T.
26		T.				1.57						T.
27	T.	T.	T.		.39	.31		.05			.06	
28		T.	.02			1.23				.02		
29	T.						.01	.31		.04	.52	.15
30	T.			.21	.18		.75	.33			.26	
31			.26				.75	.80				
	1.81	.54	3.16	3.88	4.77	10.35	6.82	6.38	5.71	4.19	2.69	3.13

[a] Precipitation observed at 8 a. m., and credited to day of observation.

JOHNSTON BROOK NEAR DEERFIELD, N. Y.

Johnston Brook, a small torrential stream having a drainage area of 0.79 square mile, forms one of the tributaries of Reels Creek, which enters the Mohawk at Utica. The surface soil is heavy and impervious and is nearly all sod covered, forming pasture land. It is underlain by shale rock at a slight depth. There is very little surface run-off during the summer season and the amount of ground water supplied to the stream is small.

A gaging weir was erected near the mouth of the stream in 1903 and observations were continued until the end of May, 1905. The drainage area above the gaging weir is shown on the Utica sheet of the United States Geological Survey topographic atlas. The precipitation at Deerfield reservoir, adjacent to this drainage basin, is shown in the accompanying table.

Information concerning this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 212; 125, pp 41-42.
Discharge, daily: 97, p 212; 125, p 43.
Discharge, monthly: 97, p 212; 125, p 44.

Daily discharge, in second-feet, of Johnston Brook near Deerfield, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	1.05	0.13	0.13	1.41	0.64	17	0.13	0.13	0.30	0.42	......
2	2.12	.13	.13	2.25	.52	18	.13	.13	......	.34	......
3	.92	.13	.13	2.44	.52	19	.24	.13	......	.30	......
4	.27	.13	.13	3.85	.83	20	.21	.13	4.10	1.20	......
5	.18	.13	.13	4.34	.57	21	.18	.13	1.75	......	.52
6	.18	.13	.13	4.70	.92	22	......	.13	1.20	1.51	.42
7	.57	.13	.13	2.31	1.99	23	......	.13	.78	.82	.37
8	.57	.13	.15	2.51	.92	24	......	.13	2.25	.52	.30
9	.30	.13	.16	2.12	1.51	25	......	.13	......	.47	.27
10	.18	.13	.16	3.38	.82	26	......	.13	5.07	.37	.24
11	.18	.13	.19	......	.57	27	......	.13	6.26	.30	.37
12	1.00	.13	.19	2.77	.64	28	......	.13	3.07	.30	.27
13	.57	.13	.19	.82	.52	29	.13	......	3.38	1.15	.24
14	.33	.13	.20	.82	......	30	.13	......	2.25	.74	.27
15	.18	.13	.20	1.15	......	31	.13	......	5.07	......	.20
16	.13	.13	.15	.57	......						

Estimated monthly discharge of Johnston Brook near Deerfield, N. Y., for 1905.

[Drainage area, 0.79 square mile.]

Month	Discharge in second-feet.			Run-off.		Rainfall.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	Inches.
January (24 days)	2.12	0.13	0.417	0.528	0.471	1.93
February	.13	.13	.130	.164	.171	1.34
March (28 days)	6.26	.13	1.36	1.72	1.79	2.26
April (28 days)	4.70	.30	1.57	1.99	2.07	3.69
May (24 days)	1.99	.20	.601	.761	.679	3.48

Precipitation at Deerfield reservoir, near Deerfield, N. Y., for 1905.[a]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.[b]	Aug.	Sept.	Oct.	Nov.	Dec.
1	([c])				T.			0.08			0.75	
2		0.08		1.18	0.09	0.21					0.01	0.20
3			0.02		.18				1.44	0.83		2.22
4	[d] 0.83			.33	.04	.11			.78		.10	.41
5					.24	.98			1.52		.03	.02
6					.35	.06		.52	T.		.32	
7		.18				.54		.98	.40		.25	
8	.18				.20				.64		.11	
9		.23			.01						.27	
10				.45		.41					.06	
11	.35	.31		.35	.08	.17						T.
12		.25			.02	T.		.64	.71	1.46		.10
13		.12						.82	.04	.71	T.	.02
14				.25	([e])					.06	.06	T.
15								.52			T.	
16								.67	.21	.01	.07	
17		.12				.19		.06			.11	
18						.79		T.	1.11		.10	
19	.23		.42			.50				1.05	T.	.01
20			.44	.62	[d] 1.70	.23				.18		
21	.12					1.32		.13	.17	.14		.52
22	([f])		.65			.02				.19		.32
23										.06		.14
24			.41						.17	.02		.02
25	[d] .22											.01
26			.17		.41							T.
27								.06				
28		.05								.02		
29				.44	.16			.19		.03	.63	.06
30				.07				.15			.18	.24
31			.15					1.07		T.		T.
	.88	1.34	2.26	3.69	1.78	5.53		5.89	7.19	4.76	3.05	4.29
	1.93				3.48							

[a] Rainfall is credited to day on which it fell or day preceding measurement.
[b] No record.
[c] No record January 1-7, inclusive.
[d] Mean of Savage and Graefenberg reservoirs used.
[e] No record May 14-20, inclusive.
[f] No record January 22-29, inclusive.

WEST CANADA CREEK AT TWIN ROCK BRIDGE, NEW YORK.

West Canada Creek rises in West Canada Lakes, in southwest-central Hamilton County, and flows southwestward, then southeastward into the Mohawk at Herkimer, N. Y. The drainage area is shown on the Utica, Little Falls, Remsen, Wilmurt, Old Forge, and Canada Lakes sheets of the United States Geological Survey topographic atlas. There are about fifty small lakes and a few undrained ponds in the watershed of the stream, most of them situated near the headwaters and above the gaging station, the largest single water surface being Honnedaga Lake, 1.4 square miles in extent. There is also a small amount of controllable storage in reservoirs formed by three dams. Swamps and marshes are numerous in the region of the headwaters, usually adjoining lakes and tributaries, and having an extent of one-half square mile or less each. Much of the region above the gaging station is timber covered, and there are extensive sand areas in the central and upper drainage basins. The soil of the upper watershed is underlain by granitic gneiss, usually at or near the surface, except in alluvial valleys. From a point just above Twin Rock Bridge downstream beyond Trenton Falls the underlying geologic formation is Trenton limestone.[a]

Compacted snow accumulates in the woodlands in winter, often to a depth of 3 or 4 feet, representing an inch of water for each 5 or 6 inches of snow. This melts slowly, feeding the stream in March and April, so that these months may show a run-off greatly exceeding the precipitation.

A current-meter gaging station was established September 7, 1900, at Twin Rock Bridge, by R. E. Horton. The drainage area of the creek at this point is 364 square miles; above Trenton Falls, 375 square miles.

The bed of the stream is gravel and cobble. The bridge is 167.5 feet long between abutments, and consists of two spans. The entire flow passes beneath at all stages. In winter the stream becomes completely ice covered, requiring special discharge measurements.

A gage board is attached to the upstream side of the right-hand abutment, the coping of the abutment over the gage being used as a bench mark. The gage is read twice each day by George Rood, and the record is furnished by the Utica Gas and Electric Company. Elevation 15.50 feet above gage datum.

At the Trenton Falls dam, tests by weir to determine the discharging capacity of the turbines, which are of a special Swiss design, have been made by the power company, and observations taken at this dam during the freshet season have been used to complete and extend the gaging record at Twin Rock Bridge.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905, and in the following Water-Supply Papers of the United States Geological Survey:

Description: 47, p 49; 65, pp 153–154; 82, p 87; 97, pp 196–197; 125, pp 46–47.
Discharge: 47, p 39; 65, p 154; 82, p 88; 97, p 197; 125, p 48.
Discharge, daily: 97, pp 200–203; 125, p 49.
Discharge, flood: 65, p 155.
Discharge, monthly: 97, pp 204–205; 125, p 50.
Gage heights: 47, p 50; 65, p 154; 82, p 88; 97, p 198; 125, p 48.
Rating table: 97, p 199.

Discharge measurements of West Canada Creek at Twin Rock Bridge, New York, in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 27	Beebe and Weeks	168	1,232	4.06	6.18	5,004
August 27 [b]	Horton and Weeks	158	290	.76	.58	220
August 28 [b]	Weeks and Wood	160	312	.73	.78	229
August 30 [b]	H. H. Halsey	162	361	.85	1.00	307
October 11 [b]	D. L. Mott	162	375	.96	1.02	361
November 15 [c]	do	168	644	1.12	2.60	719
November 17 [c]	do	168	580	1.41	2.10	818

[a] For geologic description of Trenton Falls, see Prosser, C. S., and Cummings, E. R., Rept. New York State Museum, 1895, pp. 619–628.
[b] Log jam below bridge; also obstruction on pier.
[c] Log jam below bridge.

Daily discharge, in second-feet, of West Canada Creek at Twin Rock Bridge, New York, for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	772	220	206	7,522	3,655	675	2,479	1,010	741	395	1,363	3,950
2	674	271	206	3,995	2,768	602	2,743	810	326	494	1,810	3,350
3	458	381	206	[a]4,005	3,655	602	8,100	920	2,768	395	2,382	5,000
4	492	424	206	4,016	1,995	581	4,952	901	8,120	358	1,438	4,300
5	509	424	192	7,714	2,624	602	1,995	423	8,700	358	755	2,850
6	407	390	199	6,973	1,475	626	1,724	650	3,710	414	1,325	2,020
7	390	356	322	4,813	2,768	1,010	1,766	581	2,479	452	2,768	1,810
8	424	322	192	2,607	3,292	1,288	727	559	1,252	376	2,089	1,236
9	526	356	220	2,607	1,640	1,010	810	591	1,040	358	1,902	750
10	526	356	254	2,659	1,902	782	727	473	1,075	326	755	1,066
11	598	356	254	2,871	1,948	755	1,288	342	638	311	838	636
12	598	356	560	6,973	1,040	1,010	935	473	581	1,180	755	970
13	598	288	254	6,470	950	950	626	755	342	1,948	1,252	712
14	750	288	237	4,319	838	494	591	473	326	1,557	920	750
15	750	185	254	4,198	980	537	581	515	376	700	1,075	674
16	636	185	150	4,441	1,363	581	650	1,363	342	626	1,075	441
17	598	322	150	2,154	1,363	1,363	713	1,252	376	675	782	509
18	560	206	390	2,007	1,557	2,915	1,040	1,198	1,995	700	700	475
19	543	220	390	1,605	1,145	2,721	727	1,145	3,111	2,624	727	526
20	526	220	543	1,521	1,145	2,817	1,110	281	2,042	2,915	755	526
21	475	220	712	6,190	1,145	3,424	1,127	295	1,252	1,995	755	458
22	373	220	1,210	8,888	1,010	4,150	882	281	810	1,456	650	970
23	356	220	750	6,612	838	2,672	395	268	920	1,252	537	1,018
24	475	254	712	4,750	727	1,252	838	240	1,010	1,162	473	838
25	458	271	882	4,016	782	1,040	838	204	311	995	626	560
26	424	509	1,018	4,844	782	2,089	755	184	311	950	950	579
27	475	192	1,262	4,970	980	2,721	865	247	494	865	700	579
28	492	192	1,694	4,938	755	1,438	950	288	494	687	581	579
29	526	....	1,900	5,580	882	1,216	865	240	311	727	1,401	617
30	492	....	3,620	6,330	755	1,252	1,401	247	494	473	3,710	1,262
31	390	....	7,358	....	727	....	1,438	1,025	....	980	....	1,288

[a] Interpolated.

NOTE.—River frozen entirely across, January 1 to February 20. From February 21 to March 31 there was open water near the banks and also below the gage. Average thickness of ice: January 1-31, 0.6 feet; February 1-21, 1.2 feet; February 22 to March 8, 0.8 foot; March 9-30, 0.5 foot. The discharge is computed from special rating tables, ice conditions and backwater due to log jams being taken into account.

Estimated monthly discharge of West Canada Creek at Twin Rock Bridge, New York, for 1905.

[Drainage area, 364 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	772	356	525	1.44	1.66
February	509	185	299	.821	.855
March	7,358	150	855	2.35	2.71
April	8,888	1,521	4,686	12.87	14.36
May	3,655	727	1,532	4.21	4.85
June	4,150	494	1,442	3.96	4.42
July	8,100	395	1,440	3.96	4.56
August	1,363	184	588	1.62	1.87
September	8,700	311	1,558	4.28	4.78
October	2,915	311	926	2.54	2.93
November	3,710	473	1,195	3.28	3.66
December	5,000	441	1,332	3.66	4.22
The year	8,888	150	1,365	3.75	50.87

WEST CANADA CREEK AT KAST BRIDGE, NEW YORK.

This station was established May 15, 1905. It is located on the bridge opposite the railway station at Kast Bridge, New York, about 4 miles along the stream above the mouth of the creek at Herkimer. The drainage area at this point is 574 square miles, or 58 per cent greater than at Twin Rock Bridge.

This portion of the basin is underlain by Hudson River and Trenton shales. The topography is moderately rolling. The soil is ordinarily rather impervious and usually under culture. The precipitation and snow storage are considerably less than in the upper part of the drainage area.

Discharge measurements are made from the downstream side of the bridge to which the gage tape is attached. The initial point for soundings is the top face of the left abutment, downstream side. A tape and reel gage is used.

A gage chain is fastened to the upstream hand rail of the bridge 100 feet from the left abutment. The length of the chain from the end of the weight to the marker is 49.80 feet. During 1905 the gage was read twice each day by Lloyd Kast. Gage readings at this station are paid for by the State of New York. The bench mark is on the downstream corner, nearest the water, on the plate of the bridge on the left-hand abutment, downstream side; elevation, 43.53 feet above the gage datum.

Discharge measurements of West Canada Creek at Kast Bridge, New York, in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 26	Beebe and Weeks	196	922	4.81	30.68	4,438
May 9	Beebe and Mills	196	551	3.28	29.57	1,819
May 15	Swancott and Weeks	190	511	2.60	29.39	1,332
July 8	Beebe and Mills	196	513	2.73	29.44	1,403
August 27	C. A. Cockroft	168	264	1.32	28.26	350
August 31	Cockroft and Halsey	178	388	1.77	28.78	688
October 7	D. L. Mott	178	368	1.82	28.67	594
November 14	do	195	583	3.02	29.74	1,763

Daily gage height, in feet, of West Canada Creek at Kast Bridge, New York, for 1905.

Day	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	28.83	29.23	29.27	29.18	28.55	30.32	30.3
2	....	28.77	32.1	29.05	28.78	28.6	30.62	29.88
3	....	28.75	32.7	28.9	31.25	29.0	30.12	33.55
4	....	28.77	31.45	28.7	34.7	29.1	30.02	32.1
5	....	29.67	30.4	28.57	34.48	28.88	29.98	31.0
6	....	29.13	29.87	28.8	31.6	28.65	30.35	30.45
7	....	29.37	29.43	29.4	30.8	28.6	31.08	30.0
8	....	29.97	28.93	29.0	30.2	28.6	30.82	29.9
9	....	29.87	29.03	28.67	29.62	28.58	30.4	29.58
10	....	29.37	29.03	28.6	29.55	28.55	29.92	29.5
11	....	29.23	28.73	28.55	29.18	28.45	29.75	29.0
12	....	29.77	28.77	28.77	29.38	29.55	29.62	29.08
13	....	29.43	28.85	29.17	29.28	30.48	29.58	29.3
14	....	29.5	29.23	28.83	29.18	30.2	29.78	29.08
15	29.5	29.07	29.43	28.83	28.92	29.72	29.58	28.6
16	29.23	29.03	29.05	30.17	28.88	29.45	29.45	28.6
17	29.43	28.97	28.9	29.8	28.75	29.22	29.45	28.6
18	29.17	30.37	29.17	29.13	30.72	29.28	29.32	28.78
19	29.57	30.15	29.13	28.9	31.25	30.88	29.35	28.82
20	29.37	30.53	29.75	28.63	30.4	31.0	29.22	28.92
21	29.1	30.2	29.3	28.55	30.52	30.6	28.68	29.72
22	29.27	31.25	28.9	28.55	29.8	30.2	28.9	30.68
23	29.03	30.45	28.8	28.33	29.58	29.82	28.92	30.38
24	29.87	29.73	28.77	28.3	29.22	29.58	29.12	29.88
25	29.93	29.13	28.73	28.23	29.0	29.52	29.42	29.4
26	28.77	31.35	28.8	28.03	28.88	29.4	29.42	29.3
27	29.05	30.83	28.63	28.23	28.78	29.2	29.48	29.18
28	29.15	30.55	28.47	28.07	28.78	29.05	29.3	29.08
29	28.97	29.7	28.45	28.32	28.62	28.95	31.48	29.98
30	29.0	29.57	28.55	28.42	28.68	28.9	31.48	30.25
31	28.97	....	29.73	28.92	....	28.9	....	29.95

EAST CANADA CREEK AT DOLGEVILLE, N. Y.

This creek rises in Hamilton County, flows southward between Herkimer and Fulton counties, and joins the Mohawk at East Creek. A portion of the stream and drainage basin is shown on the Little Falls and Lassellville sheets of the United States Geological Survey topographic atlas.

Observations are taken at High Falls, near Dolgeville, about 7 miles from the outlet of the stream. The gaging station is located at the dam of the Herkimer County Light and Power Company. The dam is of rubble masonry, 19 feet high, and has a flat crest 6 feet wide and 190.25 feet long between abutments. The elevation of the upstream edge of the crest is 1 foot below that of the lip. The impounded water is conducted to the power house, 500 feet below the dam, through a wrought-iron flume 10 feet in diameter.

Readings of the depth on the crest are taken from a vertical gage board attached to the bulkhead, 6 feet upstream, twice each day by Willard Hayward. The mean of the readings is used in computing the discharge. A record is also kept of the run of the water wheels and the elevation of water in the tailrace. The record since January 1, 1903, has been computed from a discharge curve based on the United States Geological Survey experiments on a full-sized model of the dams, made at Cornell University. The flow through the turbines for this period has also been computed from current-meter measurements, made in the tailrace of the electric-power plant instead of from the manufacturers' rating tables for the water wheels, as formerly. The turbines are of a special Victor cylindergate type. The two main wheels are each 36 inches in diameter, and their speed is controlled by Lombard governors.

Spruce Creek, the principal tributary of East Canada Creek, enters 1 mile above Dolgeville, and drains an area of 50 square miles. Water is diverted from this creek and from Beaver Creek, one of its tributaries, at Diamond Hill, and is carried to Little Falls through a vitrified conduit 9 miles long. The water supply of Dolgeville is taken from Cold Brook, a tributary of East Canada Creek. No allowance for diversion of water supply has been made in computing the run-off for East Canada Creek.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 35, p 52; 47, pp 55–57; 65, pp 158–159; 82, p 89; 97, p 195; 125, pp 50–51.
Discharge: WS 47, pp 39, 56–57; 65, p 159; 82, p 89.
Discharge, daily: WS 35, p 52; 47, pp 57–58; 65, p 161; 82, p 90; 125, pp 51–52.
Discharge, flood: WS 65, p 160.
Discharge, low-water: WS 65, p 161.
Discharge, monthly: Ann 21, iv, p 68; 22, iv, p 96; WS 35, p 24; 65, p 161; 82, p 91; 97, p 196; 125, p 53.
Gage heights: WS 97, p 195.
Hydrographs: Ann 21, iv, p 68; 22, iv, p 97.
Rainfall data: WS 97, p 196.
Water powers: WS 65, p 160.

Daily discharge, in second-feet, of East Canada Creek at Dolgeville, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(a)	137	136	(a)	1,479	291	408	465	4,065	(a)	1,009	1,626
2	(a)	129	137	(a)	1,160	223	2,321	327	4,070	213	1,213	3,300
3	596	129	127	3,864	916	281	3,299	260	2,305	347	972	5,572
4	448	110	139	(a)	1,130	213	1,920	200	4,422	270	876	(a)
5	286	84	101	4,379	883	228	1,229	212	3,108	287	619	1,982
6	324	131	129	4,097	859	578	818	188	1,766	224	1,055	1,348
7	410	b 117	89	2,768	965	1,011	617	188	968	254	1,523	1,089
8	304	117	94	1,894	874	1,069	493	168	730	(a)	1,124	821
9	401	112	113	(a)	798	684	423	134	617	192	1,117	668
10	399	112	123	1,514	761	465	285	117	(a)	166	685	455
11	277	100	123	2,713	1,655	(a)	250	155	376	181	616	643
12	327	42	95	3,342	1,641	788	269	172	236	878	(a)	464
13	411	115	123	3,047	1,582	629	226	200	654	1,001	537	401
14	404	120	121	2,750	1,569	478	314	258	519	653	594	376
15	386	142	150	2,295	1,631	400	276	427	394	559	443	136
16	538	125	149	1,652	1,696	319	213	716	900	632	480	150
17	612	131	146	1,264	1,565	455	227	464	1,028	391	455	(a)
18	386	90	148	1,177	1,303	(a)	289	306	1,517	850	409	196
19	348	90	(a)	881	661	390	382	281	1,295	1,287	339	313
20	267	b 121	738	882	519	335	400	208	1,152	1,292	331	335
21	249	126	777	1,974	(a)	1,011	281	(a)	1,079	(a)	315	629
22	229	117	739	2,146	488	2,299	218	179	748	896	329	984
23	172	116	700	(a)	373	1,340	281	138	632	641	311	858
24	169	124	600	1,902	292	(a)	336	122	354	589	285	625
25	175	124	779	1,610	320	1,016	250	115	344	447	281	540
26	132	125	1,166	1,606	268	2,003	191	108	294	458	292	402
27	136	123	1,470	1,548	505	1,717	185	(a)	283	395	422	317
28	119	135	2,062	1,610	500	2,087	178	73	249	376	320	322
29	63	....	2,546	1,659	363	1,178	183	129	219	276	1,195	554
30	126	....	4,045	1,843	317	1,040	(a)	231	223	274	2,128	623
31	202	....	5,004	....	336	....	617	138	....	344	....	490

a Record not available.
b February 7–20, inclusive, dam obstructed by ice; record probably deficient.

