DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY

OF

NEW ENGLAND, 1906

(ATLANTIC COAST OF NEW ENGLAND DRAINAGE)

H. K. BARROWS

DISTRICT HYDROGRAPHER

WASHINGTON

GOVERNMENT PRINTING OFFICE

1907

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY

OF

NEW ENGLAND, 1906

(ATLANTIC COAST OF NEW ENGLAND
DRAINAGE)

H. K. BARROWS
DISTRICT HYDROGRAPHER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

CONTENTS.

ILLUSTRATIONS.

5

SURFACE WATER SUPPLY OF NEW ENGLAND, 1906.[a]

H. K. BARROWS,

District hydrographer.[b]

INTRODUCTION.

SCOPE OF WORK.

The water supply of the United States is of more importance to the life and pursuits of the people than any other natural resource. In the arid States the limit of agricultural development is determined by the amount of water available for irrigation, while in all parts of the country the increase in the population of cities and towns makes necessary additional water supplies for domestic and industrial uses, in procuring which both the quantity and the quality of the water that may be obtained must be considered. The location of manufacturing plants may depend largely on the water-power facilities and on the character of the water. The notable advances made in the electric transmission of power have led to the utilization of water powers for the operation of manufacturing establishments, railroads, and municipal lighting plants, many of which are at some distance from the places at which the power is developed.

The intelligent establishment and maintenance of enterprises or industries that depend on the use of water demands a thorough knowledge of the flow of the streams and an understanding of the conditions affecting that flow. This knowledge should be based on data showing both the total flow and the distribution of the flow throughout the year, in order that normal fluctuations may be provided for As the flow of a stream is variable from year to year, estimates of future flow can be made only from a study of observations covering several years. The rapid increase in the development of the water

---

resources of the United States has caused a great demand by engineers for information in regard to the flow of streams, as it is now generally realized that the failure of many large power, irrigation, and other projects has been due to the fact that the plans were made without sufficient trustworthy information in respect to the water supply.

Owing to the broad scope of these hydrographic investigations and the length of time they should cover in order that the records may be of greatest value, it is in general impossible for private individuals to collect the necessary data, and as many of the streams traverse more than one State this work does not properly fall within the province of the State authorities. The United States Geological Survey has, therefore, by means of specific appropriations by Congress, for several years systematically made records of stream flow, with the view of ultimately determining all the important features governing the flow of the principal streams of the country. In carrying out this plan stations are established on the streams and maintained for a period long enough to show their regimen or general behavior. When a record that is sufficient for this purpose has been obtained for any stream, the work on that stream is discontinued. The order in which the streams are measured is determined by the degree of their importance.

During 1906 the regimen of flow was studied at about 700 stations distributed along the various rivers throughout the United States, as shown on Pl. I. In addition to these records data in regard to precipitation, evaporation, water power, and river profiles were obtained in many sections of the country.

These data have been assembled by drainage areas and are published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 201 to 214, inclusive, each of which pertains to the surface water resources of a group of adjacent areas. In these papers are embodied not only the data collected in the field, but also the results of computations based on these data and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc. The list follows.

Water-Supply and Irrigation Papers on surface water supply, 1906.

201. Surface water supply of New England, 1906. (Atlantic coast of New England drainage.)
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river drainages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.)
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages.)
205. Surface water supply of the Ohio and lower eastern Mississippi river drainages, 1906.

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY

OF

NEW ENGLAND, 1906

(ATLANTIC COAST OF NEW ENGLAND
DRAINAGE)

H. K. BARROWS

DISTRICT HYDROGRAPHER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

CONTENTS.

ILLUSTRATIONS.

SURFACE WATER SUPPLY OF NEW ENGLAND, 1906.[a]

H. K. BARROWS,
District hydrographer.[b]

INTRODUCTION.

SCOPE OF WORK.

The water supply of the United States is of more importance to the life and pursuits of the people than any other natural resource. In the arid States the limit of agricultural development is determined by the amount of water available for irrigation, while in all parts of the country the increase in the population of cities and towns makes necessary additional water supplies for domestic and industrial uses, in procuring which both the quantity and the quality of the water that may be obtained must be considered. The location of manufacturing plants may depend largely on the water-power facilities and on the character of the water. The notable advances made in the electric transmission of power have led to the utilization of water powers for the operation of manufacturing establishments, railroads, and municipal lighting plants, many of which are at some distance from the places at which the power is developed.

The intelligent establishment and maintenance of enterprises or industries that depend on the use of water demands a thorough knowledge of the flow of the streams and an understanding of the conditions affecting that flow. This knowledge should be based on data showing both the total flow and the distribution of the flow throughout the year, in order that normal fluctuations may be provided for As the flow of a stream is variable from year to year, estimates of future flow can be made only from a study of observations covering several years. The rapid increase in the development of the water

---

resources of the United States has caused a great demand by engineers for information in regard to the flow of streams, as it is now generally realized that the failure of many large power, irrigation, and other projects has been due to the fact that the plans were made without sufficient trustworthy information in respect to the water supply.

Owing to the broad scope of these hydrographic investigations and the length of time they should cover in order that the records may be of greatest value, it is in general impossible for private individuals to collect the necessary data, and as many of the streams traverse more than one State this work does not properly fall within the province of the State authorities. The United States Geological Survey has, therefore, by means of specific appropriations by Congress, for several years systematically made records of stream flow, with the view of ultimately determining all the important features governing the flow of the principal streams of the country. In carrying out this plan stations are established on the streams and maintained for a period long enough to show their regimen or general behavior. When a record that is sufficient for this purpose has been obtained for any stream, the work on that stream is discontinued. The order in which the streams are measured is determined by the degree of their importance.

During 1906 the regimen of flow was studied at about 700 stations distributed along the various rivers throughout the United States, as shown on Pl. I. In addition to these records data in regard to precipitation, evaporation, water power, and river profiles were obtained in many sections of the country.

These data have been assembled by drainage areas and are published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 201 to 214, inclusive, each of which pertains to the surface water resources of a group of adjacent areas. In these papers are embodied not only the data collected in the field, but also the results of computations based on these data and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc. The list follows.

Water-Supply and Irrigation Papers on surface water supply, 1906.

201. Surface water supply of New England, 1906. (Atlantic coast of New England drainage.)
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river drainages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.)
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages.)
205. Surface water supply of the Ohio and lower eastern Mississippi river drainages, 1906.
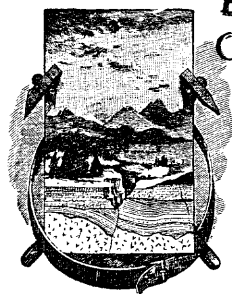
MAP OF UNITED STATES SHOWING LOCATION OF PRINCIPAL RIVER STATIONS MAINTAINED DURING 1906.