Estimated monthly discharge of East Canada Creek at Dolgeville, N. Y., for 1905.

[Drainage area, 256 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.[a]	Mean.	Second-feet per square mile.	Depth in inches.
January (29 days)	612	63	307	1.20	1.29
February	142	42	116	.453	.472
March (30 days)	5,004	89	762	2.98	3.32
April (25 days)	4,379	881	2,177	8.50	7.90
May (30 days)	1,696	317	914	3.57	3.98
June (27 days)	2,299	213	834	3.26	3.27
July (30 days)	3,299	178	579	2.26	2.52
August (29 days)	716	73	230	.898	.968
September (29 days)	4,422	219	1,191	4.65	5.02
October (28 days)	1,292	166	513	2.00	2.08
November (29 days)	2,128	281	699	2.73	2.94
December (29 days)	5,572	136	904	3.53	3.81

[a] Minimum controlled by pondage.

SCHOHARIE CREEK AT PRATTSVILLE, N. Y.

Schoharie Creek above Prattsville drains a rugged, mountainous area, almost entirely wooded. The watershed, 243 square miles in extent, lies wholly within Greene County. Rocks of the Catskill formation, chiefly sandstones and conglomerates, lie at or near the surface over most of the area. The basin is surrounded by nearly 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 November 7, 1902, at the highway bridge in the village of Prattsville, by C. C. Covert.

The bridge has a single span of 185 feet. In extreme low water the current underneath the bridge is sluggish, and meter measurements are made by fording the stream a short distance below the bridge.

A standard chain gage is attached to the steel floor beams of the bridge on the upstream side; length of chain, 25.74 feet. Gage readings are taken each morning and evening by James Brennan. The gage datum is referred to the United States Geological Survey bench mark—a circle marked on a bowlder at the right-hand end of the bridge on the downstream side; elevation, 1,151.00 feet. Elevation of gage zero, 1,130.03 feet.

The great freshet of October 9–11, 1903, apparently changed the stream bed and cross section in the vicinity of the gage. Measurements made during 1904 and 1905 have been applied toward the construction of a new rating curve.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 82, pp 95—96; 97, pp 191-192; 125, p 54.
Discharge: 82, p 96; 97, p 192; 125, p 54.
Discharge, daily: 25, pp 57-58.
Discharge, monthly: 125, p 59.
Gage heights: 82, p 96; 97, pp 193-194; 125, p 55.
Rating table: 125, p 56.

Discharge measurements of Schoharie Creek at Prattsville, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
August 11 [a]	C. C. Covert	32	20.5	1.40	4.20	28.6
August 11 [a]	do	32	21.2	1.39	4.20	29.4

[a] Wading below bridge.

Daily gage height, in feet, of Schoharie Creek at Prattsville, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.4	5.07	4.91	6.85	4.79	4.31	4.21	4.34	4.58	4.42	4.65	5.25
2	5.4	5.07	4.91	6.2	4.64	4.31	4.31	4.5	4.5	4.4	4.6	5.6
3	5.5	5.07	4.96	6.0	4.59	4.28	4.31	4.42	5.18	4.6	4.52	7.6
4	5.4	5.07	4.96	5.75	4.59	4.31	4.24	4.34	7.3	4.58	4.5	6.78
5	6.2	5.07	4.96	5.9	4.54	4.25	4.22	4.3	6.0	4.5	4.5	5.82
6	6.2	5.07	4.96	6.27	4.49	4.35	4.22	4.29	5.32	4.48	4.5	5.58
7	8.25	5.07	4.96	6.2	4.59	4.41	4.2	4.23	5.02	4.45	4.65	5.42
8	7.08	5.07	4.96	5.93	4.49	4.43	4.17	4.23	4.88	4.42	4.7	5.35
9	6.35	5.07	5.44	5.65	4.46	4.33	4.12	4.21	4.72	4.38	4.65	5.3
10	5.95	5.07	5.61	5.55	4.49	4.28	4.07	4.21	4.65	4.38	4.65	5.2
11	5.6	5.07	5.76	6.23	4.42	4.31	4.17	4.25	4.6	4.35	4.6	5.2
12	6.5	5.07	5.46	6.5	4.49	4.35	4.17	4.52	5.1	7.35	4.6	5.1
13	6.4	5.07	5.16	6.0	4.49	4.58	4.22	4.52	5.5	5.65	4.6	5.25
14	6.25	5.07	5.01	5.75	4.52	4.48	4.22	4.4	5.05	5.2	4.5	5.9
15	5.47	5.07	4.96	5.65	4.56	4.35	4.22	4.4	4.9	5.05	5.1	4.8
16	5.37	5.07	4.96	5.6	4.54	4.31	4.2	4.72	4.75	4.98	5.0	4.9
17	5.27	5.07	4.91	5.45	4.56	4.31	4.17	4.75	4.68	4.72	4.5	4.78
18	5.22	5.07	6.34	5.33	4.49	4.31	4.12	4.62	4.75	4.8	4.5	4.8
19	5.19	5.07	8.24	5.23	4.54	4.28	4.14	4.52	4.92	4.92	4.5	4.82
20	5.19	5.04	7.61	5.15	4.46	4.35	4.17	4.42	5.02	5.2	4.48	4.88
21	5.07	4.98	6.41	5.2	4.46	4.41	4.17	4.38	5.05	5.08	4.45	5.2
22	5.02	4.96	5.74	5.23	4.44	4.45	4.12	4.28	4.88	5.08	4.6	4.72
23	5.07	4.96	5.58	5.07	4.42	4.45	4.12	4.28	4.72	5.02	4.45	5.22
24	5.07	4.96	6.35	5.03	4.36	4.41	4.14	4.3	4.7	4.95	4.45	5.2
25	5.07	4.96	9.1	4.9	4.34	4.31	4.12	4.3	4.65	4.92	4.5	5.08
26	5.07	4.96	6.85	4.85	4.34	4.31	4.12	4.3	4.6	4.85	4.5	5.02
27	5.07	4.91	7.9	4.82	4.39	4.31	4.1	4.3	4.5	4.8	4.5	5.0
28	5.07	4.91	7.27	4.79	4.32	4.28	4.1	4.28	4.5	4.8	4.45	4.95
29	5.07		7.7	4.82	4.26	4.25	4.12	4.32	4.5	4.75	4.75	5.35
30	5.07		8.15	4.82	4.26	4.21	4.17	4.42	4.45	4.75	5.58	5.3
31	5.07		7.7		4.26		4.27	4.9		4.7		5.08

NOTE.—River frozen entirely across as far as the rifts from January 23 to March 18, except for narrow channel of open water March 10–18. During the frozen period gage heights are to the surface of the water in a hole in the ice. The following comparative readings were also made:

Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*
January 23	5.1	5.2	0.2
January 31	5.1	5.2	.5
February 10	5.1	5.2	1.0
February 15	5.1	5.15	1.2
March 3	5.0	5.1	2.0

Station rating table for Schoharie Creek at Prattsville, N. Y., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
4.10	18	5.20	405	6.30	1,270	7.40	2,680
4.20	28	5.30	465	6.40	1,370	7.50	2,830
4.30	42	5.40	525	6.50	1,470	7.60	2,990
4.40	61	5.50	585	6.60	1,600	7.70	3,150
4.50	85	5.60	663	6.70	1,720	7.80	3,300
4.60	125	5.70	741	6.80	1,850	7.90	3,460
4.70	165	5.80	819	6.90	1,970	8.00	3,620
4.80	205	5.90	897	7.00	2,100	8.10	3,790
4.90	245	6.00	975	7.10	2,260	8.20	3,960
5.00	285	6.10	1,070	7.20	2,390	8.30	4,130
5.10	345	6.20	1,170	7.30	2,540		

The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904 and 1905. It is well defined between gage heights 4.1 feet and 8 feet. The table has been extended beyond these limits. Above 4.4 feet the table is the same as for 1904.

Estimated monthly discharge of Schoharie Creek at Prattsville, N. Y., for 1905.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches
January (1-22)	4,045	297	960	4.00	3.27
March (18-31)	5,610	647	2,580	10.75	5.60
April	1,910	201	693	2.89	3.22
May	201	36	84.2	.351	.405
June	117	29	51.7	.215	.240
July	44	15	26.1	.109	.126
August	245	29	69.3	.289	.333
September	2,540	73	321	1.34	1.50
October	2,610	52	285	1.19	1.37
November	647	73	138	.575	.642
December	2,990	173	534	2.22	2.56

Ice conditions January 23 to March 17: No estimate.

CATSKILL CREEK AT SOUTH CAIRO, N. Y.

The basin of this stream receives the run-off from the north slope of the Catskill Range and lies, for the most part, in the timbered highlands of Greene County. The slopes are precipitous, there are no lakes, and the amount of artificial storage is small. The underlying rock formation is chiefly Devonian shale. The topography of the area is shown on the Durham, Coxsackie, and Catskill sheets of the United States Geological Survey topographic atlas. The stream flows over a rock bed through much of its course and enters tide water of Hudson River at Catskill.

The gaging station was established July 4, 1901, and is located at the highway bridge in village of South Cairo.

The stream channel is rock, covered in some places with earth. The bridge has a single span of 194.5 feet between abutments.

The stage of the stream is observed each morning and night from a standard chain gage which is attached to the bridge and the elevation of which is referred to a circle near the outer corner on the upstream side of the bridge seat on the right-hand abutment. The elevation of the bench mark is 21.29 feet above gage datum.

The erection of a dam a short distance below the gage for purposes of boating necessitated withholding a portion of the record for 1904. This dam was removed in the spring of 1905, and the discharge for 1905 has been calculated from the rating table as formerly used.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 65, p 61; 97, pp 178-179; 82, pp 109-110; 125, p 60.
Discharge: 65, p 62; 82, p 110; 97, pp 179-180; 125, p 60.
Discharge, daily: 97, pp 186-188; 125, p 62.
Discharge, monthly: 97, p 189; 125, p 63.
Discharge, winter: 65, p 63.
Gage heights: 65, p 62; 82, pp 110, 111; 97, pp 181-183; 125, p 61.
Rating tables: 97, pp 184-185; 125, p 62.
Water powers: 65, p 62.

Discharge measurements of Catskill Creek at South Cairo, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
August 10 [a]	C. C. Covert	23	16	0.52	2.11	8.5
August 10 [a]	do	39	36	.28	2.12	9.9

[a] Wading below bridge.

Daily gage height, in feet, of Catskill Creek at South Cairo, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.8	3.63	3.05	5.92	2.92	2.16	2.34	1.95	2.55	2.45	2.7	3.05
2	3.85	3.58	3.02	5.27	2.84	2.16	2.27	2.05	2.48	2.4	2.7	2.82
3	4.4	3.48	2.97	4.67	2.86	2.13	2.24	2.08	2.75	2.6	2.65	4.3
4	5.2	3.38	2.97	4.87	2.86	2.05	2.19	2.1	6.95	2.9	2.65	6.7
5	6.3	3.33	2.97	5.27	2.76	2.1	2.14	2.1	4.45	2.8	2.6	3.95
6	7.5	3.28	2.97	5.97	2.69	2.25	2.14	2.1	3.8	2.62	2.65	3.72
7	7.0	3.23	2.97	5.12	2.64	2.25	2.14	2.05	3.5	2.5	2.6	3.6
8	6.5	3.32	2.97	4.67	2.65	2.35	2.14	2.05	3.25	2.5	2.75	3.48
9	5.18	3.3	2.95	4.37	2.56	2.35	2.04	2.1	2.85	2.4	2.68	3.48
10	4.5	3.2	3.27	4.42	2.56	2.33	2.04	2.1	2.9	2.4	2.62	3.4
11	4.22	3.26	3.57	5.02	2.48	2.3	2.04	2.1	2.9	2.45	2.6	3.2
12	4.6	3.26	3.57	5.12	2.46	2.25	2.04	2.22	3.7	4.8	2.6	3.1
13	4.5	3.2	3.57	4.69	2.44	2.25	2.04	2.2	3.35	4.0	2.6	3.17
14	4.4	3.36	3.57	4.42	2.4	2.26	2.04	2.32	3.1	3.55	2.5	3.05
15	5.6	3.36	3.57	4.32	2.41	2.22	2.04	2.4	3.05	3.28	2.53	3.05
16	5.65	3.38	3.47	4.15	2.44	2.14	2.04	2.55	2.85	3.1	2.53	3.05
17	5.55	3.36	3.49	3.91	2.55	2.09	1.99	3.0	2.9	3.02	2.52	2.85
18	4.9	3.2	3.87	3.81	2.51	2.04	1.89	2.78	2.9	2.92	2.5	2.82
19	4.6	3.23	8.42	3.71	2.45	2.12	1.89	2.5	3.3	3.5	2.5	2.85
20	3.8	3.18	6.21	3.66	2.45	2.14	1.94	2.4	3.3	3.55	2.5	2.8
21	3.75	3.13	5.17	3.66	2.44	2.18	1.94	2.3	3.2	3.5	2.49	3.82
22	3.8	3.09	4.67	3.56	2.35	2.34	1.94	2.28	3.4	3.35	2.48	3.95
23	3.8	3.1	4.17	3.46	2.35	2.9	1.84	2.25	3.15	3.19	2.48	3.94
24	3.9	3.09	4.42	3.34	2.3	2.64	1.89	2.21	3.0	3.19	2.4	3.76
25	3.95	3.08	9.32	3.27	2.23	2.44	1.92	2.2	2.88	3.05	2.3	3.45
26	4.0	3.08	8.32	3.26	2.18	2.39	1.89	2.2	2.68	2.95	2.3	3.35
27	4.4	3.08	8.82	3.26	2.18	2.54	1.88	2.2	2.6	2.78	2.3	3.14
28	4.4	3.08	7.49	3.21	2.15	2.45	1.85	2.18	2.6	2.78	2.4	3.0
29	4.0	....	8.37	3.16	2.17	2.44	1.85	2.18	2.5	2.78	2.55	3.58
30	3.9	....	7.97	3.06	2.19	2.44	1.94	2.2	2.46	2.78	3.08	3.7
31	3.8	....	6.79	....	2.16	....	2.09	2.35	....	2.75	....	3.28

NOTE.—Creek frozen entirely across from January 20, approximately, to March 4, except for narrow channel under gage. Open channels on each side appeared March 4 and lasted till ice went out March 19. During the frozen period the gage was read to the surface of the water. The following comparative readings were also made:

Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*
February 4	3.4	3.7	1.1
February 11	3.25	3.8	1.3
February 18	3.2	3.35	1.3
February 25	3.1	3.4	1.1
March 4	3.0	3.2	1.0

Station rating table for Catskill Creek at South Cairo, N. Y., from July 4, 1901, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet*	*Second-feet.*	*Feet.*	*Second-feet.*
1.80	9	3.20	104	4.50	546	6.60	2,106
1.90	10	3.30	120	4.60	602	6.80	2,328
2.00	12	3.40	136	4.70	657	7.00	2,550
2.10	14	3.50	152	4.80	712	7.20	2,822
2.20	16	3.60	182	4.90	768	7.40	3,094
2.30	20	3 70	213	5.00	824	7.60	3,406
2.40	24	3.80	243	5.20	946	7.80	3,758
2.50	28	3.90	274	5.40	1,067	8.00	4,110
2.60	37	4.00	304	5.60	1,206	8.20	4,562
2.70	45	4.10	352	5.80	1,363	8.40	5,014
2.80	55	4.20	401	6.00	1,520	8.60	5,498
2.90	63	4.30	449	6.20	1,710	8.80	6,014
3.00	72	4.40	498	6.40	1,900	9.00	6,530
3.10	88						

The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1901-1905. It is well defined between gage heights 2.5 feet and 7 feet. The table has been extended beyond these limits, being based on one measurement at 8.65 feet.

Estimated monthly discharge of Catskill Creek at South Cairo, N. Y., for 1905.

[Drainage area, 263 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January 1-19	3,250	243	1,057	4.02	2.84
March 19-31	7,567	386	3,252	12.36	5.98
April	1,497	82	493	1.87	2.09
May	65	15	30.7	.117	.135
June	63	13	21.1	.080	.089
July	22	9	12.7	.048	.055
August	72	11	20.2	.077	.089
September	2,494	26	180	.684	.763
October	712	24	100	.380	.438
November	85	20	34.7	.132	.147
December	2,217	55	216	.821	.946

NOTE.—No estimates during frozen period.

ESOPUS CREEK AT KINGSTON, N. Y.

Esopus Creek has its source in northwestern Ulster County and enters Hudson River near Saugerties. Between Olivebridge and Kingston it passes successively over the shales of the Ithaca and Hamilton series. The course of the upper portion of the stream is southeastward; at Binnewater it encounters the Onondaga limestone barrier and turns abruptly to the northeast, following the western margin of this formation closely to Glen Erie, where it breaks over the Onondaga and the sandstones of the Oriskany and Helderberg series, forming precipitous falls. Finally at Saugerties it cuts through the easily eroded Hudson River shales, making its descent to tide-water level of the Hudson in an abrupt fall of about 40 feet.

In general the notable falls in the stream occur at the transition from one geologic formation to another, as follows:

Falls in Esopus Creek.

Location.	Formation.		Approximate fall.
	From—	To—	
			Feet.
Olivebridge	Catskill	Ithaca	28
Glen Erie	Onondaga	Oriskany	56
Saugerties	Helderberg	Hudson River	40

Between Binnewater and Saugerties, a distance of about 20 miles, the course of the creek lies parallel to that of Hudson River, though the two streams flow in opposite directions. At Kingston the creek is 2.5 miles from the Hudson and at an elevation of 140 feet above tide.

A gaging station was established July 5, 1901, at the Washington Street Bridge over Esopus Creek at Kingston.

The channel is straight at the point of gaging, but curves a short distance above and below. The right bank is subject to overflow during high water, but at ordinary and low stages the flow is all confined in one channel.

A standard chain gage is attached to the bridge; length of chain, 31.04 feet. The gage is read twice each day by John Douglas. The bench mark is a cut on the upstream corner of the right-hand abutment; elevation, 31.73 feet above the datum of the gage.

In winter and at times when the stream was more or less obstructed by ice special discharge measurements have been made, from which a rating curve applicable to periods when the stream is frozen has been derived. This gives a discharge considerably smaller at a given stage of the stream than is indicated by a regular rating curve for the cross section derived from measurements in open section.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 65, pp 63-64; 82, pp 107; 97, pp 165-166; 125, pp 66-67.
Discharge: 65, p 64; 82, p 108; 97, pp 166-168; 125, p 67.
Discharge, daily: 97, pp 174-175; 125, p 69.
Discharge, monthly: 65, p 65; 97, pp 175-176; 125, p 69.
Gage heights: 65, p 64; 82, pp 107, 109; 97, pp 168-170; 125, p 67.
Rating tables: 97, pp 171-173; 125, p 68.
Water powers: 65, p 66.

Discharge measurement of Esopus Creek at Kingston, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
August 13	C. C. Covert	78	156	0.30	3.82	46.6

Daily gage height, in feet, of Esopus Creek at Kingston, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.72	6.08	5.55	10.92	5.6	4.32	3.95	4.05	4.25	4.88	5.22	6.8
2	7.56	6.02	5.5	9.6	5.5	4.3	4.04	3.85	4.02	4.81	5.14	7.12
3	7.78	5.99	5.45	8.8	5.4	4.3	4.3	3.85	7.46	5.1	5.02	8.8
4	7.55	5.9	5.45	8.25	5.3	4.22	4.28	3.85	14.68	5.02	5.08	11.72
5	7.18	5.85	5.38	8.45	5.2	4.2	3.98	3.8	11.2	4.88	5.04	9.55
6	7.32	5.95	5.32	9.08	5.2	4.5	4.08	3.77	8.32	4.7	5.22	8.4
7	10.85	5.92	5.35	8.8	5.18	4.58	3.95	3.9	7.92	4.65	5.6	7.7
8	12.9	5.9	5.4	8.15	5.25	4.7	4.02	3.75	6.38	4.58	5.25	7.32
9	10.9	5.95	5.7	8.62	5.1	4.48	4.0	3.68	5.86	4.55	5.28	6.98
10	9.72	5.95	6.65	7.65	5.08	4.35	3.95	3.7	5.38	4.42	5.2	7.72
11	8.95	5.9	6.96	7.61	4.92	4.22	4.01	3.72	5.3	4.3	5.11	6.35
12	8.75	5.9	5.9	8.1	5.05	4.22	3.82	3.72	7.2	10.78	5.06	6.45
13	10.45	5.82	6.55	8.02	4.98	4.32	4.0	3.79	7.42	7.88	5.05	6.12
14	9.15	5.82	6.35	7.78	4.9	4.28	3.94	3.7	6.65	6.92	5.01	5.92
15	8.12	5.9	6.35	7.48	5.02	4.22	3.8	3.95	6.2	6.5	4.98	5.96
16	8.1	5.82	6.28	7.18	5.88	4.22	3.9	4.26	5.89	6.18	4.88	5.88
17	7.89	5.78	6.22	6.95	4.96	4.11	3.84	4.46	5.74	5.92	4.92	5.78
18	7.5	5.8	6.82	6.68	4.98	4.11	3.82	4.24	6.15	5.78	4.92	5.49
19	7.5	5.75	12.15	6.52	4.9	3.98	3.7	3.98	6.9	5.66	4.78	5.62
20	7.5	5.7	14.58	6.3	4.75	4.12	3.72	3.95	6.6	5.9	4.8	5.42
21	7.12	5.7	12.25	6.35	4.65	4.22	3.75	3.84	7.35	6.38	4.76	6.78
22	7.0	5.8	12.58	6.22	4.65	4.3	3.69	3.85	6.72	6.08	4.8	9.55
23	6.45	5.82	10.11	6.05	4.6	4.32	3.65	3.76	6.3	5.92	4.62	7.48
24	6.2	5.7	9.55	5.98	4.6	4.18	3.78	3.75	5.96	5.81	4.6	7.02
25	6.25	5.65	11.35	5.88	4.5	4.12	3.89	3.92	5.8	5.71	4.63	6.6
26	6.38	5.62	11.68	5.75	4.5	3.98	3.86	3.85	5.52	5.62	4.65	6.45
27	6.1	5.62	12.2	5.7	4.58	4.1	3.79	3.78	5.38	5.48	4.6	6.21
28	6.52	5.6	12.22	5.6	4.45	4.05	3.8	3.71	6.3	5.4	4.6	6.01
29	6.42	....	12.45	5.6	4.4	3.98	3.72	3.72	5.14	5.22	5.71	6.63
30	6.3	....	13.95	5.68	4.48	3.98	3.68	3.75	5.06	5.28	7.6	7.18
31	6.2	....	12.62	....	4.35	....	3.82	3.88	....	5.18	....	6.58

NOTE.—Creek frozen over January 1 to March 19. Thickness of ice increased from 0.7 foot to 1.5 feet. Gage heights are to the surface of the water in a hole cut in the ice.

Station rating table for Esopus Creek at Kingston, N. Y., from July 5, 1901, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
3.50	8	4.70	200	5.90	498	8.00	1,373
3.60	22	4.80	220	6.00	527	8.50	1,640
3.70	36	4.90	240	6.20	596	9.00	1,940
3.80	49	5.00	260	6.40	665	9.50	2,275
3.90	63	5.10	285	6.60	741	10.00	2,642
4.00	77	5.20	309	6.80	823	10.50	3,030
4.10	94	5.30	334	7.00	905	11.00	3,440
4.20	110	5.40	358	7.20	995	12.00	4,340
4.30	127	5.50	383	7.40	1,085	13.00	5,305
4.40	143	5.60	412	7.60	1,179	14.00	6,280
4.50	160	5.70	441	7.80	1,276	15.00	7,310
4.60	180	5.80	469				

The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1901-5. It is well defined between gage heights 3.8 feet and 11 feet. The table has been extended beyond these limits, being based on two measurements above 11 feet.

Estimated monthly discharge of Esopus Creek at Kingston, N. Y., for 1905.

[Drainage area, 324 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches
January	3,856	163	934	2.88	3.32
February	163	88	122	.377	.393
March	6,873	45	2,002	6.18	7.12
April	3,375	412	1,139	3.52	3.93
May	492	135	253	.781	.900
June	200	74	116	.358	.399
July	127	29	62.3	.192	.221
August	153	33	59.0	.182	.210
September	6,977	80	953	2.94	3.28
October	3,260	127	504	1.56	1.80
November	1,179	180	293	.904	1.01
December	4,088	363	1,007	3.11	3.58
The year	6,977	29	620	1.92	26.16

NOTE.—During frozen period the discharge is taken from special rating curve for ice conditions.

WAPPINGER CREEK NEAR WAPPINGER FALLS, N. Y.

Wappinger Creek rises in northern Dutchess County and flows southwestward into Hudson River at New Hamburg. The drainage basin comprises a hilly plateau, 400 to 600 feet above tide, nearly rectangular in shape and including numerous lakes and marsh areas. Winding, branched tributaries gather the run-off from the numerous hills which dot the area. About 16 miles from the mouth of the stream the basin becomes much narrower and the differences of elevation are of less magnitude. The stream flows near the right-hand side of a valley, 3 to 4 miles in width, the slope being gradual to Wappinger Falls, where it makes a sudden descent to nearly tide-water level, the elevation of Wappinger Pond being about 78 feet. The topography of the basin is shown on the Poughkeepsie, Rhinebeck, Millbrook, and Clove sheets of the United States Geological Survey topographic atlas, from which the following drainage areas have been determined:

Drainage areas of Wappinger Creek.

Point of measurement.	Area.	
	Place to place.	Total.
	Sq. miles.	*Sq. miles.*
East Branch Wappinger Creek above Stamfordville	40	40
East Branch above junction with West Branch	67.4	107.4
West Branch above mouth	33.8	33.8
Total area of East and West branches		141.2
Wappinger Creek above Van Wagners	33.8	175
Wappinger Creek above Central Falls	14.7	189.7
Wappinger Creek above gaging station	4.78	194.4
Wappinger Creek above Wappinger Falls	7.81	202.2
Wappinger Creek above mouth	13.7	215.9

But little power is developed on the stream. At Wappinger Falls a bleaching and dyeing establishment utilizes 22 feet fall.

A gaging station was established May 19, 1903, at the first highway bridge crossing Wappinger Creek above the village of Wappinger Falls. The gaging record was discontinued July 1, 1905.

The channel is straight for about 250 feet above and 300 feet below the bridge. The bed of the stream is of sand and gravel, with some bowlders. The bridge from which the gagings are made has two spans of 43.4 and 46.5 feet, respectively.

A graduated vertical scale attached to the central bridge pier was read twice each day by Lee Jackson. The bench mark is a spike in the root of a blazed tree on the south side of the road, 50 feet east of bridge; elevation above datum plane of gage, 9.19 feet.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 137; 125, p 70
Discharge: 97, p 137; 125, p 71.
Gage heights: 97, p 138; 125, p 71.

Discharge measurement of Wappinger Creek near Wappinger Falls, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
August 14	C. C. Covert	94	161	0.28	0.15	45.5

Daily gage height, in feet, of Wappinger Creek near Wappinger Falls, N. Y., for 1905.

Day	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.2	2.1	1.55	3.3	1.0	0.2	17	3.0	1.6	3.32	1.62	.78	.3
2	3.12	2.1	1.5	3.0	.95	.2	18	2.75	1.6	3.75	1.6	.75	.3
3	3.0	2.1	1.5	2.82	.95	.2	19	2.52	1.6	7.15	1.6	.7	.38
4	2.98	2.1	1.5	2.75	.9	.2	20	2.35	1.6	7.25	1.5	.65	.48
5	2.9	1.65	1.5	2.75	.85	.3	21	2.22	1.6	4.1	1.6	.6	.38
6	2.82	1.6	1.5	3.0	.82	.28	22	2.1	1.6	3.45	1.6	.55	.35
7	6.35	1.6	1.5	3.02	.8	.28	23	2.1	1.6	3.85	1.48	.5	.3
8	6.6	1.6	1.5	3.1	.8	.32	24	2.1	1.6	4.25	1.32	.48	.3
9	5.65	1.6	1.5	2.9	.8	.3	25	2.1	1.6	5.6	1.2	.42	.3
10	4.72	1.6	1.98	2.55	.85	.3	26	2.1	1.6	5.4	1.15	.35	.25
11	4.38	1.6	4.85	2.32	.8	.3	27	2.1	1.55	5.68	1.12	.3	.1
12	4.02	1.6	4.45	2.3	.8	.3	28	2.1	1.55	5.52	1.08	.3	.05
13	3.98	1.6	4.1	2.22	.88	.3	29	2.1	......	4.65	1.0	.3	.0
14	3.8	1.6	3.75	1.98	.88	.3	30	2.1	......	3.92	1.0	.25	.0
15	3.68	1.6	3.52	1.8	.85	.3	31	2.1	......	3.68	......	.25	......
16	3.25	1.6	3.22	1.72	.82	.3							

NOTE.—Creek frozen February 1 to March 9 approximately. During this time the gage was read to surface of water in hole cut in ice. The following comparative readings were also made:

Date.	Water surface.	Top of of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*
February 7	1.6	1.8	1.0
February 11	1.6	1.8	1.0
February 14	1.6	1.8	1.0
February 18	1.6	1.8	1.0
February 21	1.6	1.8	1.0
February 28	1.55	1.8	1.0
March 8	1.5	1.8	1.0

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 the 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 discharge of the canal was determined from observations of the depth of flow over the waste weir, of the number of lockages, and of the opening of the lock gates. Observations were made from June, 1901, to December, 1903, inclusive, and were resumed in December, 1905. The observations in 1905 have been made in cooperation with the New York water-supply commission.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 82, p 113; 97, p 152.
Discharge, daily: 97, p 152.
Diversion from Rondout Creek: 65, pp 68–69; 82, p 114; 97, p 153.

RONDOUT CREEK AT ROSENDALE, N. Y.

This station was established July 6, 1901, at the highway bridge at Rosendale, discontinued November 7, 1903, and reestablished in December, 1905, in cooperation with the New York water-supply commission.

The Delaware and Hudson Canal, now abandoned above High Falls, draws its water supply for the section from High Falls to Eddyville from Rondout Creek at the feeder dam above Rosendale. The flow in the canal is therefore to be added to that at the gaging station to obtain the total run-off from the drainage area above this point.

The bed of the channel is composed of rock. The entire discharge, with the exception of the diversion into the canal, passes under the highway bridge at all stages.

Discharge measurements are made from the bridge, except at low water, when they are made by wading at a ford 1 mile downstream. The bridge has a single span of 136 feet.

Gage readings are made twice each day by means of a chain gage supported by outriggers fastened to the floor beams near the center of the downstream side of the bridge. The bench mark is a circle cut in the upstream corner of the bridge seat on the right-hand abutment. Its elevation is 32.03 feet above gage datum. The observer is Anna Huben.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of the United States Geological Survey:

Description: 65, pp 66–67; 82, p 111; 97, p 153.
Discharge: 65, p 68; 82, p 112; 97, pp 154–155.
Discharge, daily: 97, pp 161–163.
Discharge, monthly: 97, p 164.
Diversions from, to Delaware and Hudson Canal: 82, p 114.
Gage heights: 65, p 68; 82, pp 111, 113; 97, pp 156–158.
Rainfall data: 97, p 164.
Rating table: 97, pp 159–160.

Discharge measurement of Rondout Creek at Rosendale, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
Aug. 14	C. C. Covert	107	449	0.14	6.12	62

MISCELLANEOUS MEASUREMENTS IN HUDSON RIVER DRAINAGE BASIN.

The following discharge measurements have been made in the Hudson River basin in 1905:

Miscellaneous discharge measurements in the Hudson River basin in 1905.

Date.	Stream.	Place.	Hydrographer.	Width.	Area of section.	Mean velocity	Gage height.	Discharge.
				Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
Aug. 12	Esopus Creek.	Near Olivebridge.	C. C. Covert	136	177	2.80	.087	49.5
Aug. 14	Walkill River.	At Newpaltz	do	111	599	.19	5.70	115

PASSAIC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Passaic River rises in Somerset and Morris counties, N. J. Above its confluence with Pompton River, its main tributary, it meanders through a flat country of Triassic red sandstone, to which in large measure must be attributed the turbidity of its waters. In contrast with the sluggish, muddy character of the Passaic, the Pompton is a rapid stream, and its waters are clear. It drains parts of Sussex, Passaic, Morris, and other adjoining counties, and traverses for a large part of its course a country of hard crystalline rocks and heavy forests, the general level of which is several hundred feet above that of the Passaic. At their confluence the Pompton enters with a current which carries it well toward the right bank of the Passaic, and at times of flood causes much backwater in the latter.

The flow of the Passaic is of special interest from the fact that several large cities in its drainage basin take their public 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 health of the inhabitants of several towns.

The highest recorded flood which has occurred in this drainage basin was that of October, 1903. The flood began at 6.30 p. m. October 8 and lasted until midnight October 18, the maximum height being reached at 9 p. m., October 10. There was a total rainfall of 11.74 inches between October 8 and 11. The estimated maximum discharge at the Dundee dam was 35,800 second-feet. This flood is fully described in Water-Supply Paper No. 92.

During 1905 the United States Geological Survey maintained gaging stations in this basin as follows:

Passaic River at Millington and near Chatham, N. J.
Ramapo River near Mahwah, N. J.
Wanaque River near Wanaque, N. J.

PASSAIC RIVER AT MILLINGTON, N. J.

This station was established November 25, 1903, by F. H. Tillinghast. It is located at the lower highway bridge at Millington, N. J.

The channel is straight for 600 feet above and 200 feet below the station. Both banks are high and are not subject to overflow. The bed of the stream is composed of gravel, with a few scattered bowlders, and is permanent. The section is shallow. There is but one channel at all stages.

Discharge measurements are made from the downstream side of the old wooden truss bridge to which the gage is attached. The bridge has a span of 69.7 feet. The initial point for soundings is the vertical face of the right abutment on the downstream side.

A standard chain gage is fastened to the wooden hand rail on the downstream side of the bridge. The gage is read twice each day by Mary I. Bray. The pulley wheel is located at a point 24 feet from the right abutment. The length of the chain from the end of the weight to the marker is 14.13 feet. Bench mark No. 1 is a square chiseled on the corner of the right abutment at the downstream side. Its elevation is 11.82 feet above gage datum. Bench mark No. 2 is the top of a nail 2 feet from the ground in an elm tree 150 feet east of the bridge. Its elevation is 13.57 feet above gage datum. Bench mark No. 3 is the top of the circular iron tension bar directly under the pulley. Its elevation is 8.97 feet above gage datum. Bench mark No. 4 is the top of the wooden rail of the bridge at the pulley. Its elevation is 13.44 feet above gage datum.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 237-238; 125, p 74.
Discharge: 82, p 127; 97, p 238; 125, p 74.
Gage heights: 97, p 238; 125, p 75.

Discharge measurement of Passaic River at Millington, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
June 21	R. H. Bolster	54	23.6	0.54	1.12	12.8

Daily gage height, in feet, of Passaic River at Millington, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.25	2.72	2.75	2.32	1.45	1.22	1.1	1.25	1.15	1.3	1.35	2.55
2	2.28	2.68	2.75	2.18	1.4	1.2	1.1	1.22	1.15	1.25	1.3	2.38
3	2.35	2.62	2.75	2.02	1.4	1.2	1.2	1.1	2.15	1.35	1.3	2.58
4	2.3	2.58	2.75	1.9	1.4	1.2	1.18	1.1	3.15	1.28	1.3	2.92
5	2.22	2.48	2.7	2.52	1.4	1.2	1.1	1.05	3.18	1.25	1.3	2.4
6	2.15	2.38	2.7	2.9	1.4	1.2	1.15	1.05	2.75	1.25	1.3	2.32
7	5.62	2.35	2.7	2.68	1.4	1.32	1.1	1.1	2.38	1.2	1.3	2.08
8	7.3	2.35	2.78	2.45	1.35	1.4	1.1	1.05	2.15	1.2	1.3	1.8
9	7.02	2.35	3.28	2.32	1.35	1.32	1.1	1.05	1.78	1.2	1.25	1.72
10	5.38	2.35	3.88	2.2	1.3	1.28	1.1	1.1	1.55	1.2	1.25	1.72
11	4.12	2.35	4.58	2.08	1.3	1.25	1.1	1.1	1.50	1.25	1.25	1.75
12	3.48	2.35	4.8	2.02	1.3	1.25	1.1	1.05	3.0	1.55	1.25	1.62
13	3.78	2.65	4.6	1.95	1.6	1.35	1.1	1.1	3.12	1.38	1.25	1.58
14	4.6	2.75	4.58	1.88	1.62	1.25	1.1	1.1	2.7	1.3	1.22	1.52
15	5.18	2.75	4.48	1.82	1.52	1.2	1.1	1.62	2.42	1.25	1.2	1.72
16	4.55	2.75	4.5	1.78	1.45	1.2	1.05	2.38	2.18	1.2	1.2	1.95
17	3.2	2.75	4.85	1.7	1.42	1.2	1.05	2.35	1.85	1.2	1.2	1.6
18	2.82	2.75	5.05	1.65	1.48	1.2	1.05	2.15	1.82	1.18	1.18	1.5
19	2.48	2.75	5.2	1.62	1.42	1.22	1.05	1.85	2.2	1.25	1.2	1.45
20	2.2	2.75	5.5	1.58	1.42	1.2	1.0	1.55	2.15	1.9	1.22	1.38
21	2.15	2.75	5.7	1.62	1.38	1.18	1.0	1.45	2.12	2.22	1.15	2.42
22	1.9	2.75	5.7	1.75	1.35	1.22	.95	1.38	2.02	1.95	1.18	3.1
23	2.12	2.75	5.05	1.7	1.3	1.58	1.0	1.28	1.88	1.78	1.18	2.82
24	2.0	2.75	4.15	1.62	1.3	1.45	1.05	1.2	1.65	1.62	1.18	2.78
25	2.85	2.75	4.0	1.6	1.3	1.32	1.05	1.3	1.58	1.55	1.22	2.4
26	2.9	2.75	3.7	1.58	1.3	1.25	1.05	1.52	1.48	1.52	1.18	2.2
27	2.95	2.75	3.52	1.58	1.3	1.2	1.05	1.35	1.38	1.48	1.18	1.98
28	2.95	2.75	3.22	1.52	1.3	1.15	1.0	1.25	1.35	1.45	1.15	1.8
29	2.9	....	2.9	1.5	1.28	1.1	1.4	1.2	1.32	1.4	1.9	2.22
30	2.8	....	2.68	1.5	1.25	1.1	1.55	1.2	1.3	1.4	3.08	2.4
31	2.8	....	2.52	....	1.25	....	1.35	1.18	....	1.35	....	2.12

NOTE.—River frozen January 1-6. From January 26 to March 17 river frozen entirely across, and gage read to top of ice. The following comparative readings were also made:

Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*
February 18	2.6	2.75	1.2
February 21	2.65	2.75	1.3
February 25	2.65	2.75	1.25
March 2	2.6	2.75	1.2

PASSAIC RIVER NEAR CHATHAM, N. J.

This station was established February 10, 1903, by the United States Weather Bureau, by which it is maintained. It is located at the second bridge, about 1.5 miles upstream from Chatham, N. J.

The channel is straight for 400 feet above and below the station. At low water the current makes a small angle with the normal to the cross section, caused by a small island just below the bridge. Two hundred feet above the bridge is an old timber dam, partly washed away. Both banks are high and wooded and are not liable to overflow. The bed of the stream is composed of gravel, with occasional bowlders.

Discharge measurements are made from the single-span steel highway bridge, to which the gage is attached. The downstream side is marked every 5 feet. The initial point for soundings is the base of the right abutment.

The original gage consists of a vertical staff spiked to the upstream wing wall of the right abutment. December 12, 1903, a standard chain gage was installed on the downstream side of the bridge. The length of the chain from the end of the weight to the marker is 15.59 feet. The gage is read once each day by M. A. Butler. Bench mark No. 1 for the new gage is the corner of the top of the right abutment on the upstream side. Its elevation is 10.31 feet above gage datum. Bench mark No. 2 is the upper surface of the lower chord directly under the pulley. Its elevation is 9.19 feet above gage datum. Bench mark No. 3 is the top of the first bolt on the coping of the downstream wing wall, right-hand abutment. Its elevation is 10.64 feet above gage datum.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 236; 125, p 76.
Discharge: 97, p 236; 125, p 76.
Gage heights: 97, p 237; 125, p 77.

Discharge measurements of Passaic River near Chatham, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
June 22	R. H. Bolster	70	80	0 21	2.32	17.0
July 10	N. C. Grover	64	55	.29	2.25	15.8

Daily gage height, in feet, of Passaic River near Chatham, N. J., for 1905.