C. J. Peters & Son Co., Engrs., Boston.

Scale

100   0   100   200   300   400   500 miles

206. Surface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
207. Surface water supply of the upper Mississippi River and Hudson Bay drainages, 1906.
208. Surface water supply of the Missouri River drainage, 1906.
209. Surface water supply of the lower western Mississippi River drainage, 1906.
210. Surface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
211. Surface water supply of the Colorado River drainage above Yuma, 1906.
212. Surface water supply of the Great Basin drainage, 1906.
213. Surface water supply of California, 1906. (The Great Basin and Pacific Ocean drainages in California and Colorado River drainage below Yuma.)
214. Surface water supply of the North Pacific Coast drainage, 1906.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing such records up to and including 1903 has been published in Water-Supply Paper No. 119. The following table gives, by years and primary drainage basins, the numbers of the papers on surface water supply published from 1901 to 1906:

Numbers of Water-Supply Papers containing results of stream measurements, 1901–1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
Atlantic coast of New England drainage	65 / 75	82	97	124	165	201
Hudson, Passaic, Raritan, and Delaware river drainages	65 / 75	82	97	125	166	202
Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages	65 / 75	82 / 83	97 / 98	126	167	203
Santee, Savannah, Ogeechee, and Altamaha rivers and eastern Gulf of Mexico drainages	65 / 75	83	98	127	168	204
Ohio and lower eastern Mississippi river drainages	65 / 75	83	98	128	169	205
Great Lakes and St. Lawrence River drainages	65	83	97	129	170	206
Hudson Bay and upper eastern and western Mississippi River drainages	65 / 66 / 75	83 / 84 / 85	98 / 99 / 100	128 / 130	171	207
Missouri River drainage	66 / 75	84	99	130 / 131	172	208
Meramec, Arkansas, Red, and lower western Mississippi river drainages	66 / 75	84	99	131	173	209
Western Gulf of Mexico and Rio Grande drainages	66 / 75	84	99	132	174	210
Colorado River drainage, above Yuma	66 / 75	85	100	133	175	211
The Great Basin drainage	66 / 75	85	100	133	176	212
The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage, below Yuma	66 / 75	85	100	134	177	213
North Pacific Coast drainage	66 / 75	85	100	135	178	214

[a] Reports containing data for years prior to 1901 are noted in the series list at the end of this paper.

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 inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water,

as run-off in depth in inches and acre-feet.   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.

"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 AND USE 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 monthly and yearly discharges and run-off.
6. Tables showing discharge and horsepower and the number of days during the year when the same are available.

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, name of the

hydrographer, width and area of cross section, gage height, and 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 discharge measurements and gage heights are the base data from which the other tables are computed. In cases of extensive development it is expected that engineers will use these original data in making their calculations, as the computations made by the Survey are based on the data available at the time they are made and should be reviewed and, if necessary, revised when additional data are available.

The rating table gives the discharge in second-feet corresponding to various stages of the river as given by the gage heights. It is published to enable engineers to determine the daily discharge in case this information is desired.

In the table of 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 remaining columns, which are defined on page 10, are based.

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

In most work where data in regard to flow are used the regimen of flow is of primary importance. Therefore for the principal stations tables have been prepared showing the horsepower that can be developed at various rates of flow, and the length of time that these rates of flow and the corresponding horsepower are available. These tables have been prepared on a basis of 80 per cent efficiency on the turbines, and the horsepower per foot of fall is given in order that the reader can determine the horsepower for any fall.

In the computations sufficient significant figures have been used so that the percentage of error in the tables will not in general exceed 1 per cent. Therefore, most of the values in the tables are given to only three significant figures. In making the various computations Thatcher's slide rule, Crelle's tables, and computation machines have been generally used.

In order to give engineers an idea of the relative value of the various data notes in regard to accuracy are given as far as possible. This accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data.

In the accuracy notes the following terms have been used, indicating the probable accuracy, in per cent, of the mean monthly flow. As these values are mean values, the error in the value for the flow of any individual day may be much larger.

Excellent indicates that the mean monthly flow is probably accurate to within 5 per cent; good, to within 10 per cent; fair, to within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydraulic computations:

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

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

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

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 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 or 13.572 inches deep.

1 second-foot for one year equals 31,536,000 cubic feet.

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

1 second-foot for one day covers 1 square mile 0.03719 inch deep.

1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.

1 second foot for one 29-day month covers 1 square mile 1.079 inches deep.

1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.

1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.

1 second-foot for one day equals 1.983 acre-feet.

1 second-foot for one 28-day month equals 55.54 acre-feet.

1 second-foot for one 29-day month equals 57.52 acre-feet.

1 second-foot for one 30-day month equals 59.50 acre-feet.

1 second-foot for one 31-day month equals 61.49 acre-feet.

100 California miner's inches equal 18.7 United States gallons per second.

100 California miner's inches equal 96.0 Colorado miner's inches.

100 California miner's inches for one day equal 4.96 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 104 California miner's inches.

100 Colorado miner's inches for one day equal 5.17 acre-feet.

100 United States gallons per minute equal 0.223 second-feet.

100 United States gallons per minute for one day equal 0.442 acre-foot.

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 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equal about 1 kilowatt.

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

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 those who use this report may readily become acquainted with the general methods employed, the following brief descriptions are 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; and (3) those with constantly shifting beds. In determining the daily flow special methods are necessary for each class. The data on which the determinations 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 on 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 measurements 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 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 $Q = c\ b\ h^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Papers Nos. 180 and 200[a]); (*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, the 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 determinations of flow, 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 determinations 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 good, the cooperation of the owners or operators of the plant is still essential if reliable results are to be obtained.

---

a Water-Supply Paper No. 200 replaces No. 150, the edition of which has been exhausted.

A gaging station at a weir or dam has the general advantage of continuity of record through the period 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 on the contour of the bed and the fluctuations of the water 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 of dams or other artificial obstructions that the gage height shall be an index of the discharge.

Certain permanent or semipermanent structures, usually referred to as "equipment," are generally pertinent to a gaging station. 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 débris. 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, shown in Pl. II, *B*, which has been largely developed and 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, 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 on the size and condition 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
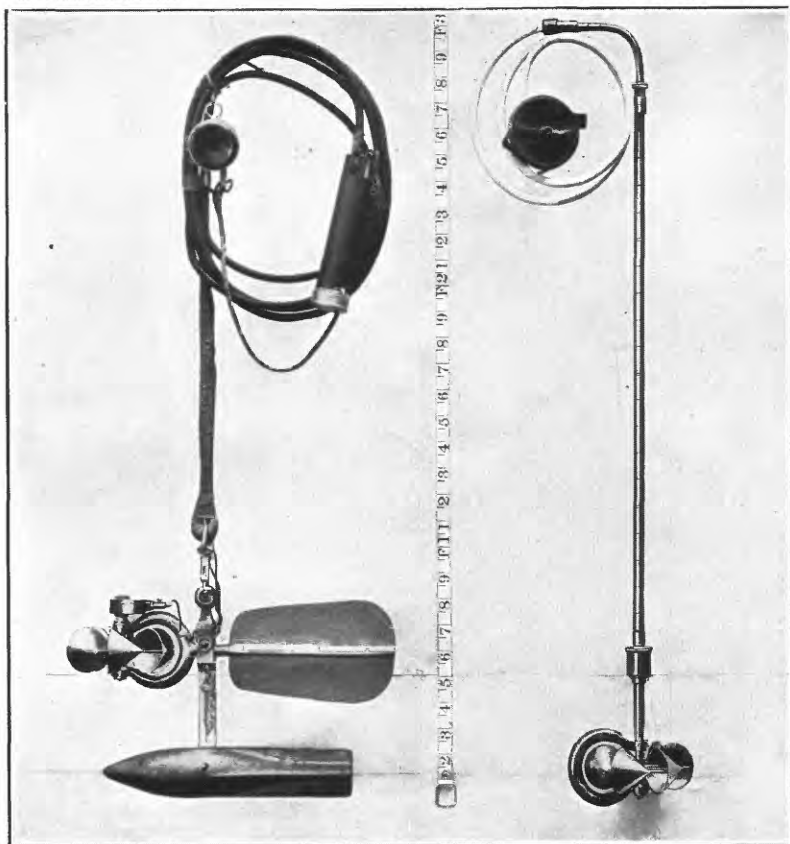
A. PRICE CURRENT METERS.