Day.	Jan.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.2	......	3.2	2.5	2.2	2.3	3.1	2.3	2.3	2.3	3.8
2	3.2	......	3.2	2.4	2.4	2.4	2.6	2.3	2.3	2.3	3.2
3	3.2	......	3.2	2.5	2.3	2.3	2.3	2.8	2.3	2.2	3.4
4	......	......	3.0	2.4	2.2	2.2	2.1	4.8	2.2	2.2	3.7
5	......	......	3.5	2.4	2.3	2.3	2.0	5.0	2.2	2.2	3.5
6	......	......	4.1	2.5	2.2	2.2	2.0	4.6	2.2	2.2	3.3
7	6.0	......	3.8	2.3	2.4	2.2	2.0	4.1	2.1	2.2	3.2
8	8.0	......	3.5	2.3	2.6	2.2	2.0	3.7	2.1	2.2	3.1
9	8.3	......	3.5	2.4	2.5	2.1	2.0	3.4	2.1	2.2	3.0
10	7.8	4.1	3.3	2.3	2.4	2.1	2.1	2.8	2.1	2.2	3.0
11	7.3	5.0	3.3	2.3	2.5	2.2	2.1	2.4	2.0	2.1	2.9
12	6.9	5.9	3.3	2.4	2.4	2.2	2.0	4.5	2.5	2.1	2.9
13	6.5	5.9	3.0	2.5	2.5	2.2	2.0	4.3	2.4	2.1	2.8
14	6.3	5.6	2.9	2.6	2.6	2.2	2.0	4.0	2.4	2.1	2.7
15	6.3	5.5	3.0	2.7	2.4	2.2	2.2	3.7	2.3	2.1	2.5
16	......	5.6	2.8	2.5	2.4	2.2	4.3	3.3	2.3	2.1	2.4
17	......	6.4	2.8	2.5	2.4	2.1	4.1	3.0	2.2	2.2	2.4
18	......	5.0	2.8	2.7	2.3	2.1	3.8	2.9	2.2	2.2	2.3
19	......	5.1	2.6	2.5	2.2	2.1	3.4	3.2	2.2	2.2	2.3
20	4.7	5.2	2.6	2.5	2.3	2.1	3.0	3.1	2.8	2.2	2.2
21	4.6	6.0	2.6	2.6	2.2	2.1	2.7	3.2	3.6	2.1	2.9
22	4.3	5.9	2.9	2.4	2.2	2.1	2.5	3.0	3.0	2.1	4.0
23	3.9	5.6	2.8	2.4	2.6	2.1	2.3	2.9	2.9	2.1	4.1
24	3.7	5.3	2.8	2.5	2.7	2.2	2.2	2.7	2.7	2.1	4.0
25	......	5.2	2.6	2.4	2.6	2.2	2.5	2.6	2.6	2.1	3.9
26	......	4.7	2.6	2.3	2.7	2.2	2.9	2.6	2.6	2.1	3.7
27	......	4.4	2.7	2.4	2.5	2.2	2.8	2.5	2.5	2.1	3.4
28	......	4.3	2.5	2.3	2.5	2.2	2.7	2.5	2.5	2.1	3.1
29	......	3.9	2.5	2.2	2.5	2.2	2.6	2.4	2.4	3.0	3.6
30	......	3.7	2.6	2.3	2.4	2.9	2.5	2.4	2.4	3.9	3.8
31	......	3.5	......	2.2	......	3.4	2.4	......	2.3	......	......

NOTE.—January 4–6 and 16–19 river frozen at gage. January 25 to March 9 river frozen entirely across; no readings taken. March 10–17 river blocked with ice.

Station rating table for Passaic River near Chatham, N. J., from March, 1903, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.00	2	2.80	101	3.60	351	4.40	708
2.10	4	2.90	124	3.70	391	4.50	758
2.20	9	3.00	149	3.80	433	4.60	809
2.30	17	3.10	176	3.90	476	4.70	861
2.40	29	3.20	206	4.00	520	4.80	914
2.50	44	3.30	239	4.10	565	4.90	968
2.60	61	3.40	274	4.20	611	5.00	1,022
2.70	80	3.50	312	4.30	659		

The above table is applicable only for open channel conditions. It is based on 13 discharge measurements made during 1903–5 between gage heights 2.28 feet and 3.8 feet. It is well defined between these gage heights. Below gage height 2.25 feet and above gage height 4.5 feet the rating curve is a rough approximation.

Estimated monthly discharge of Passaic River near Chatham, N. J., for 1903–1905.

[Drainage area, 101 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
February 10–28	1,302	206	610	6.04	4.27
March	1,770	124	674	6.67	7.69
April	1,077	61	381	3.77	4.21
May	44	2	7.5	.074	.085
June	1,132	2	334	3.31	3.69
July	611	17	158	1.56	1.80
August	914	29	288	2.85	3.29
September	1,188	29	329	3.26	3.64
October	2,312	17	576	5.70	6.57
November	176	29	71.5	.708	.790
December	1,132	17	372	3.68	4.24
1904.					
March 11–31	1,022	149	348	3.45	2.69
April	861	61	253	2.50	2.79
May	312	17	92.8	.919	1.06
June	149	4	46.9	.464	.518
July	176	4	37.7	.373	.430
August	809	17	256	2.53	2.92
September	1,593	4	261	2.58	2.88
October	809	17	169	1.67	1.92
November	433	44	114	1.13	1.26
December 1–8	29	17	23.0	.228	.068
1905.					
January 17 days	2,986	206	1,400	13.86	8.79
March 18–31	1,593	312	960	9.50	4.95
April	565	44	169	1.67	1.86
May	80	9	34.7	.344	.397
June	80	9	34.1	.338	.377
July	274	4	21.2	.210	.242
August	708	2	96.9	.959	1.11
September	1,022	17	276	2.73	3.05
October	391	2	43.5	.431	.497
November	476	4	27.4	.271	.302
December	565	9	234	2.32	2.68

NOTE.—Frozen February 20 and December 4–5, 1903; discharge interpolated. Ice conditions January 1 to March 10, December 9–31, 1904, and January 4–6, 16–19, 25–31, February 1 to March 17, 1905, no estimates made.

RAMAPO RIVER NEAR MAHWAH, N. J.

This station was established February 10, 1903, by the United States Weather Bureau, by which it is maintained. It is located at a concrete-arch highway bridge about 1 mile west of Mahwah, N. J.

The channel is straight for 300 feet above and 200 feet below the bridge. About 200 feet below the bridge there is a rift with about 1 foot fall. The right bank is low, and during high water the lowlands on this side of the river are flooded. The left bank is high, wooded, and not liable to overflow. The bed of the stream is composed of gravel and scattered bowlders, and there is but one channel.

Discharge measurements are made from the upstream side of the bridge to which the gage is attached. The bridge has a single span of 68 feet between abutments. The initial point for soundings is the end post of the hand rail on the left bank.

A standard chain gage is bolted to the hand rail on the downstream side of the bridge. The length of the chain from the end of the weight to the marker is 20.65 feet. The gage is read once each day by M. F. Brooks. Bench mark No. 1 is a cross chiseled on the coping of the upstream parapet wall at the left bank. Its elevation is 17.72 feet above gage datum. Bench mark No. 2 is a square chiseled on the edge of the coping 3.5 feet west of the gage pulley. Its elevation is 17.43 feet above gage datum.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 229; 125, pp 79-80.
Discharge: 82, p 127; 97, p 229; 125, p 80.
Discharge, monthly: 125, pp 81-82.
Gage heights: 97, p 230; 125, p 80.
Rating table: 125, p 81.

Discharge measurement of Ramapo River near Mahwah, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
June 23	R. M. Packard	52	216	0.87	3.68	188

Daily gage height, in feet, of Ramapo River near Mahwah, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	....	3.4	5.0	3.4	3.0	2.9	3.2	2.7	2.9	3.2	3.8
2	4.0	....	3.3	4.6	3.4	3.0	2.9	3.1	2.7	2.9	3.2	3.5
3	4.0	....	3.3	4.4	3.4	3.0	3.1	3.0	3.2	3.0	3.1	3.7
4	4.0	3.1	3.3	4.4	3.3	3.0	3.0	2.8	4.5	2.9	3.1	4.7
5	....	....	3.3	4.6	3.3	3.0	2.9	2.7	5.0	2.9	3.0	4.2
6	....	....	3.3	5.0	3.3	2.9	2.8	2.7	4.2	3.8	3.0	3.9
7	6.2	....	3.3	4.8	3.3	2.9	3.0	2.7	3.7	2.8	3.1	3.8
8	7.3	....	3.3	4.6	3.2	2.9	2.8	2.7	3.4	2.8	3.1	3.7
9	6.5	....	3.8	4.4	3.2	2.9	2.8	2.7	3.2	2.8	3.0	3.6
10	5.4	....	4.1	4.3	3.2	2.9	2.8	2.7	3.2	2.8	3.0	3.7
11	5.1	3.1	4.4	4.3	3.2	2.9	2.8	2.8	3.1	2.7	3.0	3.6
12	4.7	....	4.3	4.3	3.2	2.9	3.1	2.8	4.1	4.0	3.0	3.5
13	5.0	....	4.1	4.2	3.2	3.7	3.0	2.7	3.8	3.8	3.0	3.5
14	4.9	....	4.1	4.1	3.3	3.3	3.0	2.7	3.5	3.5	3.0	3.5
15	4.4	....	4.0	4.0	3.3	3.1	3.0	2.7	3.3	3.3	3.0	3.5
16	4.2	....	4.0	4.0	3.3	3.0	2.8	3.4	3.2	3.2	3.0	3.4
17	4.1	....	4.1	3.9	3.3	2.9	2.8	3.1	3.1	3.2	2.9	(a)
18	4.1	3.1	4.3	3.9	3.3	2.9	2.8	3.0	3.5	3.2	2.9	3.4
19	4.0	....	5.5	3.9	3.2	2.9	2.8	2.9	3.9	3.1	2.9	3.4
20	4.0	....	6.4	3.7	3.2	2.9	2.8	2.9	3.8	3.5	2.9	3.3
21	4.0	....	5.8	3.8	3.1	3.2	2.7	2.8	3.6	4.2	2.9	3.5
22	3.9	....	6.1	3.8	3.1	3.2	2.6	2.8	3.5	3.7	2.9	5.1
23	3.8	3.2	6.0	3.7	3.0	3.8	2.7	2.8	3.2	3.6	2.8	4.6
24	3.8	3.3	5.8	3.6	2.9	3.8	2.7	2.7	3.2	3.4	2.8	4.4
25	3.7	3.3	6.2	3.5	2.9	3.4	2.7	2.6	3.2	3.4	3.0	4.0
26	3.1	3.4	6.4	3.5	2.9	3.2	2.7	2.8	3.1	3.4	2.9	4.0
27	....	3.4	6.2	3.5	2.9	3.1	2.7	2.8	3.1	3.3	2.9	3.8
28	....	3.4	6.2	3.5	2.9	3.0	2.7	2.7	3.0	3.2	2.9	3.8
29	....	....	5.8	3.4	2.9	3.0	2.6	2.7	3.0	3.2	3.5	4.0
30	....	....	5.4	3.5	2.9	2.9	2.7	2.7	3.0	3.2	4.4	4.4
31	....	....	5.3	....	2.9	....	3.6	2.7	....	3.2	....	4.2

a Frozen.

NOTE.—January 5–6 and January 26 to February 22 river frozen entirely across; ice 0.9 to 1 foot thick; weekly readings to surface of water in hole in ice. February 23 to March 3 ice broke up and went out.

Station rating table for Ramapo River near Mahwah, N. J., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.60	24	3.40	119	4.20	371	5.00	743
2.70	30	3.50	142	4.30	413	5.20	850
2.80	37	3.60	167	4.40	456	5.40	961
2.90	46	3.70	194	4.50	500	5.60	1,075
3.00	56	3.80	224	4.60	546	5.80	1,191
3.10	68	3.90	257	4.70	593	6.00	1,310
3.20	82	4.00	293	4.80	641		
3.30	99	4.10	331	4.90	691		

The above table is applicable only for open-channel conditions. It is based on six discharge measurements made during 1904–5 between gage heights 2.65 feet and 6 feet. It is fairly well defined between these limits.

Estimated monthly discharge of Ramapo River near Mahwah, N. J., for 1905.

[Drainage area, 118 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
February 23-28	119	82	106	0.899	0.201
March	1,560	99	670	5.68	6.55
April	743	119	342	2.90	3.24
May	119	46	79.5	.674	.777
June	224	46	74.7	.633	.706
July	167	24	44.5	.377	.435
August	119	24	41.3	.350	.404
September	743	30	158	1.34	1.50
October	371	30	109	.924	1.07
November	456	37	71.3	.604	.674
December	796	99	257	2.18	2.51

NOTE.—Ice conditions January 1 to February 22: no estimates made.

WANAQUE RIVER AT WANAQUE, N. J.

This station was established December 16, 1903, by F. H. Tillinghast. It is located at the highway bridge just above the Erie Railroad bridge and below the factory of the Wanaque River Paper Company.

The channel is straight for 300 feet above and 200 feet below the station. The current is sluggish at low water. The right bank is high, rocky, and wooded, while the left bank is low. The bed of the stream is composed of gravel, with occasional bowlders. All of the water passes under the bridge at all stages. At ordinary stages the depth of water at the gaging station is from 2 to 5 feet.

Discharge measurements are made from the upstream side of the single-span highway bridge, which has a length between abutments of 98.5 feet. The initial point for soundings is the face of the right abutment on the upstream side.

A standard chain gage is located on the upstream side of the bridge. The length of the chain from the end of the weight to the marker is 17.52 feet. The gage is read twice daily by J. Herbert Hunter. Bench mark No. 1 is a circular chisel draft on the upstream side of the right abutment. Its elevation is 13.80 feet above gage datum. Bench mark No. 2 is a square chiseled on the upstream edge of the last stone upstream of the right-abutment wing wall. Its elevation is 14.21 feet above gage datum. Bench mark No. 3 is the upper edge of the lower chord on the upstream side of the bridge, 1.1 feet from the down-spout. Its elevation is 13.58 feet above gage datum.

This station was discontinued December 31, 1905.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, pp 230-231; 125, pp 82-83.
Discharge: 125, p 83.
Gage heights: 125, p 83.

Discharge measurement of Wanaque River at Wanaque, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
June 24	R. H. Bolster	81	212	0.27	1.16	58

Daily gage height, in feet, of Wanaque River at Wanaque, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.9	1.39	3.1	1.5	1.25	1.08	1.23	0.9	1.15	1.3	1.32
2	1.92	1.86	1.44	2.8	1.4	1.25	1.0	1.18	.95	1.12	1.32	1.25
3	2.08	1.72	1.46	2.65	1.38	1.31		1.2	1.45	1.12	1.29	1.25
4	1.55	1.59	1.46	2.58	1.35	1.3		1.1	2.0	1.15	1.25	1.2
5	1.82	[a]1.54	1.4	2.75	1.4	1.25	1.0	.95	1.8	1.1	1.15	1.22
6	1.88	1.7	1.4	3.02	1.4	1.25	.95	.95	1.4	1.0	1.25	1.18
7	7.25	1.65	1.45	2.71	1.4	1.2	.9	1.05	1.25	1.05	1.25	[b]1.16
8	5.7	1.54	1.47	2.55	1.38	1.22	.95	.9	1.1	1.1	1.2	1.14
9	4.3	1.6	1.45	2.55	1.4	1.18	.95	.98	1.1	1.18	1.17	1.12
10	3.82	1.75	1.9	2.5	1.35	1.15	1.0	.95	1.15	1.35	1.1	1.1
11	3.32	1.62	2.1	2.3	1.3	1.2	1.05	.9	1.25	1.4	1.15	1.19
12	3.3	1.68	2.16	2.2	1.32	1.2	1.05	.95	1.55	1.3	1.0	1.15
13	3.3	1.57	2.1	2.15	1.5	1.62	1.05	1.29	1.7	1.25	1.05	1.12
14	2.8	1.65	1.98	2.12	1.45	1.35	1.0	1.25	1.35	1.25	1.1	1.15
15	2.38	1.57	2.0	2.25	1.4	1.35	.9	1.3	1.25	1.2	1.12	1.1
16	2.3	1.55	2.1	1.95	1.4	1.28	1.0	1.35	1.3	1.2	1.15	1.1
17	2.2	1.62	2.19	1.95	1.3	1.25	1.1	1.14	1.35	1.4	1.2	1.34
18	2.24	1.5	2.26	1.92	1.34	1.2	1.02	1.05	1.45	1.68	1.16	1.5
19	2.18	1.45	3.5	1.8	1.38	1.07	.93	1.0	1.6	1.75	1.15	1.65
20	2.15	1.48	4.48	1.85	1.4	1.05	.95	.9	1.5	1.5	1.15	1.9
21	2.04	1.45	4.99	1.98	1.45	1.0	.95	.85	1.45	1.45	1.1	2.24
22	1.85	1.52	4.78	1.95	1.4	1.2	.98	.88	1.35	1.4	1.12	2.15
23	1.7	1.55	4.5	1.85	1.2	2.05	.95	.8	1.3	1.3	1.0	2.4
24	1.72	1.7	4.35	1.8	1.2	1.3	1.02	.89	1.2	1.35	1.05	2.5
25	1.9	1.74	4.69	1.65	1.28	1.25	1.0	.98	1.2	1.35	1.0	2.61
26	1.97	1.68	4.75	1.65	1.25	1.22	1.05	.95	1.2	1.35	.9	2.7
27	2.1	1.65	4.75	1.65	1.25	1.2	.95	.85	1.15	1.28	.8	2.7
28	2.19	1.56	4.35	1.52	1.25	1.14	1.0	.8	1.12	1.25	.95	2.65
29	[c]2.7		3.98	1.55	1.3	1.0	1.15	.9	1.1	1.37	1.65	2.5
30	2.26		3.04	1.56	1.22	1.1	1.2	.95	1.1	1.35	1.54	2.52
31	2.09		3.3		1.3		1.25	.9		1.35		2.4

[a] February 5 channel clear.
[b] Gage height interpolated December 7-9, inclusive.
[c] January 29 river frozen over except for narrow strip.

RARITAN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Raritan River, the largest stream in New Jersey except the Delaware, is formed by two chief branches, North and South, which have their sources a few miles apart in the highlands of Morris County, flow southward, and unite near Somerville, from which point the course of the river is southeastward to Raritan Bay. The river is tidal to a point about 2 miles above New Brunswick, and is navigable to that city, about 12 miles from the mouth.

The total area of the drainage basin is 1,105 square miles, about 10 per cent of which is forested. The highlands consist mostly of trap rock and contain a large proportion of the wooded areas of the basin. The area outside of the highlands consists either of trap rock or red sandstone. Of the 800 square miles of drainage area above the gaging station at Bound Brook, about 150 square miles are in the cultivated part of the highlands and on the trap ridges; the remainder is mostly on the low, level, red-sandstone plain.

The valley of the Raritan is populous and highly cultivated, and a large amount of water power is utilized on its various branches. North Branch is considered a valuable source for a gravity supply, the elevation of the upper portion ranging from 750 to 1,100 feet. Millstone River, an important stream, which unites with the Raritan a few miles west of Bound Brook, differs from the other branches, having its rise in sand hills and flowing northwestward through a sandy soil. It has large ground storage, and is better suited for power than for water supply, being very muddy at high stages.

The United States Geological Survey maintained gaging stations in this basin during 1905 as follows:

South Branch Raritan River at Stanton, N. J.
North Branch Raritan River near Pluckemin, N. J.
Raritan River at Finderne and Bound Brook, N. J

SOUTH BRANCH RARITAN RIVER AT STANTON, N. J.

This station was established July 2, 1903, by E. P. Roundey. It is located at the highway bridge about 500 feet from the Lehigh Valley Railroad station at Stanton, N. J.

The channel is straight for 800 feet above and 400 feet below the station. Both banks are low and liable to overflow. The bed of the stream is composed of gravel.

Discharge measurements are made from the downstream side of the single-span highway bridge. The initial point for soundings is the face of the right abutment.

A standard chain gage is located on the lower chord of the bridge on the downstream side. The length of the chain from the end of the weight to the marker is 14.63 feet. The gage is read twice each day by William Wilson, the station agent. Bench mark No. 1 is a square chiseled on the coping of the left abutment, 1.5 feet from the downstream end. It is 13.37 feet above gage datum. Bench mark No. 2 is the top of the upstream corner of the right abutment. It is 13.665 feet above gage datum. Bench mark No. 3 is a nail projecting one-fourth inch from the downstream side of a large sycamore tree 210 feet below the bridge and is 6 feet above the ground. Elevation, 11.024 feet above gage datum. Bench mark No. 4 is a nail at the 8.5-foot mark of a secondary gage spiked to the same sycamore tree. Elevation, 8.164 feet above gage datum. Bench marks Nos. 2 and 4 are used to obtain the slope of the water surface at the station. They are 236 feet apart.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, pp 244–245; 125, pp 85–86.
Discharge: 97, p 245; 125, p 86.
Discharge, monthly: 125, p 87.
Gage heights: 97, p 245; 125, p 86
Rating table: 125, p 87.

Discharge measurements of South Branch Raritan River at Stanton, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 17	F. H. Tillinghast	99	262	2.28	3.90	599
June 20	R. M. Packard	80	99	.50	2.13	49

Daily gage height, in feet, of South Branch Raritan River at Stanton, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.39	3.24	3.97	3.49	2.74	2.29	2.22	2.28	2.26	2.46	2.46	3.32
2	3.41	3.25	3.95	3.44	2.71	2.26	2.22	2.21	2.85	2.54	2.4	3.12
3	3.37	3.26	3.95	3.41	2.69	2.29	2.19	2.22	3.41	2.48	2.4	3.01
4	3.39	3.26	3.93	3.39	2.66	2.31	2.21	2.14	4.61	2.56	2.38	2.96
5	3.39	3.25	3.93	3.96	2.65	2.28	2.09	2.2	3.66	2.48	2.3	2.89
6	3.41	3.28	3.96	3.56	2.64	2.29	2.2	2.21	3.61	2.39	2.41	2.81
7	9.46	3.27	3.97	3.49	2.64	2.25	2.24	2.22	3.58	2.44	2.36	2.66
8	5.77	3.37	4.13	3.34	2.64	2.28	2.26	2.24	3.62	2.51	2.38	2.7
9	4.29	3.32	4.93	3.29	2.65	2.29	2.28	2.21	3.33	2.52	2.35	2.64
10	3.77	3.37	5.41	3.31	2.64	2.25	2.27	2.25	2.51	2.45	2.32	2.71
11	3.35	3.42	5.55	3.29	2.61	2.29	2.24	2.24	2.46	2.84	2.32	2.64
12	3.33	3.56	4.01	3.24	2.6	2.59	2.32	2.25	5.28	3.07	2.28	2.6
13	3.35	3.7	4.0	3.09	2.6	2.88	2.2	2.26	4.32	2.94	2.31	2.54
14	3.41	3.78	3.59	3.14	2.56	2.56	2.24	2.24	4.08	2.81	2.36	2.49
15	3.42	4.08	3.3	3.14	2.58	2.4	2.24	2.72	3.7	2.79	2.34	2.42
16	3.42	3.94	3.73	3.05	2.5	2.2	2.25	3.22	3.26	2.79	2.32	2.41
17	3.38	3.91	3.76	3.09	2.49	2.18	2.26	2.52	3.04	2.81	2.36	2.39
18	3.46	3.93	4.28	3.0	2.46	2.2	2.26	2.31	3.32	2.78	2.32	2.41
19	3.51	3.95	5.75	2.98	2.45	2.46	2.24	2.24	3.18	2.65	2.32	2.39
20	3.84	3.96	5.3	2.95	2.46	2.25	2.21	2.26	3.24	2.68	2.24	2.38
21	3.86	4.23	5.41	2.94	2.45	2.21	2.2	2.22	3.06	2.65	2.31	4.51
22	3.56	4.01	5.02	2.95	2.48	2.28	2.19	2.24	3.22	2.6	2.24	4.22
23	3.28	4.0	5.0	2.92	2.46	2.48	2.18	2.21	2.88	2.68	2.18	4.09
24	3.36	4.0	4.66	2.94	2.46	2.3	2.21	2.22	2.76	2.81	2.29	4.07
25	3.3	4.04	5.09	2.9	2.5	2.16	2.2	2.28	2.51	2.74	2.37	3.99
26	3.34	3.96	4.7	2.9	2.51	2.14	2.18	2.55	2.54	2.64	2.31	3.92
27	3.22	3.97	4.38	2.9	2.42	2.18	2.21	2.31	2.32	2.62	2.28	3.91
28	3.18	3.99	4.44	2.86	2.41	2.19	2.2	2.3	2.52	2.56	3.78	3.92
29	3.17	....	4.83	2.8	2.42	2.15	2.18	2.22	2.59	2.6	4.46	3.68
30	3.21	....	4.09	2.75	2.34	2.11	2.1	2.26	2.48	2.62	3.95	3.42
31	3.24	....	3.9	....	2.28	....	2.36	2.3	....	2.6	....	3.48

NOTE.—January 1 to 6 and January 18 to March 7, river frozen; gage readings to top of ice. Thickness of ice: January 24, 0.2 foot; February 10, 0.9 foot; February 17, 1.25 feet; March 8, 0.9 foot.

Station rating table for South Branch Raritan River at Stanton, N. J., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.00	37	2.80	174	3.60	462	4.40	847
2.10	46	2.90	201	3.70	506	4.50	900
2.20	57	3.00	231	3.80	551	4.60	954
2.30	70	3.10	264	3.90	597	4.70	1,009
2.40	86	3.20	299	4.00	645	4.80	1,065
2.50	105	3.30	337	4.10	694	4.90	1,122
2.60	126	3.40	377	4.20	744	5.00	1,180
2.70	149	3.50	419	4.30	795		

The above table is applicable only for open-channel conditions. It is based on ten discharge measurements made during 1903-1905. It is well defined between gage heights 2.1 feet and 4.4 feet.

Estimated monthly discharge of South Branch Raritan River at Stanton, N. J., for 1905.

[Drainage area, 158 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January 7-17	4,210	349	888	5.62	2.30
March 8-31	1,632	337	950	6.01	5.37
April	626	162	290	1.84	2.05
May	159	67	114	.722	.832
June	196	47	73.6	.466	.520
July	80	45	60.0	.380	.438
August	307	50	76.6	.485	.559
September	1,345	65	348	2.20	2.46
October	254	84	140	.886	1.02
November	879	55	136	.861	.961
December	905	84	316	2.00	2.31

NOTE.—River frozen January 1-6 and January 18 to March 7; no estimates made.

NORTH BRANCH OF RARITAN RIVER NEAR PLUCKEMIN, N. J.

This station was established September 9, 1903, by E. P. Roundey. It is located at the second bridge below Far Hills, N. J., on the road to Somerville, about 2 miles from Far Hills.

The channel is straight for 400 feet above and 300 feet below the bridge. A small rift occurs in the channel about 200 feet above the bridge. Both banks are low and liable to overflow. The bed of the stream is composed of gravel.

Discharge measurements are made from the single-span wooden highway bridge on the downstream side. The initial point for soundings is the face of the right abutment at its downstream end.

The original gage was spiked to the upstream wing wall of the right abutment. During 1905 observations have been made by measuring from the bench mark to the water surface with a graduated rod. The observer is Thomas Moore, who records the stage twice each day. The bench mark is a square chiseled on the top of the upstream wing wall of the right abutment. Its elevation is 10.38 feet above the zero of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 125, pp 91-92.
Discharge: 82, p 127; 125, p 92.
Gage heights: 125, p 92.

Discharge measurements of North Branch Raritan River near Pluckemin, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 16[a]	F. H. Tillinghast	46	69	1.56	2.30	108
June 21	R. M. Packard	55	146	0.17	1.26	24.6

[a] Measurement taken at bridge near Far Hills railroad station.

Daily gage height, in feet, of North Branch Raritan River near Pluckemin, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.52	2.3	2.9	2.15	1.55	1.45	1.15	1.72	1.7	1.6	1.48	3.6
2	2.4	2.3	2.9	2.1	1.6	1.4	1.15	1.6	2.2	1.6	1.4	3.35
3	2.35	2.3	2.9	2.05	1.5	1.3	1.5	1.45	2.75	1.6	1.4	2.95
4	2.4	2.3	2.9	2.05	1.45	1.27	1.42	1.32	3.4	1.6	1.4	2.25
5	2.4	2.3	2.9	2.55	1.5	1.3	1.32	1.3	2.9	1.52	1.4	1.9
6	2.5	2.35	2.9	2.6	1.45	1.35	1.25	1.3	2.25	1.5	1.4	1.9
7	4.9	2.3	2.8	2.2	1.45	1.7	1.2	1.28	1.75	1.5	1.42	1.9
8	3.25	2.3	2.9	2.2	1.5	1.5	1.18	1.22	1.7	1.5	1.45	1.85
9	3.1	2.3	3.35	2.05	1.45	1.45	1.1	1.2	1.6	1.45	1.5	1.8
10	2.6	2.3	3.05	2.35	1.5	1.45	1.1	1.2	1.6	1.45	1.5	1.75
11	2.7	2.3	2.5	2.1	1.45	1.3	1.1	1.4	2.8	1.5	1.5	1.72
12	2.6	2.6	2.5	2.1	1.5	1.55	1.15	1.4	3.6	2.2	1.5	1.8
13	2.5	3.3	2.15	2.05	1.6	1.45	1.35	1.5	2.9	1.58	1.5	1.8
14	2.5	3.3	2.15	1.95	1.7	1.4	1.22	1.55	2.1	1.52	1.5	1.75
15	2.45	3.3	2.4	2.1	1.5	1.42	1.2	3.15	1.85	1.5	1.5	1.68
16	2.45	3.3	2.1	2.05	1.55	1.35	1.18	2.75	1.8	1.5	1.5	1.62
17	2.45	3.3	2.75	1.95	1.55	1.25	1.2	2.4	1.8	1.45	1.5	1.58
18	2.38	3.3	3.2	1.9	1.55	1.3	1.1	1.95	3.35	1.55	1.5	1.52
19	2.2	3.3	3.9	1.75	1.47	1.25	1.1	1.7	2.8	1.9	1.5	1.5
20	2.2	3.25	3.85	1.8	1.5	1.25	1.65	1.5	2.75	3.02	1.5	1.6
21	2.15	3.15	3.9	1.95	1.4	1.25	1.7	1.25	2.7	1.85	1.5	3.6
22	2.2	3.1	3.75	1.8	1.4	1.35	1.25	1.2	2.7	1.68	1.45	2.2
23	2.3	3.0	3.25	1.75	1.35	1.25	1.5	1.2	2.6	1.6	1.45	2.4
24	2.3	3.0	2.95	1.65	1.35	1.4	1.6	1.2	2.3	1.6	1.4	2.1
25	2.3	2.92	3.55	1.7	1.4	1.25	1.85	1.9	1.95	1.55	1.4	2.0
26	2.3	2.9	3.15	1.55	1.33	1.22	1.65	1.7	1.7	1.68	1.4	1.9
27	2.3	2.9	2.95	1.65	1.27	1.2	1.55	1.5	1.7	1.6	1.4	1.82
28	2.3	2.9	2.6	1.7	1.32	1.15	1.45	1.4	1.6	1.58	1.45	1.8
29	2.3	....	2.45	1.65	1.25	1.15	2.75	1.3	1.6	1.5	3.95	2.9
30	2.3	....	2.5	1.6	1.3	1.15	2.3	1.3	1.6	1.45	4.1	2.7
31	2.3	....	2.3	....	1.25	....	1.85	1.3	....	1.45	....	2.1

NOTE.—River frozen January 1 to March 10, approximately. Gage read to top of ice. The following comparative readings were also made:

Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*
February 13	3.2	3.3	1.5
February 17	3.2	3.3	1.7
February 18	3.3	3.4	1.85
February 24	2.95	3.1	2.15
March 6	2.8	2.9	2.2

RARITAN RIVER AT FINDERNE, N. J.

This station was established June 27, 1903, by E. P. Roundey. It is located at the highway bridge one-fourth mile from the Central Railroad of New Jersey station at Finderne, N. J.

The channel is straight for 300 feet above and 800 feet below the station. The right bank is low, wooded, and liable to overflow. The left bank will overflow only at extreme high water. The bed of the stream is composed of gravel.

Discharge measurements are made from the upstream side of the two-span highway bridge. The initial point for soundings is the face of the right abutment.

A standard chain gage is located on the downstream side of the right-hand truss on the lower chord. The length of the chain from the end of the weight to the end of the ring is 19.53 feet. The gage is read twice each day by Jacob Siegel. Bench mark No. 1 is a cross chiseled on the coping of the downstream wing wall of the right abutment. Its elevation is 20.11 feet above gage datum. Bench mark No. 2 is the top of the outside connection plate near the zero of the gage scale. Its elevation is 20.14 feet above gage datum.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 242; 125, pp 87-88.
Discharge: 97, p 242; 125, p 88.
Discharge, monthly: 125, p 89.
Gage heights: 97, p 243; 125, p 88.
Rating table: 125, p 89.

Discharge measurements of Raritan River at Finderne, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 15	F. H. Tillinghast	175	364	3.97	5.08	1,445
June 19	R. M. Packard	117	129	1.42	3.64	182

Daily gage height, in feet, of Raritan River at Finderne, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.48	4.82	5.48	4.68	4.0	3.6	3.48	3.82	3.65	3.9	3.72	4.48
2	6.02	4.9	5.25	4.62	3.98	3.68	3.42	3.72	3.6	3.78	3.7	4.22
3	5.45	4.78	5.42	4.65	3.88	3.75	3.52	3.65	7.32	4.25	3.7	6.0
4	5.08	4.82	5.42	4.52	3.88	3.45	3.55	3.55	8.38	4.38	3.72	4.72
5	4.6	4.9	5.05	5.12	4.22	3.6	3.58	3.52	7.55	3.85	3.75	4.3
6	4.4	4.98	5.12	6.15	3.85	3.6	3.5	3.48	4.7	3.88	3.7	4.22
7	14.03	5.25	5.3	5.0	3.85	3.58	3.55	3.58	4.45	3.82	3.72	4.15
8	7.45	5.25	4.78	4.8	3.88	3.7	3.52	3.48	4.25	3.88	3.75	4.15
9	5.58	4.95	10.33	4.6	3.78	3.75	3.5	3.58	4.3	3.82	3.72	4.2
10	5.05	4.88	11.75	4.5	3.72	3.65	3.5	3.48	4.0	3.92	3.8	4.1
11	4.85	4.95	8.55	4.55	3.65	3.58	3.55	3.5	3.98	3.88	3.65	4.3
12	5.9	4.8	6.5	4.58	3.82	3.65	3.42	3.55	7.88	4.25	3.65	4.2
13	5.05	5.55	5.62	4.45	3.75	4.02	3.55	4.08	4.3	3.98	3.65	4.5
14	4.7	5.45	5.72	4.4	3.9	3.8	3.48	3.62	4.65	3.98	3.65	4.1
15	4.5	5.2	5.3	4.45	3.98	3.7	3.55	4.95	4.38	3.92	3.7	4.0
16	4.25	4.85	5.5	4.3	4.0	3.65	3.42	9.62	4.28	3.85	3.6	4.25
17	4.38	5.1	5.95	4.18	3.95	3.6	3.48	4.58	4.12	3.9	3.65	4.3
18	4.3	5.3	5.62	4.18	3.98	3.55	3.42	4.15	4.1	3.85	3.6	4.0
19	4.38	4.95	7.85	4.2	3.9	3.65	3.48	3.98	5.32	3.92	3.62	3.98
20	4.35	4.95	7.22	4.15	3.82	3.52	3.38	3.75	4.25	4.98	3.58	3.98
21	4.37	5.05	9.05	4.18	3.7	3.55	3.38	3.72	4.68	4.65	3.5	7.55
22	4.08	5.12	7.4	4.42	3.8	3.65	3.35	3.68	4.32	4.28	3.62	5.42
23	4.35	5.23	5.88	4.2	3.75	4.0	3.42	3.62	4.22	4.0	3.62	5.32
24	4.2	5.05	5.68	4.18	3.75	3.7	3.48	3.6	4.3	4.0	3.52	4.78
25	4.15	5.32	7.1	4.15	3.62	3.58	3.5	3.58	4.1	3.98	3.58	4.52
26	5.1	5.45	6.0	4.1	3.68	3.52	3.42	4.4	4.0	3.98	3.48	4.38
27	5.22	5.62	5.9	4.08	3.68	3.48	3.42	3.75	3.92	3.98	3.45	4.3
28	5.48	5.75	5.5	4.3	3.6	3.52	3.42	3.68	4.0	3.95	3.52	4.28
29	5.32	......	5.18	4.0	3.7	3.45	3.52	3.75	3.88	3.92	6.22	5.6
30	5.5	......	4.98	4.12	3.68	3.55	4.28	3.68	3.88	3.9	6.32	4.95
31	4.85	......	4.9	......	3.62	......	3.9	3.78	......	3.9	......	4.6

NOTE.—River frozen over January 26 to March 15, approximately. Gage was read to water surface in a hole cut in the ice. Thickness of ice, 0.5 foot.

Station rating table for Raritan River at Finderne, N. J., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
3.30	75	4.40	695	5.50	1,785	7.00	3,565
3.40	105	4.50	783	5.60	1,895	7.20	3,815
3.50	140	4.60	875	5.70	2,005	7.40	4,065
3.60	180	4.70	969	5.80	2,120	7.60	4,325
3.70	225	4.80	1,064	5.90	2,235	7.80	4,585
3.80	275	4.90	1,159	6.00	2,350	8.00	4,845
3.90	330	5.00	1,255	6.20	2,585	8.50	5,515
4.00	393	5.10	1,355	6.40	2,825	9.00	6,210
4.10	461	5.20	1,460	6.60	3,065	9.50	6,950
4.20	534	5.30	1,565	6.80	3,315	10.00	7,730
4.30	612	5.40	1,675				

The above table is applicable only for open channel conditions. It is based on thirteen discharge measurements made during 1903-1905. It is fairly well defined between gage heights 3.9 feet and 10.5 feet. The table has been extended beyond these limits. Above gage height 10 feet the rating curve is a tangent, the difference being 170 per tenth.

Above 4 feet the table is the same as for 1904.

Estimated monthly discharge of Raritan River at Finderne, N. J., for 1905.

[Drainage area, 490 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January 1-25	14,580	447	1,722	3.51	3.27
March 16-31	6,280	1,159	2,682	5.47	3.25
April	2,525	393	772	1.58	1.76
May	629	180	293	.598	.689
June	407	123	201	.410	.457
July	596	90	153	.312	.360
August	7,130	133	513	1.05	1.21
September	5,353	180	1,024	2.09	2.33
October	1,236	265	420	.857	.988
November	2,729	122	364	.743	.829
December	4,335	380	914	1.87	2.16

NOTE.—River frozen January 26 to March 15; no estimates made.

RARITAN RIVER AT BOUND BROOK, N. J.

This station was established September 12, 1903, by E. P. Roundey. It is located at the highway bridge just back of the Lehigh Valley Railroad station at Bound Brook, N. J.

The channel is straight for 500 feet above and below the station. Both banks are high, subject to overflow only at very high stages, and are without trees. The bed of the stream is composed of gravel.

Discharge measurements are made from the upstream side of the three-span highway bridge. The initial point for soundings is the face of the right abutment.

The original staff gage fastened to the upstream wing wall of the right abutment was carried away by the ice January 23, 1904. February 2, 1904, a standard chain gage was fastened to the upstream side of the bridge 240 feet from the right abutment. The length of the chain from the end of the weight to the marker is 23.44 feet. The gage is read twice each day by Joseph K. Tantum. Bench mark No. 1 is a square chiseled on the upstream wing wall of the right abutment. Its elevation is 19.45 feet above gage datum. Bench

mark No. 2 is the top of the rail 2 feet beyond the pulley end of the gage. Its **elevation is** 23.77 feet above **gage datum. Bench mark No. 3 is a point on the guard rail of the bridge** 225 feet from the initial point for soundings. Its elevation is 20.75 feet above gage datum.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 239; 125, p 90.
Discharge: 82, p 127; 97, p 240; 125, p 90.
Gage heights: 97, p 240; 125, p 91.

Discharge measurements of Raritan River at Bound Brook, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 15	F.H. Tillinghast	380	1,465	1.80	2.83	2,639
March 17	do	380	1,469	1.83	2.89	2,684
June 19	R.H. Bolster	352	817	.39	1.05	315

Daily gage height, in feet, of Raritan River at Bound Brook, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.8	1.8	2.2	2.15	1.45	1.2	1.05	1.3	1.2	1.2	1.2	1.9
2	3.15	1.8	2.2	2.0	1.4	1.2	1.05	1.25	1.2	1.2	1.2	1.7
3	2.95	1.8	2.2	1.9	1.4	1.2	1.1	1.2	5.07	1.3	1.2	2.3
4	2.35	1.7	2.25	1.85	1.4	1.2	1.15	1.15	5.8	1.3	1.2	2.75
5	2.1	1.8	2.1	2.85	1.4	1.2	1.15	1.1	3.25	1.2	1.2	1.95
6	2.35	1.9	2.0	3.8	1.4	1.2	1.15	1.1	2.4	1.2	1.2	1.8
7	10.3	1.9	2.25	2.9	1.4	1.2	1.1	1.05	2.0	1.2	1.2	1.65
8	5.7	2.0	2.1	2.5	1.3	1.3	1.1	1.1	1.8	1.2	1.2	1.6
9	3.5	2.0	6.0	2.15	1.3	1.3	1.1	1.25	1.65	1.2	1.2	1.55
10	2.65	1.95	7.4	2.0	1.3	1.2	1.05	1.15	1.45	1.2	1.2	1.7
11	2.35	1.85	5.7	2.15	1.25	1.2	1.05	1.15	1.4	1.2	1.2	1.7
12	3.1	1.8	4.2	2.15	1.3	1.2	1.0	1.1	4.67	1.45	1.2	1.6
13	3.2	2.1	3.4	2.0	1.3	1.25	1.05	1.1	2.25	1.4	1.15	1.5
14	2.3	2.8	3.05	1.9	1.3	1.25	1.05	1.5	1.85	1.2	1.1	1.5
15	2.3	2.6	2.9	1.9	1.35	1.2	1.05	2.3	1.65	1.2	1.1	1.35
16	3.3	2.4	2.9	1.85	1.4	1.2	1.05	6.2	1.6	1.2	1.15	1.4
17	3.0	2.3	3.2	1.65	1.4	1.2	1.05	2.3	1.5	1.2	1.15	1.45
18	2.85	2.0	3.3	1.6	1.55	1.2	1.0	1.75	1.6	1.2	1.15	1.35
19	2.3	1.8	4.7	1.65	1.5	1.1	1.05	1.6	2.05	1.2	1.15	1.4
20	1.8	1.8	4.65	1.6	1.4	1.3	1.05	1.4	1.75	2.15	1.1	1.4
21	1.8	1.8	5.9	1.6	1.35	1.15	.95	1.3	1.85	2.15	1.1	3.75
22	1.7	1.8	5.45	1.65	1.25	1.15	.95	1.25	1.6	1.65	1.1	3.3
23	1.7	1.8	3.8	1.55	1.3	1.35	.95	1.2	1.55	1.5	1.15	2.6
24	1.5	1.8	3.15	1.5	1.25	1.25	.95	1.15	1.4	1.4	1.15	2.45
25	1.2	1.9	4.0	1.5	1.2	1.2	1.0	1.4	1.35	1.4	1.1	2.05
26	1.2	2.1	3.5	1.5	1.2	1.2	1.05	1.6	1.35	1.4	1.15	1.85
27	1.2	2.45	3.15	1.5	1.2	1.1	1.05	1.2	1.3	1.4	1.15	1.8
28	1.25	2.35	2.95	1.6	1.2	1.1	.95	1.25	1.25	1.3	1.2	1.7
29	1.8		2.7	1.6	1.2	1.05	1.0	1.2	1.25	1.3	2.85	2.95
30	1.8		2.35	1.5	1.2	1.05	1.85	1.25	1.2	1.3	3.6	2.6
31	1.8		2.3		1.2		1.5	1.15		1.2		2.05

NOTE.—River frozen over January 16-21 and January 26 to March 9. Thickness of ice, 0.4 to 0.7 foot. During frozen period gage was read to top of ice.