B. CURRENT-METER RATING STATION AT LOS ANGELES, CAL.

in one part of the stream may not be extended to parts where they do not apply.

Three classes of methods of measuring velocity with current meters are in general use—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
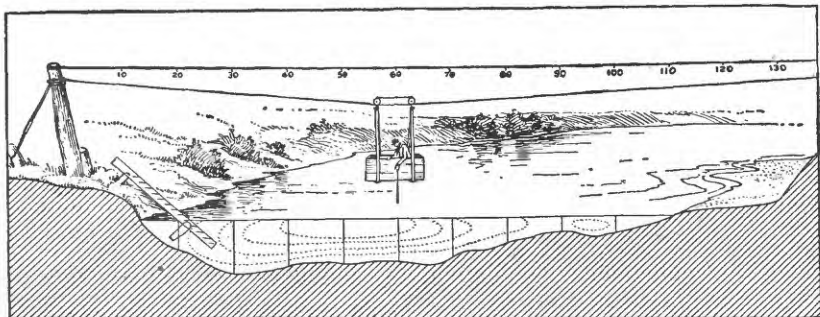
Fig. 1.—Cable station, showing section of river, car, gage, etc.

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. On the assumption 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, and moreover the indications are that it holds 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 a majority of the 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 the 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 on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is specially 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 of the vertical is measured twice. It is useful 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 0.2 and 0.8, and vertical velocity-curve methods, 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, the varying thickness of ice. For information in regard to flow under ice cover see Water-Supply Paper No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of determining run-off, depending on 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 a 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 on 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 on the type of dam and other conditions near its crest. After inserting in the weir formula the measured length of crest and the 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. A thorough knowledge of the conditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends on the following laws of flow for open, permanent channels: (1) The discharge will remain constant so long as conditions at or near the gaging station remain constant; (2) the discharge will be the same whenever the stream is at a given stage if the change of slope due to the rise and fall of the stream be neglected; (3) the discharge is a function of and increases gradually with the stage.
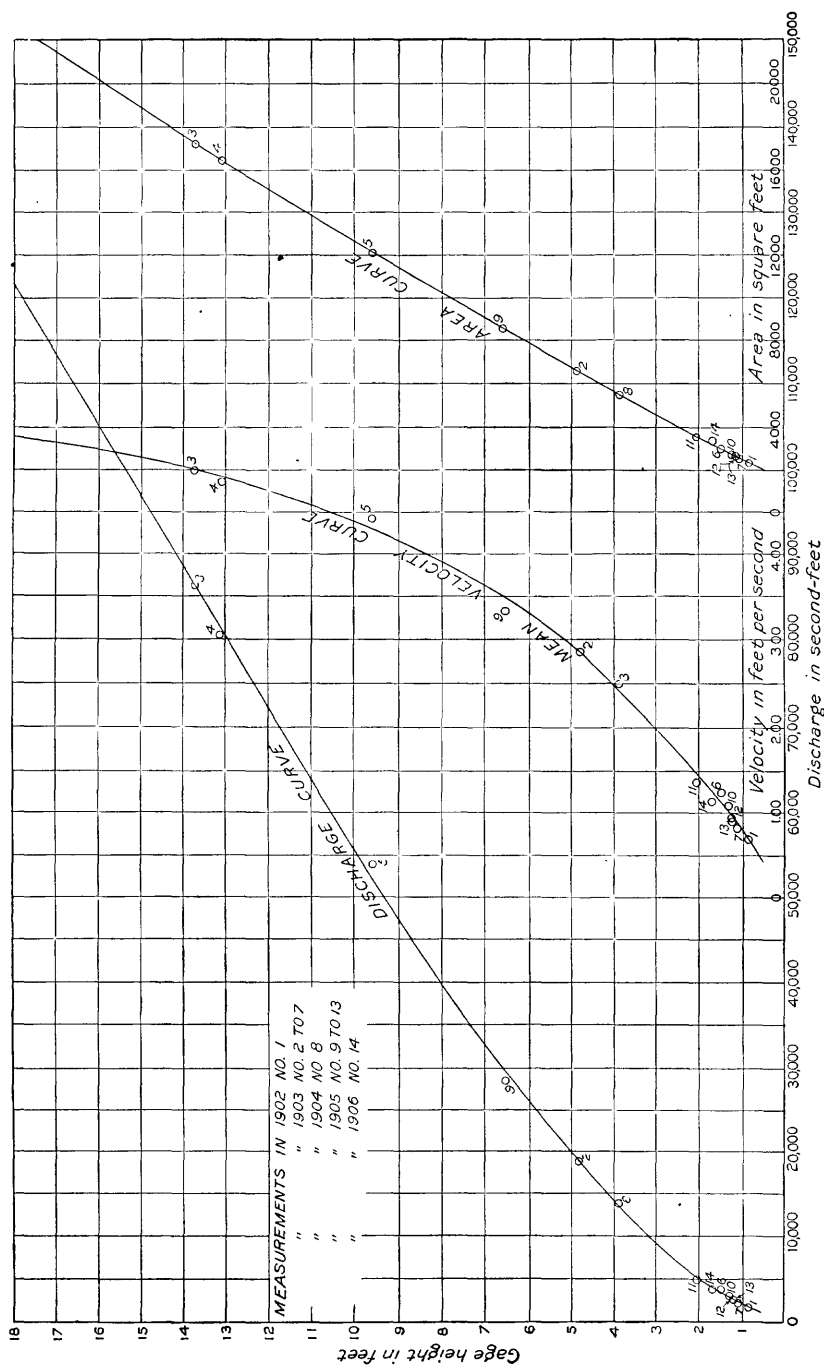
FIG. 2.—Discharge, area, and mean-velocity curves for Potomac River at Point of Rocks, Md.

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 on 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 changes 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. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

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, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the determinations of flow 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 of the United States Geological Survey, 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 determining the flow at stations where the bed shifts but slowly.

<div align="center">COOPERATION AND ACKNOWLEDGMENTS.</div>

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

Maine State survey commission, L. A. Lee, chairman, C. S. Hichborn, secretary and treasurer, and William Engel; Bangor and Aroostook Railroad; Maine Central Railroad; Washington County Railroad; Portland and Rumford Falls Railroad; Montpelier and Wells River Railroad; H. S. Ferguson, engineer of Great Northern Paper Company; H. C. Lord; F. E. Boston, agent, and James L. Dean, engineer, for the Hollingsworth & Whitney Company; Joseph A. Warren, of S. D. Warren & Co.; C. A. Mixer, engineer for the Rumford Falls Power Company; Walter H. Sawyer, agent Union Water Power Company, Lewiston, Me.; J. Brodie Smith, manager of Manchester Traction Light and Power Company; R. A. Hale, principal assistant engineer Essex Company, Lawrence, Mass.; Frederic P. Stearns, chief engineer of the Metropolitan water and sewerage board; Otis Company and George H. Gilbert Manufacturing Company, Ware, Mass.; John T. F. MacDonnell, Holyoke, Mass.; E. E. Lochridge, engineer for the Springfield water department.