Station rating table for Raritan River at Bound Brook, N. J., from September 12, 1903, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.90	205	2.00	1,300	3.20	3,240	5.40	7,980
1.00	275	2.10	1,440	3.40	3,610	5.60	8,480
1.10	350	2.20	1,580	3.60	4,000	5.80	8,980
1.20	430	2.30	1,730	3.80	4,400	6.00	9,500
1.30	520	2.40	1,890	4.00	4,800	6.20	10,030
1.40	615	2.50	2,050	4.20	5,220	6.40	10,570
1.50	715	2.60	2,210	4.40	5,660	6.60	11,120
1.60	820	2.70	2,370	4.60	6,100	6.80	11,680
1.70	930	2.80	2,540	4.80	6,560	7.00	12,250
1.80	1,050	2.90	2,710	5.00	7,020	7.50	13,700
1.90	1,170	3.00	2,880	5.20	7,500	8.00	15,200

The above table is applicable only for open-channel conditions. It is based on eleven discharge measurements made during 1903-1905 between gage heights 1.05 feet and 7.35 feet. Measurements at this station do not plot well, owing to slight shifting of the stream bed and influence of backwater from a dam 2 miles below. Estimates are therefore subject to considerable error, particularly in times of low water.

Estimated monthly discharge of Raritan River at Bound Brook, N. J., for 1903–1905.

[Drainage area, 800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
September 12–30	5,880	665	1,544	1.93	1.36
October	28,500	615	3,152	3.94	4.54
November	1,370	615	757	.946	1.06
December 1–9, 20–26	10,570	520	1,800	2.25	1.34
1904.					
February 8–9, 22–29	19,820	1,370	5,191	6.49	2.41
March	17,060	820	2,204	2.76	3.18
April 1–28	7,740	615	1,617	2.02	2.10
May 8–31	875	430	566	.708	.632
June	1,300	350	651	.814	.908
July	2,130	430	758	.948	1.09
August	6,330	615	1,860	2.32	2.68
September	21,940	520	1,830	2.29	2.56
October	10,440	520	1,604	2.00	2.31
November	5,330	665	1,122	1.40	1.56
December 1–9, 28–31	4,600	568	1,581	1.98	.957
1905.					
January 1–15, 22–25	22,620	430	3,451	4.31	3.04
March 10–31	13,410	1,730	4,723	5.90	4.83
April	4,400	715	1,284	1.60	1.78
May	768	430	545	.681	.785
June	568	312	430	.538	.600
July	1,110	240	347	.434	.500
August	10,030	312	878	1.10	1.27
September	8,980	430	1,640	2.05	2.29
October	1,510	430	575	.719	.829
November	4,000	350	594	.782	.872
December	4,300	568	1,336	1.67	1.92

NOTE.—River frozen December 10–19, 27–31, 1903; January 1–22, February 2–7, 10–21, December 10–27, 1904; January 16–21, January 26 to March 9, 1905; no estimates made. No record of gage heights January 24 to February 1 and April 29 to May 7, 1904.

DELAWARE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Delaware River rises in Delaware, Greene, and Schoharie counties, N. Y., the source of the main stream, which is commonly known as West Branch, to distinguish it from the smaller East or Pepacton Branch, being a small lake almost on the line of Schoharie and Delaware counties, at an elevation of 1,886 feet above tide. From this lake it flows southwestward across central Delaware County to Deposit, where it receives Oquaga Creek, a large tributary draining eastern Broome County, and turns abruptly to the southeast, forming the boundary line between New York and Pennsylvania until Port Jervis is reached. Here it turns again to the southwest and flows for a distance of about 40 miles along the base of the Shawangunk Range until it passes through the water gap, from which point it flows irregularly southward to Trenton. Below Trenton the course is in general southwestward to Delaware Bay. South of Port Jervis it forms the dividing line between Pennsylvania and New Jersey, and for a few miles between Delaware and New Jersey.

East Branch rises at Grand Gorge in northeastern Delaware county, and flows parallel to West Branch across southern Delaware County, uniting with the latter stream at Hancock.

The total length of the river from the mouth to the head of West Branch is about 410 miles; its drainage area, measured at Philadelphia and including Schuylkill River is 10,100 square miles, of which about 2,580 square miles lie in New York, 5,720 in Pennsylvania, and 1,800 in New Jersey. The river is tidal to Trenton, which lies also at the head of navigation.

The upper drainage area is relatively long and narrow, with numerous short, lateral tributaries. From its head streams in New York it flows in a tortuous course through a deep, narrow trough in an elevated table land, the mean level of the plateau remaining nearly constant, the valley growing progressively deeper, and the river hills becoming higher and steeper. On leaving the plateau in Wayne and Pike counties, Pa., the river emerges into a broad, open valley, bordered on the west by fertile cultivated flats, behind which rise numerous rolling hills, and on the east by the forest-covered flanks of the Kittatinny Mountains. Passing through the mountains by means of the celebrated water gap, it descends obliquely southward across the entire Appalachian Valley to the point where it enters the South Mountains below Easton. The topography of this portion of its course is marked by no striking features, the surface of the country being elevated only 100 or 200 feet above the stream. Between Easton and Trenton the river is bordered by an alternation of hills and narrow intervening valleys, while below Trenton it becomes a wide, tidal stream flowing between shores which are in many places only low banks of sand or gravel and in others broad, slimy marshes covered with reeds and grass.

The fall of the river is rapid; the bed is principally gravel, sand, and bowlders, and at many places rock, and the banks are generally high. The flow is extremely variable, and would no doubt be much more so were it not for the great number of lakes which are tributary to the stream from northern Pennsylvania and New Jersey as well as from New York. The influence of these lakes in moderating floods must be considerable.

The Delaware receives a number of important tributaries, among which may be mentioned Mongaup and Neversink rivers and Callicoon creek from New York; Lackawaxen, Lehigh, and Schuylkill rivers and numerous creeks from Pennsylvania, and Rancocas Creek, Musconetcong River, and Maurice River from New Jersey.

Measurements of the flow of Delaware River were made during the last half of June, 1891, by Prof. Dwight Porter and students at Delaware Watergap, Pa. The results show a flow 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. The discharge was measured by E. G. Paul June 4, 1899, at Martins Creek, Pa., 7 miles above the mouth of Lehigh River, and found to be 2,724 second-feet.

During 1905 the following gaging stations were maintained in the Delaware River basin by the United States Geological Survey:

West Branch Delaware River at Hancock, N. Y.
East Branch Delaware River at Hancock, N. Y.
Delaware River at Lambertville, N. J.
Musconetcong River near Bloomsbury, N. J.

In addition to the work at these stations measurements have been made for several years by Mr. John E. Codman, hydrographer of the water department of the city of Philadelphia, on the following streams in the vicinity of Philadelphia: Perkiomen, Tohickon, Neshaminy, and Wissahickon creeks, and Schuylkill River.

WEST BRANCH DELAWARE RIVER AT HANCOCK, N. Y.

This station was established October 15, 1902, by P. M. Churchill, It is located one-half mile west of the Erie Railroad station at Hancock, N. Y., and about 1 mile above the mouth of East Branch.

The channel is straight for 400 feet above and 800 feet below the bridge. The current is swift. Both banks are high and rocky and are not subject to overflow. The bed of the stream is composed of earth and cobblestones.

Discharge measurements are made from the downstream side of the bridge, at which the gage is located. The bridge has a single span of 235 feet. The initial point for soundings is the top of the face of the left abutment on the downstream side. The bridge floor is marked at intervals of 5 feet with black paint.

The original wire gage was attached to the upstream side of the bridge. It was replaced July 20, 1903, by a standard chain gage. The location and the gage datum were not changed. The length of the chain from the end of the weight to the marker is 30.44 feet. The gage is read twice each day by David Pulver, the collector of tolls at the bridge. The bench mark is a circular chisel draft on the upstream corner of the left abutment. Its elevation is 24.25 feet above gage datum. The elevation of the top of the pulley is 30.54 feet above gage datum.

Information in regard to this station is contained in the annual reports of the state engineer and surveyor of New York prior to 1905 and in the following Water-Supply Papers of of the United States Geological Survey:

Description: 82, p. 128; 97, p. 262; 125, p. 96.
Discharge: 82, p. 128; 97, p. 263; 125, p. 96.
Gage heights: 82, p. 129; 97, p. 263; 125, p. 97.

Discharge measurements of West Branch Delaware River at Hancock, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 22	Beebe and Swancott	245	1,130	4.89	6.38	5,525
March 23	.....do	245	1,025	5.08	5.92	5,211
March 24	.....do	253	937	4.29	5.55	4,022
March 25	.....do	300	1,633	6.96	8.05	11,380
March 26	.....do	295	1,689	5.42	7.45	9,165
August 18	Covert and Weeks	222	543	1.42	3.90	774

Daily gage height, in feet, of West Branch Delaware River at Hancock, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.65	4.49	3.65	5.85	3.5	3.0	3.15	3.6	4.22	3.4	3.6	5.0
2	4.5	4.29	3.75	5.25	3.45	2.95	3.35	3.7	3.8	3.4	3.5	4.7
3	4.35	4.09	3.85	4.9	3.5	2.9	4.3	3.28	4.0	3.32	3.4	7.2
4	3.95	4.09	3.7	4.9	3.5	2.95	3.65	3.15	4.65	3.75	3.4	7.8
5	3.65	4.04	3.8	4.95	3.35	3.15	3.4	3.15	4.75	3.45	3.4	6.15
6	4.1	4.09	3.75	5.1	3.45	4.2	3.3	3.0	4.35	3.35	3.45	5.55
7	6.95	3.79	3.7	5.05	3.65	4.0	3.3	3.1	4.3	3.22	4.0	5.15
8	6.45	3.53	3.95	5.0	3.6	3.85	3.4	3.45	3.95	3.2	4.0	4.85
9	5.2	3.28	3.95	4.7	3.3	3.85	3.35	3.15	3.95	3.18	3.9	4.6
10	4.8	3.43	4.2	4.9	3.35	3.6	3.3	3.1	3.72	3.18	3.9	4.4
11	4.4	3.38	3.85	5.0	3.3	3.45	3.3	3.2	3.62	3.1	3.8	4.3
12	4.6	3.58	3.95	5.3	3.4	3.65	3.15	3.2	4.48	4.6	3.75	4.2
13	5.6	3.88	3.85	5.05	3.5	3.45	3.0	3.85	4.25	4.52	3.7	4.05
14	4.6	3.53	3.8	4.7	3.5	3.45	3.05	3.35	3.95	4.05	3.6	3.9
15	3.99	3.43	3.8	4.55	3.7	3.35	3.0	3.4	3.8	3.8	3.55	3.65
16	3.84	3.52	3.85	4.5	3.55	3.3	3.05	4.05	3.8	3.75	3.52	3.45
17	3.94	4.0	3.95	4.35	3.6	3.22	3.1	4.15	3.8	3.65	3.5	3.95
18	3.89	3.9	4.2	4.2	3.6	3.05	3.1	3.8	4.4	3.6	3.48	4.75
19	4.09	4.2	8.6	4.15	3.65	3.35	3.0	3.5	4.9	3.7	3.4	4.25
20	3.84	4.0	8.0	4.05	3.4	3.35	3.2	3.4	4.7	4.3	3.35	3.95
21	3.59	4.2	7.25	4.3	3.45	3.25	3.05	3.35	5.8	4.25	3.25	4.2
22	3.54	3.9	6.55	4.35	3.35	4.1	3.0	3.3	5.05	4.1	3.2	4.65
23	4.34	4.0	6.05	4.15	3.4	4.0	3.1	3.15	4.7	3.95	3.3	4.25
24	3.54	3.95	5.6	4.0	3.35	3.85	3.05	3.15	4.45	3.9	3.2	3.9
25	3.94	4.05	7.22	3.95	3.3	3.7	3.05	3.15	4.25	3.9	3.3	3.75
26	4.84	4.05	7.5	3.95	3.25	3.35	3.0	3.1	4.0	3.75	3.15	3.75
27	4.94	4.0	8.0	3.9	3.35	3.25	2.9	3.1	3.85	3.65	3.15	3.6
28	4.94	3.95	7.55	3.9	3.5	3.2	3.0	2.98	3.7	3.7	2.98	3.6
29	4.74	....	7.0	3.6	3.3	3.35	2.9	3.05	3.6	3.55	4.6	3.85
30	4.69	....	6.9	3.7	3.15	3.25	2.95	3.3	3.55	3.55	6.18	4.05
31	4.59	....	6.65	....	3.1	....	3.3	4.28	....	3.45	....	3.85

NOTE.—Ice conditions February 1 to March 18, approximately.

Station rating table for West Branch Delaware River at Hancock, N. Y., from October 15, 1902, to October 10, 1903.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.00	20	3.60	814	5.20	3,246	7.60	9,880
2.10	27	3.70	900	5.30	3,465	7.80	10,520
2.20	40	3.80	992	5.40	3,690	8.00	11,200
2.30	58	3.90	1,091	5.50	3,920	8.20	11,880
2.40	85	4.00	1,198	5.60	4,155	8.40	12,560
2.50	120	4.10	1,315	5.70	4,395	8.60	13,240
2.60	161	4.20	1,443	5.80	4,640	8.80	13,960
2.70	208	4.30	1,583	5.90	4,890	9.00	14,680
2.80	260	4.40	1,734	6.00	5,150	9.50	16,560
2.90	317	4.50	1,895	6.20	5,690	10.00	18,520
3.00	378	4.60	2,065	6.40	6,250	10.50	20,520
3.10	443	4.70	2,244	6.60	6,820	11.00	22,600
3.20	511	4.80	2,431	6.80	7,400	11.50	24,780
3.30	582	4.90	2,625	7.00	8,000	12.00	27,000
3.40	656	5.00	2,826	7.20	8,600	13.00	31,600
3.50	733	5.10	3,033	7.40	9,240		

The above table is applicable only for open-channel conditions. It is based on seven discharge measurements made during 1902–3. It is fairly well defined between gage heights 2.5 feet and 6 feet. The table has been extended beyond these limits.

Station rating table for West Branch Delaware River at Hancock, N. Y., from October 11, 1903, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.70	50	3.60	523	4.50	1,680	5.40	3,610
2.80	79	3.70	614	4.60	1,859	5.50	3,860
2.90	113	3.80	714	4.70	2,047	5.60	4,110
3.00	152	3.90	822	4.80	2,245	5.70	4,370
3.10	196	4.00	939	4.90	2,453	5.80	4,630
3.20	245	4.10	1,066	5.00	2,670	5.90	4,890
3.30	300	4.20	1,204	5.10	2,896	6.00	5,150
3.40	365	4.30	1,352	5.20	3,130		
3.50	440	4.40	1,511	5.30	3,370		

The above table is applicable only for open-channel conditions. It is based on seven discharge measurements made during 1904–5. It is fairly well defined between gage heights 3 feet and 8 feet. The table has been extended beyond these limits, being the same as the preceding table above 6 feet.

Estimated monthly discharge of West Branch Delaware River at Hancock, N. Y., for 1902–1905.

Month.	Discharge in second-feet.			Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
1902.				1904.			
October 15-31	8,090	378	1,812	July	1,680	129	410
November	1,980	184	622	August	3,860	440	1,247
December	12,662	366	2,439	September	2,670	196	761
1903.				October	9,560	332	1,582
March 16-31	12,560	1,341	3,471	November	1,680	300	669
April	2,726	378	1,170	December 1-9, 28-31	8,920	300	1,696
May	208	37	119	1905.			
June	3,421	21	782	January	7,850	473	1,899
July	1,256	92	381	March 19-31	13,240	4,110	8,544
August	9,368	184	1,100	April	4,760	523	1,894
September	2,509	109	604	May	614	196	396
October	33,740	136	3,492	June	1,204	113	454
November	5,582	187	1,013	July	1,352	113	270
December	7,460	418	2,431	August	1,322	144	397
1904.				September	4,630	482	1,344
March 7-31	31,830	2,760	10,803	October	1,859	196	652
April	6,791	857	2,666	November	5,636	144	681
May	2,627	346	1,013	December	10,520	402	2,026
June	1,528	53	420				

NOTE.—No estimates during frozen period.

EAST BRANCH DELAWARE RIVER AT HANCOCK, N. Y.

This station was established October 14, 1902, by P. M. Churchill. It is located at the highway bridge one-half mile southeast of the Erie Railroad station at Hancock, N. Y., and 1 mile above the junction with West Branch of the Delaware. The Erie Railroad bridge is just below the station.

The channel is straight for 600 feet above and 300 feet below the station. The current is swift. Both banks are of medium height and are not liable to overflow. The bed of the stream is composed of rocks and gravel. There are three channels at low water and five channels at high water. During low water the elevation of the water surface at the station is lower than the water surface on West Branch of the Delaware, but there is no danger of the gage heights being affected by backwater from West Branch, as there is considerable fall between the gaging station and the junction of the branches.

Discharge measurements are made from the downstream side of the five-span iron highway bridge to which the gage is attached. The bridge has a total span of 425.5 feet between abutments. The initial point for soundings is the face of the right abutment at the top.

A standard chain gage is attached to the lower chord of the second span from the left end of the bridge on the upstream side. It was installed July 21, 1903, to replace the old wire gage. The gage datum was not changed. The length of the chain from the end of the weight to the marker is 32.43 feet. The gage is read twice each day by D. B. Van Etten. The bench mark is a circular chisel draft on the top of the left abutment on the downstream side. It is marked "B. M." Its elevation is 27.93 feet above gage datum. The elevation of the top of the gage pully is 32.40 feet above gage datum.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York prior to 1905, and in the following Water-Supply Papers of the United States Geological Survey:

Description: 82, pp 129-130; 97, p 264; 125, p 98.
Discharge: 82, p 129; 97, p 265; 125, p 98.
Gage heights: 82, p 130; 97, p 265; 125, p 99.