<div align="center">ATLANTIC COAST OF NEW ENGLAND DRAINAGE.</div>

<div align="center">ST. JOHN RIVER DRAINAGE BASIN.</div>

<div align="center">DESCRIPTION OF BASIN.</div>

St. John River drains the largest basin between St. Lawrence River on the north and Susquehanna River on the south. Its total drainage area is stated by Wells[a] to be 26,000 square miles, of which approximately 7,500 square miles lie in Maine, its basin occupying the whole northern portion of the State. The extreme headwaters lie in the mountainous region between Maine and Canada, at elevations of 1,500 and 2,000 feet; thence its waters flow at first generally north-

---

[a] Wells, Walter, The water power of Maine, 1869.

eastward through Maine. From the point of junction of the north-west and southwest branches, where the river first takes its name, to its junction with St. Francis River, a distance of 90 miles, its course lies wholly in Maine, though a portion of the tributary area lies in Canada. In this distance Allegash River is the only tributary of importance. Wells estimates the average slope in the 90 miles to be 1.6 feet per mile. From its junction with St. Francis River the St. John forms the northern boundary of Maine for 70 miles. Within this distance the slope is slightly greater than above, having been esti-mated at 2.7 feet per mile, while the volume is considerably aug-mented by two important tributaries—Fish River from the south and Madawaska River from the north. At the point where it leaves the State line the river has an elevation of about 420 feet above sea level and drains an area of 8,765 square miles, of which 4,670 square miles are in Maine and 4,095 square miles in Canada. Beyond this point it receives the waters of Aroostook and Meduxnekeag rivers, the basins of which are almost entirely in Maine, besides several smaller tributaries having their sources, and in some cases a large portion of their drainage basins in the same State.

Both the Allegash and upper St. John rivers are generally inaccess-ible. The middle St. John, forming the northern boundary of the State, may be reached on the Canadian side at any point by the Temiscouata Railway, and on the Maine side at Fort Kent and Van Buren by the Bangor and Aroostook Railroad. The basins of Fish and Aroostook rivers are easily accessible by the latter road. The drainage areas of the principal tributaries are given in Water-Supply Paper No. 165, page 20.

ST. JOHN RIVER AT FORT KENT, ME.

This station was established October 13, 1905. It is located at the footbridge which crosses the St. John near Fort Kent post-office, a short distance above the point where Fish River enters the St. John. The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 21.

Discharge measurements of St. John River at Fort Kent, Me., 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
October 13 a....	F. E. Pressey..........................	230	385	2.55	660
1906.					
May 29........	F. E. Pressey..........................	656	3,910	8.25	17,400
August 15...... .....do...........................	431	735	3.20	1,420

a Measured partly from a boat and partly by wading.

Daily gage height, in feet, of St. John River at Fort Kent, Me., for 1905-6.

Day.	1905.		1906.						
	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.
1	....	3.35	....	9.95	6.45	4.8	2.9	....	3.6
2	....	3.9	....	10.6	6.45	4.8	2.9	....	3.5
3	....	4.1	....	10.95	6.15	4.75	2.8	....	3.5
4	....	4.55	....	11.55	5.9	4.7	2.8	....	3.5
5	....	5.15	....	11.85	5.75	4.7	2.8	....	3.5
6	....	4.9	....	12.6	5.55	4.6	2.8	....	3.5
7	....	4.9	....	12.9	5.45	4.6	2.8	....	3.5
8	....	....	....	13.25	5.0	4.6	2.8	....	3.5
9	....	....	....	13.3	5.0	4.5	2.8	....	3.5
10	....	....	....	12.9	5.0	4.5	2.95	....	3.5
11	....	....	....	12.35	5.0	4.4	3.15	....	3.5
12	....	....	....	11.8	4.9	4.3	3.25	....	3.5
13	2.6	....	....	11.3	4.9	4.2	3.3	....	3.5
14	2.7	....	....	10.6	4.8	4.2	3.15	....	3.5
15	2.6	....	....	9.9	4.8	4.1	2.95	....	3.5
16	2.65	....	....	9.3	4.7	4.0	2.8	....	3.5
17	2.6	....	....	9.1	4.7	4.0	....	....	3.35
18	2.6	....	....	9.0	4.7	4.0	....	....	3.45
19	2.6	....	....	9.0	4.6	4.0	....	....	3.5
20	2.45	....	....	8.9	4.5	3.9	....	....	3.65
21	2.8	....	8.9	8.85	4.45	3.8	....	3.2	3.85
22	3.35	....	8.8	8.45	4.5	3.7	....	3.65	4.4
23	4.35	....	8.75	7.9	4.5	3.6	....	3.95	4.3
24	4.0	....	9.05	7.45	4.75	3.5	....	4.3	4.3
25	3.8	....	9.4	6.95	5.3	3.4	....	4.5	4.3
26	3.65	....	9.9	6.85	6.15	3.3	....	4.25	....
27	3.4	....	10.35	6.7	6.85	3.2	....	3.95	....
28	3.05	....	10.65	6.6	7.3	3.2	....	3.55	....
29	3.1	....	10.4	6.5	7.95	3.1	....	3.55	....
30	2.95	....	10.1	6.5	7.95	3.0	....	3.4	....
31	2.8	....	....	6.5	....	3.0	....	3.55	....

NOTE.—From August 16 to October 20, 1906, inclusive, gage readings were reported at 2.8 feet, but during much of the time were probably below this, as gage could not be read.

Rating table for St. John River at Fort Kent, Me., for 1905-6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.40	550	3.90	2,680	5.40	6,620	7.80	15,430
2.50	630	4.00	2,890	5.50	6,930	8.00	16,250
2.60	710	4.10	3,110	5.60	7,250	8.20	17,090
2.70	800	4.20	3,340	5.70	7,580	8.40	17,930
2.80	900	4.30	3,580	5.80	7,910	8.60	18,780
2.90	1,010	4.40	3,830	5.90	8,250	8.80	19,640
3.00	1,130	4.50	4,090	6.00	8,590	9.00	20,500
3.10	1,270	4.60	4,350	6.20	9,280	10.00	24,950
3.20	1,420	4.70	4,610	6.40	10,000	11.00	29,550
3.30	1,580	4.80	4,880	6.60	10,730	12.00	34,250
3.40	1,740	4.90	5,150	6.80	11,470	13.00	39,050
3.50	1,910	5.00	5,430	7.00	12,220	13.3	40,520
3.60	2,090	5.10	5,720	7.20	13,000		
3.70	2,280	5.20	6,010	7.40	13,800		
3.80	2,480	5.30	6,310	7.60	14,610		

NOTE.—The above table is applicable only for open-channel conditions. It is based on three discharge measurements made during 1905-6. This curve should be fairly accurate, but is subject to revision later when more data become available.

Monthly discharge of St. John River at Fort Kent, Me., for 1905–6.

[Drainage area, 5,280 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
October (13–31)	3,700	590	1,350	0.256	0.18
November (1–7)	5,860	1,660	3,980	.754	.20
1906.					
April (21–30)	27,900	19,400	23,300	4.41	1.64
May	40,500	10,400	24,000	4.55	5.25
June	16,000	3,960	7,090	1.34	1.50
July	4,880	1,130	3,060	.580	.67
August (1–16)	1,580	900	1,070	.203	.12
October (21–31)	4,090	1,420	2,550	.483	.20
November (1–25)	3,830	1.660	2,220	.421	.39

NOTE.—The above values are only approximate, owing to errors in gage-height observations.

FISH RIVER AT WALLAGRASS, ME.

This station was established July 29, 1903. It is located at Wallagrass, Me., just below the outlet of Wallagrass Brook. The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 21, where are given also references to publications that contain data for previous years.

Discharge measurements of Fish River at Wallagrass, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.a	Gage height.b	Thickness of ice.	Discharge.
		Feet.	Sq. ft.	Feet.	Feet.	Feet.	Sec.-ft.
February 15	F. E. Pressey	95	205	3.91	3.91	1.25	196
March 15	do	115	312	4.99	5.03	1.20	378
March 15	do	115	319	5.08	5.12	1.20	390
May 30	do	168	1,210	9.30			4,250
August 15	do	106	240	2.50			175

a To water surface. b To top of ice.

Daily gage height, in feet, of Fish River at Wallagrass, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					8.8		5.8	3.1	2.2	1.9		4.2
2			4.3		9.3	8.6					4.8	
3						8.2	5.3	3.0	2.1	1.9	4.7	4.5
4					10.2			3.0		1.8		
5				3.2	11.2	7.6	5.0		2.1		4.7	4.5
6	2.9							2.9	2.1	1.8		
7				3.2	12.0	7.3	4.9	2.9		1.8	4.5	4.5
8			4.3	3.2	13.0				2.1	1.8		4.4
9		3.5			7.0	4.7	2.8	2.1	1.8	4.9		
10				3.2	13.6	7.0					5.0	5.2
11	3.1					4.5	2.8	2.1	3.0			
12				3.2	13.7	7.0					4.8	4.9
13						4.4	2.7	2.1	2.9			
14		3.9	5.1	3.3	13.5	7.0	4.3	2.5	2.1		4.6	4.8
15				3.5			4.2	2.5	2.1	2.0		4.8
16					13.2	6.3		2.5	2.0	3.2	4.5	
17				3.7	13.2		4.0			3.5	4.4	4.5
18						6.0		2.4	2.0			
19				4.2	13.0		3.9			3.7	4.4	
20		3.0	3.8	4.7		6.6		2.4	2.0	3.7		

Daily gage height, in feet, of Fish River at Wallagrass, Me., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21				5.3	12.7		3.8	2.4			4.3	
22					12.3	4.7			1.9	3.8		
23			5.2	5.5		4.6	3.7	2.4			4.2	4.6
24	3.3				11.0		3.7		1.9	3.9	4.1	
25				6.0		6.0		2.4				
26				6.8	10.8	6.0	3.6	2.3	2.0	4.7	4.4	4.8
27				7.2	10.5					4.5		
28			4.6	7.5		6.0	3.3	2.3	2.0		4.4	
29					9.4				2.0	4.5		
30	3.4			8.4		5.9	3.2	2.2			4.3	
31					8.8					4.7		

NOTE.—The following ice conditions prevailed during 1906: River frozen from January 1 to about April 20; ice began to wear away about March 25; there was no ice near gage or measuring section after April 5. There was ice along both shores during December, but river did not freeze entirely across. During the frozen period gage heights were taken to water surface, through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 6 [a]	2.9	3.0	0.1	March 2	4.3	4.3	1.15
January 11 [a]	3.1	3.0	.7	March 8	4.3	4.2	.85
January 20 [a]	3.0	3.1	.8	March 14	5.1	5.2	1.25
January 24 [a]	3.3	3.4	.1	March 23	5.2	5.2	1.3
January 30	3.4	3.4	.65	March 28 [a]	4.6	4.6	.1
February 9	3.5	3.6	.9	December 17 [a]	4.5	5.0	.8
February 14	3.9	3.9	1.25	December 23 [a]	4.6	4.7	.7
February 20	3.8	3.9	1.35	December 26 [a]	4.8	4.9	1.3

[a] Open channel in midstream; thickness of ice given is at gage, near shore.

Rating table for Fish River at Wallagrass, Me.

OPEN-CHANNEL CONDITIONS, 1903 TO 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.80	59	3.20	366	4.60	888	7.00	2,200
1.90	72	3.30	397	4.70	932	7.20	2,331
2.00	86	3.40	429	4.80	977	7.40	2,464
2.10	102	3.50	462	4.90	1,023	7.60	2,599
2.20	120	3.60	496	5.00	1,070	7.80	2,738
2.30	139	3.70	531	5.20	1,167	8.00	2,880
2.40	159	3.80	567	5.40	1,268	9.00	3,650
2.50	180	3.90	604	5.60	1,372	10.00	4,520
2.60	203	4.00	642	5.80	1,479	11.00	5,490
2.70	227	4.10	681	6.00	1,590	12.00	6,550
2.80	252	4.20	721	6.20	1,705	13.00	7,650
2.90	279	4.30	762	6.40	1,824	14.00	8,850
3.00	307	4.40	803	6.60	1,946		
3.10	336	4.50	845	6.80	2,071		

[a] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906, and is well defined.

FROZEN SEASON, 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.30	140	2.90	230	3.50	320	4.10	425
2.50	170	3.10	260	3.70	355	4.30	460
2.70	200	3.30	290	3.90	390	4.50	495

[a] This table is applicable only for ice-covered conditions using gage heights to bottom of ice. It is based on 4 discharge measurements made during 1906, and is fairly well defined between gage heights 2.5 feet and 4 feet.

Monthly discharge of Fish River at Wallagrass, Me., for 1906.

[Drainage area, 890 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January			193	0.217	0.25
February			202	.227	.24
March			380	.427	.49
April	3,170	305	953	1.07	1.19
May	8,490	3.490	6,330	7.11	8.20
June	3,410	888	2,010	2.26	2.52
July	1,480	351	753	.846	.98
August	336	120	206	.231	.27
September	120	72	92.8	.104	.12
October	932	59	419	.471	.54
November	1,070	681	860	.966	1.08
December			561	.630	.73
The year			1,080	1.21	16.61

NOTE.—Values are rated as follows: January to March and December, fair; September, good; remainder of year excellent.

AROOSTOOK RIVER AT FORT FAIRFIELD, ME.

This station was established July 31, 1903. It is located at the steel highway bridge in the village of Fort Fairfield. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 24, where are given also references to publications that contain data for previous years.

A measurement was made August 17, 1906, by F. E. Pressey, with the following results:

Width, 269 feet; area, 515 square feet; gage height, 3.44 feet; discharge, 488 second-feet.