Discharge measurements of East Branch Delaware River at Hancock, N. Y., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 22	Beebe and Swancott	351	1,568	4.38	6.18	6,863
March 23	do	337	1,420	4.62	5.85	6,554
March 24	do	336	1,309	3.85	5.42	5,046
March 25	do	352	2,028	6.04	7.59	12,260
March 26	do	352	1,879	5.57	7.00	10,470
August 16	C. C. Covert	321	660	1.26	3.45	829
August 18	Covert and Weeks	318	643	1.23	3.40	791

Daily gage height, in feet, of East Branch Delaware River at Hancock, N. Y., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.6	4.9	4.35	6.85	3.62	3.45	2.8	3.52	3.9	3.32	3.42	5.05
2	4.5	4.8	4.2	5.95	3.55	2.95	3.0	3.35	3.58	3.28	3.4	4.8
3	4.95	4.65	4.2	5.4	3.5	3.02	3.88	3.15	4.7	3.35	3.3	7.05
4	4.35	4.65	4.2	5.12	3.48	2.98	3.48	3.08	5.0	3.45	3.32	8.8
5	4.05	4.45	4.15	5.18	3.4	2.9	3.22	3.0	5.1	3.28	3.3	6.2
6	4.22	4.55	4.15	5.45	3.4	3.25	3.1	2.92	4.55	3.2	3.35	5.3
7	6.5	4.5	4.15	5.45	3.5	3.72	3.08	2.9	4.25	3.12	3.8	5.05
8	7.0	4.58	4.25	5.1	3.48	3.52	3.02	2.9	4.05	3.1	3.7	4.75
9	5.55	4.52	4.35	4.85	3.35	3.42	2.98	2.88	3.85	3.05	3.7	4.55
10	5.1	4.6	4.6	4.68	3.32	3.28	2.9	2.8	3.72	3.02	3.6	4.35
11	4.7	4.6	4.7	4.7	3.28	3.22	2.9	2.8	3.6	3.5	3.55	4.15
12	4.7	4.55	4.65	5.0	3.3	3.2	2.88	2.95	4.6	4.48	3.52	4.08
13	5.7	4.5	4.55	4.8	3.38	3.48	3.0	3.2	4.5	4.22	3.5	3.95
14	4.8	4.5	4.45	4.62	3.35	3.42	3.05	3.05	4.1	3.85	3.48	3.82
15	4.2	4.45	4.35	4.52	3.32	3.25	3.15	3.05	3.85	3.7	3.38	3.6
16	4.25	4.5	4.35	4.45	3.32	3.12	3.05	3.4	3.7	3.6	3.38	3.55
17	4.3	4.45	4.35	4.32	3.32	3.1	2.92	3.65	3.68	3.5	3.38	3.6
18	4.32	4.5	4.3	4.2	3.32	3.0	2.85	3.4	3.65	3.48	3.32	3.5
19	4.22	4.4	6.05	4.08	3.35	3.1	2.8	3.2	4.2	3.52	3.3	3.65
20	4.05	4.4	8.0	4.0	3.32	3.1	3.1	3.1	4.05	4.0	3.28	3.5
21	3.98	4.38	6.7	4.2	3.25	3.08	3.05	3.05	5.05	4.1	3.2	3.55
22	3.88	4.4	6.25	4.2	3.2	3.15	2.92	3.0	4.52	4.08	3.2	4.35
23	3.52	4.3	5.9	4.05	3.2	3.2	2.88	2.95	4.25	3.98	3.22	3.95
24	3.4	4.32	5.4	3.92	3.18	3.08	2.8	2.9	4.05	3.9	3.12	3.82
25	3.82	4.38	7.92	3.9	3.12	2.95	2.95	2.9	3.85	3.85	3.15	3.68
26	4.25	4.4	7.35	3.8	3.1	2.9	3.05	3.02	3.75	3.75	3.15	3.6
27	4.7	4.3	8.2	3.8	3.1	2.9	2.92	2.92	3.62	3.65	3.1	3.7
28	5.15	4.3	8.05	3.72	3.1	2.9	2.82	2.85	3.58	3.55	3.1	3.62
29	5.1	....	7.9	3.65	3.05	2.85	2.8	2.82	3.48	3.52	4.1	3.65
30	5.1	....	8.4	3.75	3.0	2.8	3.15	3.1	3.4	3.48	6.65	3.82
31	4.95	....	7.85	....	3.0	....	3.55	4.5	....	3.42	....	3.62

NOTE.—River frozen entirely across February 1 to March 18, approximately. There was a large quantity of needle ice. During this period the gage was read to water surface in a hole cut in the ice. The following comparative readings were also made:

Daily gage height, in feet, of East Branch Delaware River at Hancock, N. Y., for 1905—Con.

Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*
February 4	4.7	4.85	0.9
February 11	4.6	4.4	1.0
February 18	4.5	4.4	1.1
February 25	4.4	4.3	1.0
March 4	4.2	4.5	1.2
March 11	4.7	4.6	1.3
March 18	4.3	4.4	1.3

Station rating table for East Branch Delaware River at Hancock, N. Y., from October 14, 1902, to October 10, 1903.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.50	190	4.30	2,265	6.20	7,330	9.80	22,880
2.60	230	4.40	2,453	6.40	8,020	10.00	23,960
2.70	280	4.50	2,650	6.60	8,730	10.50	26,700
2.80	340	4.60	2,857	6.80	9,460	11.00	29,520
2.90	410	4.70	3,075	7.00	10,210	11.50	32,440
3.00	490	4.80	3,304	7.20	10,980	12.00	35,460
3.10	580	4.90	3,544	7.40	11,760	12.50	38,600
3.20	679	5.00	3,795	7.60	12,560	13.00	41,880
3.30	787	5.10	4,055	7.80	13,360	13.50	45,280
3.40	903	5.20	4,320	8.00	14,200	14.00	48,780
3.50	1,027	5.30	4,590	8.20	15,040	14.50	52,400
3.60	1,159	5.40	4,865	8.40	15,920	15.00	56,120
3.70	1,298	5.50	5,150	8.60	16,820	15.50	59,960
3.80	1,443	5.60	5,440	8.80	17,760	16.00	63,900
3.90	1,594	5.70	5,735	9.00	18,740	16.50	67,960
4.00	1,751	5.80	6,035	9.20	19,740	17.00	72,140
4.10	1,915	5.90	6,345	9.40	20,780	17.50	76,440
4.20	2,086	6.00	6,665	9.60	21,820		

The above table is applicable only for open-channel conditions. It is based upon nine discharge measurements made during 1902–3. It is fairly well defined between gage heights 2.7 feet and 6 feet. The table has been extended beyond these limits.

Station rating table for East Branch Delaware River at Hancock N. Y., from October 11, 1903, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.50	120	3.50	924	4.50	2,752	5.50	5,285
2.60	151	3.60	1,054	4.60	2,984	5.60	5,565
2.70	195	3.70	1,196	4.70	3,222	5.70	5,850
2.80	252	3.80	1,351	4.80	3,464	5.80	6,140
2.90	322	3.90	1,519	4.90	3,710	5.90	6,435
3.00	402	4.00	1,700	5.00	3,960	6.00	6,735
3.10	492	4.10	1,892	5.10	4,215	6.20	7,365
3.20	589	4.20	2,094	5.20	4,475	6.40	8,025
3.30	693	4.30	2,306	5.30	4,740	6.60	8,730
3.40	804	4.40	2,526	5.40	5,010		

The above table is applicable only for open-channel conditions. It is based upon nine discharge measurements made during 1904–5. It is well defined between gage heights 3 feet and 7.5 feet. Above gage height 6.5 feet the table is the same as the preceding one.

Estimated monthly discharge of East Branch Delaware River at Hancock, N. Y., for 1902.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
October 15-31	10,400	903	2,821
November	3,424	679	1,270
December	23,960	903	5,093

Estimated monthly discharge of East Branch Delaware River at Hancock, N. Y., for 1903.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
March 16-31	20,210	2,733	6,010
April	6,601	744	2,434
May	679	270	416
June	10,670	198	2,252
July	4,055	403	909
August	10,750	490	1,817
September	3,520	368	962
October	50,510	334	5,724
November	9,571	782	2,205
December	12,440	1,320	2,914

No estimate for frozen period.

Estimated monthly discharge of East Branch Delaware River at Hancock, N. Y., for 1904.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
March 22-31	72,480	4,449	33,320
April	11,680	1,892	5,162
May	4,554	793	1,677
June	2,054	308	848
July	6,615	322	897
August	3,222	589	1,305
September	1,435	322	656
October	19,240	589	2,842
November	4,215	748	1,329
December	10,590	1,274	3,064

No estimate for frozen period.

Estimated monthly discharge of East Branch Delaware River at Hancock, N. Y., for 1905.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
January	10,210	804	3,261
March 19-31	15,920	5,010	11,330
April	9,645	1,125	3,123
May	1,082	402	698
June	1,227	252	555
July	1,485	252	455
August	2,752	252	548
September	4,215	804	1,946
October	2,707	420	1,112
November	8,910	492	1,088
December	17,760	924	2,837

No estimate for frozen period.

DELAWARE RIVER AT LAMBERTVILLE, N. J.

This station was established July 22, 1897, by Arthur P. Davis. It is located at the toll bridge at Lambertville, N. J.

The channel is straight above and below the station. The bed of the stream is of gravel and sand and does not change. A dam located about a mile below the station may change slowly and thus in time affect the stage of water at the station.

Discharge measurements are made from the lower side of the bridge to which the gage is attached. The initial point for soundings is on the left bank.

The original gage was a standard chain gage attached to the covered toll bridge. The datum of this gage was 2.00 feet below that of the United States Weather Bureau gage painted on the first bridge pier, and was referred to a copper bolt set in the sill of the extreme south door on the east side of the station of the Pennsylvania Railroad; elevation, 27.82 feet. This bench mark is No. 9 of the Pennsylvania Railroad and has an elevation of 72.69 feet above sea level. The bridge to which the original gage was attached was carried away in the flood of October 10-11, 1903, and from that date until July 22, 1904, gage heights were read from a temporary gage on one of the piers. On the latter date a standard chain gage was attached to the new steel bridge which occupies the site of the old wooden bridge and set to the same datum as the original chain gage; length of chain, 30.46 feet. The gage is read twice daily by Charles H. Naylor, collector of tolls. At the time the new gage was installed a second bench mark was established on the top of the bolt in the fifth course below the coping on the upstream face of the left abutment; elevation, 14.82 feet.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: Ann 20, iv, pp 84-85; WS 15, p 7; 27, p 9; 35, pp 62-63; 47, p 80; 65, p 214; 82, p 133; 97, pp 249-250; 125, pp 99-100.

Discharge: WS 15, p 7; 27, p 23; 35, p 63; 47, p 80; 65, p 214; 82, p 134; 97, p 250; 125, p 100.

Discharge, monthly: Ann 20, iv, p 85; 21, iv, p 77; 22, iv, p 112; WS 75, p 27; 82, p 135.

Discharge, yearly: Ann 20, iv, p 48.

Gage heights: WS 15, p 7; 27, p 16; 35, p 63; 47, p 80; 65, p 214; 82, p 134; 97, p 251; 125, p 100.

Hydrographs: Ann 20, iv, p 86; 21, iv, p 77; 22, iv p 113; WS 75, p 28.

Rating tables: WS 27, p 24; 39, p 442.

Discharge measurement of Delaware River at Lambertville, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
June 17	R. H. Bolster	811	3,615	0.94	2.90	[a]3,386

[a] Total discharge of river plus canal, 3,844 second-feet.

Daily gage height, in feet, of Delaware River at Lambertville, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.15	([a])	....	8.7	3.75	2.7	2.3	3.15	3.25	4.1	4.25	6.9
2	5.1	....	....	7.8	3.7	2.7	2.35	3.55	3.6	4.05	4.2	6.1
3	5.0	....	....	6.95	3.65	2.6	2.35	3.65	4.6	3.95	4.2	5.85
4	([b])	....	....	6.25	3.55	2.5	2.6	3.75	5.4	3.9	4.15	8.83
5	....	....	....	6.2	3.5	2.5	3.1	3.65	7.6	3.85	4.1	9.3
6	....	....	([c])	6.4	3.4	2.45	3.35	3.65	6.7	3.8	4.1	7.55
7	8.25	....	....	6.55	3.35	2.5	3.0	3.3	5.85	3.75	4.05	6.7
8	10.82	....	....	6.55	3.4	2.5	2.85	3.35	5.3	3.75	4.2	6.15
9	9.75	....	....	6.05	3.45	3.1	2.8	3.15	5.0	3.6	4.3	5.85
10	8.05	....	[d]4.9	5.8	3.4	3.3	2.55	3.1	4.75	3.55	4.35	5.55
11	7.05	....	4.9	5.55	3.3	3.2	2.6	2.95	4.65	3.45	4.3	5.45
12	6.55	....	5.0	5.55	3.2	3.05	2.6	3.35	5.95	4.6	4.25	5.2
13	6.4	....	4.55	5.45	3.15	2.85	3.05	3.7	7.37	5.45	4.2	5.1
14	6.1	....	4.7	5.4	3.2	2.9	3.1	3.6	6.7	5.5	4.1	4.95
15	6.0	....	4.55	5.25	3.4	3.15	3.35	4.1	5.95	5.15	4.1	4.75
16	5.2	....	4.65	4.95	3.4	3.1	3.4	5.5	5.45	4.8	4.05	4.55
17	4.85	....	4.8	4.75	3.25	2.95	3.1	4.85	5.15	4.55	3.95	4.6
18	4.9	....	5.25	4.75	3.4	2.8	3.1	4.5	5.05	4.45	3.9	4.6
19	4.7	....	6.52	4.6	3.25	2.6	3.05	4.4	5.1	4.35	4.0	4.[illegible]
20	4.75	....	10.12	4.5	3.2	2.55	2.85	4.25	5.05	5.03	3.95	4.3
21	4.75	....	11.69	4.45	3.15	2.5	3.0	3.95	5.3	5.4	3.8	5.1
22	4.65	....	10.95	4.5	3.1	2.7	2.8	3.8	5.35	5.5	3.8	5.7
23	4.25	....	10.0	4.55	3.05	2.85	3.1	3.55	5.5	5.25	3.65	5.75
24	4.15	....	9.15	4.65	2.9	3.1	3.2	3.4	5.1	5.05	3.65	5.7
25	3.7	....	9.4	4.5	2.9	3.2	3.2	3.5	4.85	4.9	3.65	5.4
26	([b])	....	11.22	4.05	2.8	3.2	3.0	4.45	4.65	4.8	3.65	5.05
27	....	....	11.58	4.05	2.7	2.85	2.8	4.25	4.5	4.7	3.7	5.0
28	....	....	11.87	4.0	2.8	2.6	2.15	3.9	4.35	4.6	3.65	4.8
29	....	....	10.7	3.95	2.7	2.45	2.85	3.65	4.25	4.5	4.85	4.8
30	....	....	9.8	3.8	2.65	2.4	3.45	3.45	4.15	4.45	5.5	5.15
31	....	....	9.35	....	2.7	....	3.25	3.3	....	4.35	....	5.15

[a] River frozen entirely across.
[b] River frozen at gage.
[c] Channel open between first and second piers.
[d] Ice almost gone.

MUSCONETCONG RIVER NEAR BLOOMSBURY, N. J.

This station was established July 4, 1903, by E. P. Roundey. It is located at the first highway bridge over Musconetcong River above the village of Bloomsbury, N. J.

The channel is straight for 200 feet above and 100 feet below the station. Both banks are low and liable to overflow. At high stages part of the water flows around the bridge. The bed of the stream is composed of gravel.

Discharge measurements are made from the downstream side of the two-span highway bridge, to which the gage is attached. The initial point for soundings is the end of the hand rail on the right bank.

The original gage is a vertical cypress board spiked to the right abutment near the downstream end. A standard chain gage was installed at this station April 12, 1904, having the same datum as the staff gage; length of chain, 12.48 feet. Gage readings are taken twice each day by Michael Kieffer. The bench mark is a square chiseled on the top of the right abutment at its downstream end. Its elevation is 9.63 feet above the gage datum.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 97, p 254; 125, pp 102–103.
Discharge: 97, p 254; 125, p 103.
Gage heights: 97, p 254; 125, p 103.

Discharge measurements of Musconetcong River near Bloomsbury, N. J., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
March 18	F. H. Tillinghast	59	151	2.72	2.15	410
June 21	R. M. Packard	54	86	.95	1.07	81
July 10	Grover and Biggi	50	98	.79	1.03	77

Daily gage height, in feet, of Musconetcong River near Bloomsbury, N. J., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.42	1.95	1.45	2.28	1.5	1.15	1.0	1.2	0.98	1.0	1.05	1.55
2	1.45	1.82	1.35	2.25	1.42	1.18	1.0	1.12	1.0	1.08	1.08	1.4
3	1.48	1.72	1.32	2.12	1.28	1.18	1.15	1.05	1.32	.92	1.1	1.82
4	1.2	1.72	1.3	2.1	1.25	1.1	1.15	.98	2.05	.98	1.12	1.85
5	1.42	1.68	1.32	2.28	1.25	1.12	1.1	.95	1.6	1.05	1.02	1.82
6	1.38	1.65	1.35	2.42	1.2	1.08	1.1	.95	1.38	1.05	1.1	1.88
7	4.85	1.62	1.22	2.35	1.32	1.1	1.0	1.0	1.28	1.02	1.12	1.58
8	3.92	1.65	1.32	2.32	1.32	1.15	1.02	.98	1.18	.95	1.08	1.48
9	2.72	1.65	1.6	2.25	1.22	1.08	1.0	.98	1.05	1.1	1.1	1.42
10	2.4	1.62	2.12	2.22	1.18	1.12	1.02	.95	1.05	1.05	1.08	1.45
11	2.15	1.62	2.15	2.22	1.25	1.08	1.02	1.0	1.15	1.1	1.05	1.38
12	2.35	1.55	1.88	2.18	1.25	1.12	1.0	.92	1.85	1.4	1.0	1.35
13	2.25	1.8	1.82	2.02	1.25	1.2	1.05	.88	1.58	1.25	1.12	1.32
14	2.0	1.68	1.8	1.9	1.25	1.15	1.02	.98	1.32	1.12	1.12	1.25
15	1.8	1.72	1.8	1.92	1.3	1.12	.98	1.02	1.25	1.1	.92	1.1
16	1.75	1.6	1.9	1.88	1.3	1.12	.98	1.3	1.18	1.12	.95	1.1
17	1.85	1.65	2.08	1.98	1.25	1.12	1.02	1.12	1.12	1.08	1.12	1.2
18	1.75	1.58	2.5	1.98	1.25	1.05	1.02	1.08	1.25	1.0	1.08	1.15
19	1.78	1.6	3.48	1.92	1.2	1.1	.98	1.05	1.28	1.05	1.02	1.12
20	1.82	1.5	3.32	1.85	1.2	1.1	.92	.98	1.35	1.52	1.12	1.12
21	1.8	1.52	3.92	1.85	1.12	1.08	.98	.95	1.28	1.42	1.1	1.82
22	1.8	1.55	3.68	1.75	1.18	1.12	.9	.98	1.15	1.3	1.05	1.7
23	1.78	1.52	3.22	1.68	1.18	1.12	.92	.92	1.15	1.28	1.18	1.58
24	1.7	1.52	2.92	1.7	1.12	1.08	1.05	.95	1.12	1.22	1.12	1.5
25	1.32	1.5	3.32	1.58	1.1	1.08	1.0	1.38	1.08	1.3	1.08	1.4
26	4.3	1.48	3.65	1.48	1.12	1.12	.95	1.22	1.1	1.18	1.05	1.35
27	4.4	1.48	3.65	1.48	1.15	1.08	.95	1.12	1.02	1.1	1.1	1.32
28	3.12	1.45	3.6	1.48	1.1	1.0	.95	1.05	1.13	1.08	1.12	1.28
29	2.48		2.92	1.4	1.12	1.08	.95	1.02	1.02	1.05	1.9	1.52
30	2.18		2.6	1.35	1.1	1.05	.98	1.02	.98	1.08	1.75	1.52
31	2.02		2.45		1.1		1.05	1.0		1.12		1.45

NOTE.—There was no ice at this station except around the middle pier and a narrow strip near one bank during February.

Station rating table for Musconetcong River near Bloomsbury, N. J., from July 4, 1903, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.90	56	1.50	190	2.10	388	2.70	618
1.00	69	1.60	220	2.20	424	2.80	658
1.10	86	1.70	251	2.30	461	2.90	698
1.20	107	1.80	283	2.40	499	3.00	739
1.30	132	1.90	317	2.50	538		
1.40	160	2.00	352	2.60	578		

The above table is applicable only for open-channel conditions. It it based on eight discharge measurements made during 1903-1905 between gage heights 1 foot and 2.9 feet. It is well defined between these heights. Above gage height 3 feet the rating curve is a rough approximation.

Estimated monthly discharge of Musconetcong River near Bloomsbury, N. J., for 1903-1905.

[Drainage area, 146 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
July 4-31	558	184	280	1.92	2.00
August	706	190	292	2.00	2.31
September	317	146	192	1.31	1.46
October	2,780	132	599	4.10	4.73
November	359	166	220	1.51	1.68
December	903	190	330	2.26	2.61
1904.					
January	1,408	154	335	2.29	2.64
February	1,877	146	329	2.25	2.43
March 1-7	1,498	267	503	3.44	.895
April 12-30	345	127	197	1.35	.954
May	205	92	142	.973	1.12
June	154	60	105	.719	.802
July	199	66	93.8	.642	.740
August	317	66	97.9	.671	.774
September	1,183	56	176	1.21	1.35
October	558	83	156	1.07	1.23
November	205	96	140	.959	1.07
December	283	96	135	.925	1.07
1905.					
January	1,542	107	454	3.11	3.58
February	334	175	227	1.55	1.61
March	1,126	112	507	3.47	4.00
April	507	146	336	2.30	2.57
May	190	86	113	.774	.892
June	107	69	88.1	.603	.673
July	96	57	71.2	.488	.563
August	154	53	77.4	.530	.611
September	370	66	124	.849	.947
October	196	59	96.2	.659	.760
November	317	59	96.6	.662	.739
December	310	86	177	1.21	1.40
The year	1,542	53	197	1.35	18.34

NOTE.—No correction made in estimates for the ice period. No gage-height record March 8 to April 11, 1904.

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. Rudolph Hering, in the report of the Philadelphia water department for 1885, page 350, gives a classification of the drainage area of Tohickon Creek, from which it appears that 76 square miles are 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 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, p. 81. Daily records of gage height were not kept during 1900. The following discharge record for 1905 was furnished by John E. Codman, hydrographer of the water department of Philadelphia.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; W S=Water-Supply Paper):

Description: WS 35, p 64; 47, p 81; 65, p 215; 82, p 138; 97, pp 251-252; 125, p 104.
Discharge: WS 65, p 215.
Discharge, daily: WS 35, p 64; 47, pp 81-89; 65, p 215; 82, p 139; 97, p 252; 125, p 104.
Discharge, monthly: Ann 20, iv, pp 98-102; 21, iv, p 83; 22, iv, pp 113-116; WS 75, p 28; 82, p 139; 125, p 105.
Discharge, yearly: Ann 20, iv, p 48.
Hydrographs: Ann 20, iv, p 103; 21, iv, pp 84, 85.

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pa., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	79	58	53	73	26	8	5	6	27	16	34	313
2	120	58	43	61	26	7	9	4	18	21	34	223
3	154	58	36	54	23	4	7	5	224	26	23	869
4	154	72	39	51	23	7	9	5	911	32	21	820
5	186	79	35	317	23	5	8	6	606	35	25	224
6	278	64	32	764	23	12	5	5	152	29	26	112
7	4,174	58	33	307	20	9	3	4	68	23	24	84
8	952	58	126	122	17	8	5	17	44	15	23	73
9	255	58	605	84	15	12	3	31	39	16	23	67
10	193	58	1,568	83	14	11	2	34	28	21	24	92
11	119	58	934	129	14	5	2	28	46	12	16	104
12	398	58	841	169	14	3	6	19	1,129	158	14	76
13	485	58	721	138	11	7	3	11	423	128	21	59
14	220	58	675	91	15	11	4	14	120	51	15	50
15	145	58	636	75	15	10	5	1,237	60	31	19	48
16	111	58	767	68	20	9	5	3,353	45	29	15	43
17	89	58	996	57	11	9	3	376	26	24	16	39
18	87	58	1,776	50	10	6	2	109	93	21	17	39
19	87	58	2,657	46	25	4	3	52	229	20	14	32
20	75	72	1,611	40	26	5	3	34	181	817	9	24
21	64	79	2,302	42	18	5	2	28	392	573	16	1,061
22	61	64	1,271	48	17	5	2	24	166	162	14	652
23	58	58	662	44	18	14	11	18	72	82	12	318
24	58	58	482	35	10	21	3	15	46	56	11	226
25	58	58	1,189	32	10	12	2	623	39	51	14	98
26	58	58	611	36	8	12	3	742	34	53	13	82
27	58	58	434	43	8	13	5	176	28	58	8	69
28	58	58	511	40	7	7	4	72	21	48	16	64
29	72	......	132	35	5	7	5	41	21	39	2,167	310
30	87	......	104	30	6	5	36	30	20	36	1,206	374
31	72	......	87	......	10	......	14	26	......	32	......	137

Estimated monthly discharge of Tohickon Creek at Point Pleasant, Pa., for 1905.

[Drainage area, 102 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	4,174	58	293	2.87	3.31
February	79	58	61.1	.599	.624
March	2,657	32	709	6.95	8.01
April	764	30	106	1.04	1.16
May	26	5	16.3	.160	.184
June	21	3	8.8	.086	.096
July	36	2	6.3	.062	.071
August	3,353	4	231	2.26	2.61
September	1,129	18	177	1.74	1.94
October	817	12	88	.863	.995
November	2,167	8	130	1.27	1.42
December	1,061	24	219	2.15	2.48
The year	4,174	2	170	1.67	22.92

NESHAMINY CREEK AT FORKS, PENNSYLVANIA.

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 square miles, of which 128 are cultivated and improved and 11 miles untillable and wooded. The daily discharges from 1884 to 1900 are given in Water-Supply Paper No. 47, pages 90 to 98. The table of daily discharge for 1905 was furnished by John E. Codman.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; W S=Water-Supply Paper):

Description: Ann 21, iv, p 85; WS 35, pp 64–65; 47, p 90; 65, p 216; 75, p 29; 82, p 140; 97, p 249; 125, p 105.
Discharge, daily: WS 35, p 65; 47, pp 90–98; 65, p 216; 82, p 140; 97, p 249; 125, p 106.
Discharge, monthly: Ann 20, iv, pp 104–107; 21, iv, p 86; 22, iv, pp 116–119; WS 82, p 141; 125, p 106.
Discharge, yearly: Ann 20, iv, p 48.
Hydrographs: Ann 20, iv, p 108; 21, iv, p 86; 22, iv, p 120.

Daily discharge, in second-feet, of Neshaminy Creek at forks, Pennsylvania, for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	368	72	415	345	82	27	11	7	33	15	33	140
2	31	72	425	318	75	29	20	6	29	16	30	105
3	31	72	394	138	72	28	30	6	358	22	30	661
4	31	72	375	177	60	23	26	6	200	28	30	403
5	122	80	352	586	50	24	16	7	188	24	28	164
6	276	142	339	1,084	52	24	12	10	77	20	20	115
7	4,064	210	353	344	50	23	12	17	46	18	28	100
8	504	229	566	224	49	27	10	19	37	14	28	95
9	233	233	1,813	200	44	26	10	26	33	15	27	98
10	153	230	3,036	188	41	23	10	15	55	15	23	103
11	165	265	1,706	245	42	21	10	15	31	42	22	104
12	538	248	1,045	369	42	22	10	14	383	72	21	97
13	510	324	494	266	42	26	12	311	147	60	21	85
14	216	376	768	195	40	25	14	121	67	33	23	62
15	200	357	819	175	43	23	12	317	44	20	22	58
16	176	340	833	160	59	18	10	658	34	15	21	68
17	154	340	1,091	146	64	15	9	115	30	15	21	64
18	124	307	1,176	130	52	14	11	49	35	15	22	64
19	105	272	1,432	117	42	13	10	33	68	23	19	52
20	96	268	1,194	110	37	14	7	24	56	724	19	46
21	88	253	2,533	122	32	15	6	19	60	116	21	1,761
22	88	256	1,075	131	31	19	6	20	54	96	19	478
25	80	271	601	108	32	28	8	15	34	66	18	294
24	72	271	520	92	26	31	11	13	28	55	16	245
25	72	271	1,435	88	26	24	11	43	24	52	17	176
26	72	342	509	86	26	19	9	263	22	62	20	134
27	72	414	342	138	21	19	8	75	20	55	19	105
28	72	404	286	145	21	15	7	36	19	41	20	105
29	72	......	249	97	22	12	6	26	20	41	1,165	476
30	72	......	230	90	22	10	6	26	17	37	544	350
31	72	......	213	......	24	......	7	31	......	34	......	166

Estimated monthly discharge of Neshaminy Creek at forks, Pennsylvania, for 1905.

[Drainage area, 139 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	4,064	31	288	2.07	2.39
February	414	72	250	1.80	1.87
March	3,036	213	859	6.18	7.12
April	1,084	86	221	1.59	1.77
May	82	21	42.9	.309	.356
June	31	10	21.6	.155	.173
July	30	6	11.5	.083	.096
August	658	6	75.9	.546	.630
September	383	17	75.5	.543	.606
October	724	14	60.3	.434	.500
November	1,165	16	78.8	.567	.633
December	1,761	46	225	1.62	1.87
The year	4,064	6	184	1.32	18.01

SCHUYLKILL RIVER NEAR PHILADELPHIA, PA.

This river receives the drainage of the portion of southeastern Pennsylvania lying between Lehigh River on the north and Susquehanna River on the south. It flows in a general southeasterly course into Delaware River, the city of Philadelphia being located at the junction of the 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 John E. Codman, in charge of hydrographic work, bureau of water, city of Philadelphia, the results being given in the Twentieth Annual Report of the United States Geological Survey, Part IV, page 97.

The figures for daily discharge in the following table represent the total flow of the stream, computed from the amount wasted over the flashboards at the Fairmount dam, the pumpage from the river, the leakage, and also the quantity used for power at Fairmount. They were furnished by John E. Codman.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: Ann 20, iv, pp 96–97; WS 35, pp 74–75; 48, p 109; 65, p 219; 82, p 142; 97, p 247; 125, p 107.
Discharge, daily: WS 35, p 75; 48, p 109; 65, p 219; 82, p 142; 97, p 247; 125, p 107.
Discharge, monthly: Ann 20, iv, p 97; WS 35, p 75; 48, p 110; 65, p 219; 82, p 142; 125, p 108.
Discharge, yearly: Ann 20, iv, p 48.
Hydrograph: Ann 20, iv, p 97.

Daily discharge, in second-feet, of Schuylkill River near Philadelphia, Pa., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,537	1,540	2,328	5,115	1,466	813	595	1,332	1,542	1,327	755	4,443
2	2,980	1,540	1,880	4,660	1,454	813	595	1,332	1,542	1,327	755	2,906
3	3,236	1,540	1,720	4,447	1,340	813	595	1,332	1,825	1,327	755	4,371
4	2,983	1,540	1,896	4,342	1,340	813	595	1,332	3,724	1,327	755	10,390
5	1,958	1,540	1,850	5,787	1,492	813	595	1,332	8,125	1,327	755	7,165
6	2,957	1,540	2,090	7,427	1,340	813	595	1,332	4,620	1,327	755	4,314
7	30,190	1,540	2,199	6,537	1,340	813	595	1,452	2,455	1,327	755	3,051
8	20,450	1,540	2,541	5,067	1,340	813	595	1,424	1,828	1,327	755	2,570
9	9,071	1,540	6,965	4,617	1,340	813	595	1,332	1,554	1,327	755	2,296
10	6,500	1,540	13,260	4,242	1,340	813	595	1,332	1,542	1,327	755	2,168
11	5,279	1,540	13,780	4,355	1,340	813	595	1,332	1,542	1,327	755	1,975
12	5,680	1,540	10,270	4,890	1,340	813	595	1,444	2,068	2,796	755	1,949
13	6,430	1,540	8,210	4,410	1,340	813	595	1,975	3,498	3,472	755	1,949
14	5,583	1,632	8,140	3,628	1,340	813	595	1,332	2,187	1,500	755	1,781
15	3,766	1,572	7,652	3,530	1,340	813	595	1,965	1,854	1,327	755	1,689
16	3,910	1,540	8,290	3,355	1,340	813	595	6,006	1,709	1,327	755	1,689
17	2,439	1,540	9,973	3,084	1,340	813	595	2,882	1,627	1,327	755	1,689
18	2,872	1,540	12,780	2,755	1,340	813	595	1,348	1,693	1,327	755	1,689
19	2,696	1,540	15,560	2,447	1,340	813	595	1,332	1,992	1,327	755	1,689
20	2,536	1,540	17,380	2,313	1,340	813	595	1,332	1,656	2,103	755	1,689
21	2,376	1,540	23,160	2,458	1,340	813	595	1,332	1,667	5,992	755	4,995
22	2,464	1,540	21,040	2,668	1,340	813	595	1,332	1,542	3,450	755	5,993
23	1,958	1,540	14,860	2,595	1,340	813	595	1,332	1,542	2,368	755	3,601
24	1,720	1,540	10,500	2,322	1,340	813	595	1,332	1,542	1,825	755	2,875
25	1,545	1,540	13,810	1,970	1,340	813	595	2,937	1,542	1,457	755	2,570
26	1,350	1,785	14,800	1,913	1,340	813	595	6,572	1,542	1,503	755	2,240
27	1,350	2,276	11,940	2,008	1,340	813	595	2,688	1,542	1,420	755	1,918
28	1,368	2,276	9,625	2,166	1,340	813	595	1,508	1,542	1,327	755	1,959
29	1,993	....	8,025	2,011	1,340	813	595	1,332	1,542	1,327	5,825	2,248
30	2,324	....	6,775	1,902	1,340	813	595	1,332	1,542	1,327	7,730	2,642
31	1,372	....	5,885	....	1,340	....	595	1,332	....	1,327	....	2,432

Estimated monthly discharge of Schuylkill River near Philadelphia, Pa., for 1905.

[Drainage area, 1,915 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	30,190	1,350	4,641	2.42	2.79
February	2,276	1,540	1,606	.839	.874
March	23,160	1,720	9,329	4.87	5.62
April	7,427	1,902	3,634	1.90	2.12
May	1,492	1,340	1,353	.707	.815
June	813	813	813	.425	.474
July	595	595	595	.311	.358
August	6,572	1,332	1,855	.969	1.12
September	8,125	1,542	2,138	1.12	1.25
October	5,992	1,327	1,788	.934	1.08
November	7,730	755	1,156	.604	.674
December	10,390	1,689	3,063	1.60	1.84
The year	30,190	595	2,664	1.39	19.02

PERKIOMEN CREEK AT FREDERICK, PA.

Perkiomen Creek drains an area lying northwest of the city of Philadelphia. It flows southward, uniting with Schuylkill River about 7 miles above Norristown and about 18 miles above Philadelphia.

The point of measurement of discharge is located at Frederick, about 12 miles above the mouth, and 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 at 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, page 65, contains tables of the daily discharge for the entire period from 1884 to 1899, inclusive. The records of daily discharge for 1905, as furnished by John E. Codman, are given in the table below.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: Ann 20, iv, pp 89-90; WS 35, p 65; 47, p 98; 65, p 217; 82, pp 135-136; 97, p 248; 125, p 108.
Discharge, daily: WS 35, pp 66-73; 47, p 99; 65, p 217; 82, p 136; 125, p 109.
Discharge, monthly: Ann 20, iv, pp 90-93; 21, iv, p 78; 22, iv, pp 121-123; WS 75, p 29; 82, p 137; 125, p 110.
Discharge, yearly: Ann 20, iv, p 48.
Hydrographs: Ann 20, iv, p 94; 21, iv, pp 79, 80.

Daily discharge, in second-feet, of Perkiomen Creek at Frederick, Pa., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	251	128	150	212	103	49	27	31	125	45	84	323
2	488	128	128	176	110	47	32	30	83	43	79	207
3	376	128	128	163	105	47	45	34	655	217	65	703
4	326	128	128	165	95	41	46	39	1,026	146	54	1,654
5	267	128	123	410	93	38	49	29	477	92	54	701
6	322	168	123	814	95	44	58	84	220	79	65	322
7	5,708	208	128	321	93	54	49	217	145	68	80	224
8	837	198	162	243	87	59	40	123	110	58	72	196
9	380	198	539	198	81	56	40	109	88	54	65	155
10	328	219	1,392	188	84	47	39	87	79	53	65	146
11	261	219	1,812	310	75	39	36	68	164	195	55	168
12	596	231	1,829	279	65	41	37	53	1,937	582	48	150
13	602	307	1,060	233	65	54	49	44	401	115	50	119
14	301	332	734	137	62	55	58	39	216	112	50	114
15	234	280	697	78	63	47	52	438	162	83	43	96
16	205	242	884	113	74	44	45	3,241	130	75	48	121
17	162	224	1,220	145	80	81	38	273	112	73	54	75
18	128	219	2,018	136	87	35	31	142	443	75	46	71
19	128	203	2,486	128	92	34	30	88	392	92	43	76
20	153	198	1,473	128	81	33	29	60	423	1,063	48	66
21	173	204	3,019	130	63	32	29	53	507	570	54	1,136
22	152	200	1,267	135	52	39	26	48	206	335	57	514
23	137	189	810	122	52	60	19	44	155	273	54	372
24	117	173	547	117	50	61	25	63	129	119	57	305
25	167	170	1,501	120	45	53	31	1,393	111	111	53	185
26	140	190	683	106	78	50	30	697	101	127	43	146
27	135	279	610	106	43	45	32	235	105	175	44	140
28	162	201	645	111	31	36	30	142	107	94	60	132
29	137	......	336	111	26	34	27	105	85	80	3,156	599
30	128	......	292	103	34	32	29	104	58	81	893	350
31	128	......	254	......	48	......	28	169	......	84	......	182

Estimated monthly discharge of Perkiomen Creek at Frederick, Pa., for 1905.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	5,708	117	440	2.89	3.33
February	332	128	203	1.34	1.40
March	3,019	123	877	5.77	6.65
April	814	78	191	1.26	1.41
May	110	26	71.6	.471	.543
June	81	32	46.6	.307	.343
July	58	19	37.1	.244	.281
August	3,241	29	268	1.76	2.03
September	1,937	58	299	1.97	2.20
October	1,063	43	174	1.14	1.31
November	3,156	43	188	1.24	1.38
December	1,654	66	315	2.07	2.39
The year	5,708	19	259	1.71	26.35

WISSAHICKON CREEK NEAR PHILADELPHIA, PA.

Wissahickon Creek is the principal stream draining into Schuylkill River from the north below Perkiomen Creek. The records of daily discharge for 1905, as furnished by John E. Codman, are given in the following table:

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pa., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec
1	123	20	157	166	106	18	10	10	18	3	16	238
2	143	20	135	162	106	34	37	10	30	3	15	37
3	135	20	131	166	98	30	41	12	165	4	11	253
4	114	20	131	277	98	20	14	17	376	4	10	261
5	109	20	127	323	89	19	13	404	342	4	12	133
6	148	20	123	392	114	25	11	716	125	4	19	80
7	1,746	20	123	240	111	40	7	492	21	3	16	44
8	247	18	208	204	101	29	8	143	20	3	18	77
9	166	61	654	188	96	21	8	7	18	4	17	124
10	159	63	1,011	188	63	19	7	11	18	4	10	165
11	148	20	504	193	63	16	8	37	86	98	12	137
12	266	20	365	208	64	33	10	200	246	156	9	62
13	277	20	265	208	63	26	23	366	110	35	10	41
14	145	20	285	177	63	19	16	241	24	6	16	35
15	131	20	263	157	96	16	10	355	19	5	11	25
16	126	30	308	150	97	13	8	372	20	8	10	20
17	112	20	350	141	126	13	4	186	20	8	14	18
18	109	20	381	140	112	11	2	76	21	3	12	19
19	109	20	434	137	86	14	2	28	16	10	6	20
20	109	42	479	128	52	16	7	28	10	479	9	21
21	106	47	859	128	29	10	7	28	12	258	11	764
22	106	47	459	137	41	12	3	28	11	103	14	347
23	106	63	295	131	41	16	7	28	6	37	13	237
24	106	63	270	119	22	14	9	28	4	26	12	216
25	75	85	468	116	19	9	8	202	4	32	23	195
26	38	175	278	111	16	11	8	219	3	41	13	178
27	31	206	242	120	16	14	8	47	3	30	12	164
28	28	171	216	134	28	11	8	15	3	18	21	159
29	28	......	183	128	25	10	10	17	3	13	367	335
30	31	......	175	114	31	9	10	13	3	16	397	260
31	25	......	175	......	21	......	9	14	......	16	......	204

Estimated monthly discharge of Wissahickon Creek near Philadelphia, Pa., for 1905.

[Drainage area, 64.6 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	1,746	25	171	2.65	3.060
February	206	18	49.0	.759	.790
March	1,011	123	325	5.03	5.80
April	392	111	173	2.68	2.99
May	126	16	68.0	1.05	1.21
June	40	9	18.7	.290	.324
July	41	2	11.2	.173	.199
August	716	7	141	2.18	2.51
September	376	3	58.9	.912	1.02
October	479	3	46.8	.725	.836
November	397	6	38.3	.593	.662
December	764	18	157	2.43	2.80
The year	1,746	3	94.2	1.46	19.94

INDEX.

CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 166.]

The publications of the United States Geological Survey consist of (1) Annual Reports; (2) Monographs; (3) Professional Papers; (4) Bulletins; (5) Mineral Resources; (6) Water-Supply and Irrigation Papers; (7) Topographic Atlas of United States, folios and separate sheets thereof; (8) Geologic Atlas of United States, folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

Most of the above publications may be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they may be obtained, free of charge (except classes 2, 7, and 8), on application.
2. A certain number are delivered to Senators and Representatives in Congress, for distribution.
3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they may be had at practically cost.
4. Copies of all Government publications are furnished to the principal public libraries in the large cities throughout the United States, where they may be consulted by those interested.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports.

Series P.—The hydrographic progress reports contain the results of stream measurements. A report is issued for every calendar year, containing the results of data collected during that year. These reports were first published as a part of the Director's annual report or as a bulletin; they are now published as water-supply and irrigation papers. The following is a list, by years, of the publications containing the progress reports of stream measurements. A detailed index of these reports (1888–1903) is published as Water-Supply Paper No. 119.

1888. Tenth Annual Report, Part II.
1889. Eleventh Annual Report, Part II.
1890. Twelfth Annual Report, Part II.
1891. Thirteenth Annual Report, Part III.
1892. Fourteenth Annual Report, Part II.
1893. Bulletin No. 131.
1894. Bulletin No. 131; Sixteenth Annual Report, Part II.
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, 36, 37, 38, and 39; Twenty-first Annual Report, Part IV.
1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.
1901. East of Mississippi River, Water-Supply Papers Nos. 65 and 75.
West of Mississippi River, Water-Supply Papers Nos. 66 and 75.
1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.

1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.
1905. East of Mississippi River, Water-Supply Papers Nos. 165, 166, 167, 168, 169, 170, and 171.
West of Mississippi River, Water-Supply Papers Nos. 171, 172, 173, 174, 175, 176, 177, and 178.

The Geological Survey and the Reclamation Service have suboffices in different parts of the United States, from which hydrographic and reclamation work in the respective localities is carried on and where data may be obtained on application. These offices are located as follows:

Boston, Mass., 6 Beacon street; Utica, N. Y., 75 Arcade; Atlanta, Ga., 409 Temple court; Austin, Tex., University of Texas; Chicago, Ill., 876 Federal Building; Belle Fonrche, S. Dak.; Cody, Wyo.; Denver, Colo., Chamber of Commerce Building; Salt Lake, Utah; Los Angeles, Cal., 1108 Union Trust Building; Phoenix, Ariz.; Carlsbad, N. Mex.; El Paso, Tex.; Billings, Mont.; Huntley, Mont.; Hazen, Nev.; Boise, Idaho; North Yakima, Wash.; Portland, Oreg., 351 Washington street.

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WASHINGTON, D. C.

MAY, 1906.

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