Daily gage height, in feet, of Aroostook River at Fort Fairfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.6				11.9	6.75	4.95	4.35	3.25	3.3	4.6	4.4
2					12.3	6.6	4.7	4.05	3.2	3.35	4.6	4.4
3					12.65	6.8	4.55	3.85	3.2	3.4	4.5	4.4
4				5.4	12.15	7.4	4.2	3.7	3.25	3.4	4.5	4.95
5					12.5	7.85	4.05	3.8	3.2	3.3	4.5	5.75
6	3.6				12.85	7.35	4.2	3.9	3.1	3.35	4.4	6.6
7					13.35	6.9	4.1	3.9	3.15	3.35	4.4	
8					13.3	6.6	4.05	3.9	3.1	3.4	4.4	
9					13.05	6.4	4.1	3.8	3.1·	3.35		
10		4.6			12.4	6.45	4.0	3.7	3.2	3.5	4.4	
11			4.75		12.3	6.3	4.15	3.75	3.2	7.45		
12					12.0	5.95	4.3	3.85	3.3	9.25		
13	3.6			5.7	12.45	5.9	4.05	3.7	3.25	8.4		
14					11.7	5.15	3.95	3.75	3.3	8.45	4.4	
15					11.35	4.35	4.0	3.65	3.25	7.45		
16					11.0	4.4	3.9	3.7	3.2	6.15		
17		4.5			10.55	4.55	4.05	3.5	3.2	5.85	4.6	
18			4.8	8.5	10.45	4.35	4.2	3.45	3.2	5.7		
19				9.7	10.65	4.2	4.65	3.4	3.2	5.5	4.5	
20	3.9			9.1	10.9	4.2	4.9	3.35	3.25	5.0	4.5	
21				8.75	10.85	4.15	5.2	3.3	3.25	4.8	4.4	
22				9.45	9.75	4.3	5.0	3.35	3.2	4.7	4.4	
23	4.2			10.15	8.8	4.35	4.95	3.4	3.2	4.7	4.5	5.0
24				10.75	8.2	4.9	4.85	3.2	3.2	4.65	4.4	
25		4.5	4.75	9.9	7.8	5.2	4.5	3.3	3.3	4.65	4.4	

Daily gage height, in feet, of Aroostook River at Fort Fairfield, Me., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26				10.4	7.65	5.5	4.2	3.25	3.3	4.6	4.3	
27				11.05	7.75	5.35	4.05	3.3	3.25	4.65	4.4	
28				11.2	7.45	5.35	4.0	3.4	3.3	4.5	4.4	
29				10.95	7.1	5.45	4.15	3.4	3.2	4.6	4.4	
30				11.35	7.05	5.0	4.2	3.4	3.25	4.6	4.4	5.1
31		4.6			6.5		4.4	3.4		4.6		

NOTE.—The following ice conditions prevailed during 1906: River frozen January 1 to April 17, inclusive, and December 6 to 31, inclusive: ice began to go out April 18. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	Feet.	Feet.		Feet.	Feet.	Feet.
January 1	3.6	3.6	1.0	February 25	4.5	4.6	1.9
January 6	3.6	3.6	1.1	March 11	4.75	4.8	1.9
January 13	3.6	3.6	1.1	March 18	4.8	4.8	1.9
January 20 a	3.9	3.9	1.6	March 25	4.75	4.8	1.9
January 23 a	4.2	4.1	1.6	April 4	5.4	5.6	1.8
January 31	4.6	4.6	1.7	April 13	5.7	5.9	1.8
February 10	4.6	4.7	1.9	December 23	5.0	5.1	0.8
February 17	4.5	4.6	1.9	December 30	5.1	5.1	1.1

a Water above top of ice.

Rating table for Aroostook River at Fort Fairfield, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.
3.10	180	4.40	1,664	5.70	4,019	8.00	9,500
3.20	240	4.50	1,822	5.80	4,222	8.20	10,100
3.30	310	4.60	1,984	5.90	4,427	8.40	10,710
3.40	390	4.70	2,150	6.00	4,635	8.60	11,330
3.50	480	4.80	2,320	6.20	5,060	8.80	11,960
3.60	580	4.90	2,494	6.40	5,495	9.00	12,600
3.70	690	5.00	2,672	6.60	5,940	10.00	15,910
3.80	810	5.10	2,854	6.80	6,395	11.00	19,400
3.90	940	5.20	3,040	7.00	6,865	12.00	23,000
4.00	1,075	5.30	3,230	7.20	7,345	13.00	26,700
4.10	1,215	5.40	3,423	7.40	7,840		
4.20	1,360	5.50	3,619	7.60	8,360		
4.30	1,510	5.60	3,818	7.80	8,910		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903-1906, and is well defined.

Monthly discharge of Aroostook River at Fort Fairfield, Me., for 1906.

[Drainage area, 2,230 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (18-30)	20,700	11,000	16,300	7.31	3.53
May	28,000	5,720	18,400	8.25	9.51
June	9,060	1,290	4,000	1.79	2.00
July	3,040	940	1,600	.718	.83
August	1,590	240	620	.278	.32
September	310	180	254	.114	.13
October	13,400	310	3,120	1.40	1.61
November	1,980	1,510	1,740	.780	.87
December (1-6)	5,940	1,660	2,940	1.32	.29

NOTE.—The above values are excellent.

A. PLANT OF ST. CROIX PAPER COMPANY AT SPRAGUE'S FALLS, MAINE.

B. SACO RIVER BELOW SALMON FALLS DAM, MAINE.

ST. CROIX RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

St. Croix River is formed by two branches; one, known as the upper St. Croix or Chiputneticook River, is the outlet of Schoodic Lakes, the other, Kennebasis River, is the outlet of the western lakes of the area, known as Kennebasis Lakes. The upper St. Croix, with its tributary lakes, forms nearly half of the eastern boundary of Maine, separating that State from New Brunswick. The total drainage area of the main stream is about 1,630 square miles, of which 920 square miles are tributary to the great reservoir systems controlled by dams at Vanceboro and Princeton. The length of the stream from the headwaters to the mouth is 100 miles. The basin is, in general, lower than that of any of the larger streams of the State flowing into the Atlantic, its headwaters having an elevation of about 540 feet. The fall from Chiputneticook (the lower of the Schoodic Lakes) to tide water, a distance of 54 miles, is, however, 382 feet, or 7 feet to the mile. At a number of places, where falls and rapids occur, water power has been or can easily be developed.

The lake surface area of the upper St. Croix is approximately 50 square miles and that of West Branch 70 square miles, taking into account only the principal lakes and ponds. Indeed, above Vanceboro and Princeton, each branch of the river is simply a succession of lakes to almost the extreme headwaters. Wells estimated the total lake surface of the St. Croix as not less than 150 square miles, or nearly one-tenth of the total basin. The drainage area at various points on the river is given in Water-Supply Paper No. 165, page 27.

There are on this stream favorable locations for paper and pulp mills, and during 1905 the St. Croix Paper Company developed Spragues Falls with a 6,000-horsepower installation of wheels, to utilize a head of from 40 to 44 feet.

ST. CROIX RIVER NEAR WOODLAND, ME.

This station was established December 4, 1902, at a point a short distance above Spragues Falls, now called Woodland, near Baring; on June 8, 1905, it was moved about $1\frac{1}{2}$ miles downstream to avoid backwater effects caused by the building of a paper mill and dam at Spragues Falls (see Pl. III, *A*). The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 28, where are given also references to publications that contain data for previous years.

Discharge measurements of St. Croix River near Woodland, Me., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 14	F. E. Pressey	295	1,090	7.73	2,370
September 6	...do...	292	790	6.74	1,170
September 7	...do...	292	790	6.75	1,140
October 5	...do...	283	660	6.23	640
November 20[a]	...do...	288	785	6.69	995
1906.					
April 25	F. E. Pressey	315	1,920	10.46	7,620
April 25	...do...	315	1,930	10.50	7,790
May 25	...do...	311	1,460	8.75	3,370
August 27	...do...	298	1,080	7.60	1,630
November 7	...do...	296	1,010	7.56	1,980

[a] Anchor ice probably affected results.

Daily gage height, in feet, of St. Croix River near Woodland, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			8.8			9.2		8.7	7.2	7.0	8.3	
2	8.5						7.6	8.7		7.1	8.3	7.3
3					10.2		7.5	8.6	7.2	7.1		7.3
4					10.2	9.2	7.5	8.5	7.1	7.0		7.3
5	8.7			6.1	10.1	9.2	7.5		7.4	7.0	8.7	7.3
6					10.1	9.3	7.4		7.2	6.9	8.4	7.3
7					10.0	9.4	7.4	8.4	7.2		7.8	
8	8.7	8.9	8.9		9.9	9.3		8.3	7.0	6.9	7.7	
9					9.8	9.2	7.7	8.2		7.0	7.7	
10					9.7		7.9	8.1	7.0	7.2	7.7	
11					9.6	9.1	8.0		7.0	7.4		
12	8.7			7.9	9.4	9.0	8.1		7.1	7.5	7.7	7.7
13						8.8	8.2	8.0	7.1	7.5	7.7	7.7
14					9.1	8.7	8.2	7.9	7.1		7.4	7.7
15					8.8	8.7		7.9	7.1	7.6	7.5	7.7
16			8.6		8.7	8.6	8.3	7.8		7.7	7.7	
17		9.4			8.7		8.4	7.8	7.0	7.8	7.8	7.5
18				10.2	8.6	8.5	8.4	7.8	7.0	7.9		
19	9.4	9.4				8.2	8.5		6.9	7.9	7.8	
20						8.0	8.5		6.9	7.9	7.8	7.7
21					8.5	7.8		7.6	7.1		7.8	7.7
22			9.4		8.5	7.7		7.5		8.0	7.7	7.6
23		9.4		10.4	8.5		8.4	7.4		8.1	7.6	
24				10.4	8.4		8.4	7.45	7.3	8.1		
25					8.4	7.7	8.4	7.4	7.4	8.2		7.5
26	12.9			10.6	8.4	7.6	8.4		7.5	8.2	6.6	7.6
27				10.6		7.6	8.3		7.6	8.2	7.0	
28			9.3		9.0	7.6	8.3	7.3	6.4		7.3	7.7
29					9.6	7.7		7.2	6.4	8.2	7.5	
30					9.6	7.8	8.5	7.2		8.3	7.5	
31	10.0				9.4		8.6	7.2		8.3		

NOTE.—The following ice conditions prevailed during 1906: River frozen January 1-26; ice partly went out on the latter date; again frozen from about February 1 to April 15; river clear of ice April 26. In December some ice formed near the gage, but the river did not freeze over. During the frozen period gage heights were taken to water surface through a hole in the ice.

The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 8.................	8.7	....	1.8	March 1...................	8.8	8.9	1.55
January 19................	9.4	....	1.4	March 8...................	8.9	8.9	1.5
January 26 *a*.............	12.9	....	....	March 16..................	8.6	9.4	1.6
January 31................	10.0	....	.6	March 22..................	9.4	9.4	1.6
February 9................	8.9	8.9	1.3	March 28..................	9.3	9.3	1.6
February 17...............	9.4	9.4	1.6	April 5...................	6.1	....	(*b*)
February 23...............	9.4	9.5	1.6				

a Ice all gone in midstream.   *b* No ice at gage.

Rating table for St. Croix River near Woodland, Me., from July 1 to May 14, 1905, and October 26 to December 31, 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
6.00	480	7.00	1,360	8.00	2,660	9.00	4,390
6.10	545	7.10	1,470	8.10	2,810	9.20	4,790
6.20	615	7.20	1,590	8.20	2,970	9.40	5,210
6.30	690	7.30	1,710	8.30	3,130	9.60	5,640
6.40	770	7.40	1,830	8.40	3,300	9.80	6,090
6.50	860	7.50	1,960	8.50	3,470	10.00	6,550
6.60	950	7.60	2,090	8.60	3,650	10.20	7,020
6.70	1,050	7.70	2,230	8.70	3,830		
6.80	1,150	7.80	2,370	8.80	4,010		
6.90	1,250	7.90	2,510	8.90	4,200		

NOTE.—The above table is applicable only for open-channel conditions. It is based on eight discharge measurements made during 1905-6 and is fairly well defined between gage heights 6.2 feet and 11 feet. From about May 15 to about October 25, 1906, the flow was affected by backwater, the table has been applied during this period by taking the discharge as that given for a gage height 0.3 foot lower than the observed height.

Monthly discharge of St. Croix River near Woodland, Me., for 1905–6.

[Drainage area, 1,420 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
July......................................	4,390	2,660	3,210	2.26	2.61
August...................................	2,370	1,050	1,420	1.00	1.15
September................................	1,150	690	964	.679	.76
October..................................	690	480	549	.387	.45
November.................................	1,250	480	756	.532	.59
1906.					
May......................................	7,020	2,810	4,670	3.29	3.79
June.....................................	4,590	1,710	3,090	2.18	2.43
July.....................................	3,130	1,470	2,410	1.70	1.96
August...................................	3,300	1,250	2,100	1.48	1.71
September................................	1,710	545	1,150	.810	.90
October..................................	3,130	950	2,020	1.42	1.64
November.................................	3,830	950	2,310	1.63	1.82
December.................................	2,230	1,710	2,040	1.44	1.66

NOTE.—Values for 1905 are rated as follows: October, good; remainder of 1905, excellent. Values for 1906 are rated as follows: All months good, except September and October, which are fair, owing to errors in gage height observations.

MACHIAS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Machias may be taken as fairly representative of several of the smaller streams of Maine which empty their waters directly into the ocean and which are commonly referred to as "coastal rivers." Its total drainage basin is 495 square miles, nearly all of which lies in Washington County, Me. Its extreme headwaters lie at an elevation of nearly 500 feet, and are not more than 50 miles from tide water. Wells listed 20 lakes in this basin, aggregating 29.5 square miles in area of water surface. Without important exception these lie, however, in the extreme headwaters. Dams are maintained at several of the outlets of the lakes, and the stored water is used for log driving.

MACHIAS RIVER NEAR WHITNEYVILLE, ME.

This station was established October 17, 1903, at the bridge of the Washington County Railway, near Whitneyville. The drainage area at this point is 465 square miles. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 30, where are given also references to publications that contain data for previous years. The original gage, of the standard chain type, was attached to the guard timber on the downstream side of the railroad bridge, but on October 3, 1905, a vertical wooden staff gage was placed on one of the piers of the wooden highway bridge, about one-half mile upstream from the railroad bridge, and all gage heights given below are by this new gage, which is read by Ira S. Albee. The bench mark is a marked point on an outcropping ledge 25 feet downstream from the bridge on the left bank; elevation, 15.54 feet; the reference point is a marked point on a timber behind the gage; elevation, 9.33 feet. Elevations refer to datum of gage. Measurements are made from the railroad bridge, as formerly.

Discharge measurements of Machias River near Whitneyville, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis- charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 24........	F. E. Pressey......................	124	1,050	7.01	2,710
May 24.........	.....do...........................	126	830	5.49	1,460
August 28.....	.....do...........................	125	605	3.45	315
November 8...	.....do...........................	125	650	4.11	535

Daily gage height, in feet, of Machias River near Whitneyville, Me., for 1905.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	3.6	2.9	4.25	17	3.3	4.85	4.05
2	3.55	3.8	4.1	18	3.25	4.85	3.95
3	3.4	4.5	5.1	19	3.1	4.4	3.85
4	3.35	4.35	6.55	20	2.9	4.1	3.8
5	3.3	4.45	6.9	21	3.3	3.9	3.9
6	3.2	4.5	5.1	22	3.0	3.8	4.05
7	2.9	4.85	4.8	23	3.4	3.7	4.55
8	2.8	4.8	4.35	24	3.35	3.7	4.4
9	3.2	4.8	4.1	25	3.4	3.6	4.45
10	3.2	4.7	4.1	26	3.3	3.6	4.1
11	3.2	4.2	4.0	27	3.2	3.5	4.0
12	3.25	3.6	3.8	28	3.25	3.45	3.9
13	3.3	3.75	3.9	29	2.85	3.45	3.8
14	3.3	3.7	4.35	30	3.05	4.2	4.4
15	3.0	3.7	4.55	31	3.0	....	....
16	3.35	3.6	4.3				

Daily gage height, in feet, of Machias River near Whitneyville, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.8	4.6	4.5	6.8	7.7	7.8	5.8	4.2	3.2	3.0	3.7	4.1
2	4.4	4.6	4.4	6.0	7.7	7.4	5.3	4.0	3.2	3.0	4.0	4.2
3	4.4	4.6	4.3	5.4	7.6	7.6	4.8	3.7	3.2	3.0	5.0	4.4
4	4.5	4.4	6.7	5.2	7.4	7.5	4.8	3.7	3.2	2.9	5.2	4.2
5	5.4	4.2	6.6	5.4	7.2	7.2	5.1	3.8	3.2	2.9	4.8	3.8
6	5.4	4.1	5.7	5.9	7.2	7.1	5.3	3.6	3.2	2.5	4.4	3.8
7	5.0	4.0	5.1	6.1	7.9	7.4	5.0	3.7	3.2	2.7	4.2	3.9
8	4.6	4.0	4.8	5.8	7.9	7.7	4.7	3.6	3.1	2.8	4.0	3.9
9	4.3	4.2	4.8	5.3	7.2	7.5	4.6	3.6	3.0	3.4	4.0	4.0
10	4.1	4.2	6.8	5.2	6.7	7.2	4.6	3.6	3.0	3.7	3.95	4.0
11	3.9	4.3	6.2	5.1	6.5	6.8	4.7	3.6	3.1	4.0	4.5	4.0
12	4.0	4.3	5.7	4.8	7.0	6.1	6.7	4.5	3.1	4.6	5.3	3.9
13	3.8	4.1	5.1	4.6	7.0	5.6	6.9	4.4	3.2	4.4	5.9	3.9
14	3.9	4.2	4.7	4.9	7.0	5.5	7.1	4.0	3.6	4.4	5.3	4.0
15	4.1	4.2	4.5	6.3	6.1	5.5	6.3	3.7	3.9	4.2	4.6	3.9
16	4.3	4.1	4.4	9.8	5.8	5.4	5.4	3.6	3.9	3.9	5.0	4.0
17	7.4	4.1	4.4	9.4	5.4	5.3	5.1	3.5	3.8	3.8	5.5	4.0
18	7.3	4.1	4.3	8.4	5.7	5.0	4.4	3.5	3.6	3.7	5.3	4.0
19	6.8	4.0	4.2	8.1	6.1	5.2	4.3	3.6	3.6	3.6	5.0	4.0
20	6.2	4.0	4.5	7.1	6.2	5.3	4.2	3.6	3.5	3.5	5.0	4.0
21	5.9	3.9	4.4	6.5	5.9	5.1	4.0	3.5	3.2	3.5	4.7	4.2
22	6.0	4.0	4.4	6.8	5.8	4.8	4.2	3.5	3.1	3.4	4.6	5.6
23	6.2	4.1	4.4	6.8	5.7	4.8	4.2	3.6	3.0	3.3	4.7	6.0
24	6.3	4.0	4.3	7.1	5.5	5.1	4.1	3.5	3.1	3.4	4.6	5.6
25	6.4	4.0	4.3	8.0	5.4	5.4	4.1	3.5	3.0	3.4	4.4	5.4
26	6.4	4.4	4.2	7.8	5.5	5.3	4.0	3.4	3.0	3.6	4.3	5.2
27	6.3	5.4	4.3	7.5	5.6	5.0	4.0	3.4	3.0	4.0	4.2	5.2
28	6.1	5.4	5.4	7.2	7.9	5.2	4.0	3.4	3.0	4.0	4.1	4.9
29	5.7	....	6.4	7.2	9.5	5.3	3.9	3.4	3.0	3.8	4.0	4.8
30	5.3	....	6.7	7.1	9.4	5.8	4.0	3.3	3.0	3.7	4.5	4.6
31	4.9	....	6.8	....	8.4	....	4.1	3.2	....	3.6	....	4.4

NOTE.—The river does not usually freeze at or near the gage, and the flow is probably not greatly affected by ice conditions.

PENOBSCOT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Penobscot basin, which has a total area of about 8,500 square miles, lies wholly in Maine.   It extends from the Atlantic Ocean on the south to the basin of the St. John on the north, a distance of 160 miles, and from the New Brunswick boundary on the east to the Quebec boundary on the west, a distance of 115 miles.   The general elevation of the basin is lower than that of the drainage basins to the west.   The headwaters of the main river lie in the mountainous region on the boundary of Quebec, at an elevation of nearly 2,000 feet. The slopes of the upper tributaries are generally steep.   Chesuncook Lake lies near the center of the basin at an elevation of 930 feet. From this point to tide water the distance along the river is about 121 miles, indicating an average slope of 7.7 feet to the mile.   This is concentrated at intervals by ledges where water power has been or may be developed.   The water from about 800 square miles of the basin is discharged into the main river below its lowest available water power at Bangor.   The drainage areas of the principal tributaries are given in Water-Supply Paper No. 165, page 33.

RIVER SURVEYS IN PENOBSCOT DRAINAGE.

In order to point out the power and storage possibilities in the Penobscot River drainage basin, surveys have been made as follows: From tide water to Seboomook Falls, near Northwest Carry, for the determination of the profile and plan of the river.

From the data collected sheets have been prepared showing, as far as available, profile of water surface, plan of the river, contours along the banks, and prominent natural or artificial features.   The results of these surveys have been published on sheets and may be had on application to the Director of the Geological Survey.

PENOBSCOT RIVER AT MILLINOCKET, ME.

The discharge of Penobscot River at Millinocket has been computed and the data furnished by II. S. Ferguson, engineer for the Great Northern Paper Company.   The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 33, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Penobscot River at Millinocket, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	342	992	656	548	2,541	5,071	7,619	5,830	2,042	2,054	2,075	2,041
2	363	833	643	634	2,511	5,051	7,708	6,329	(a)	2,041	2,071	(a)
3	351	943	674	636	2,511	4,836	2,431	4,015	1,999	2,039	2,059	(a)
4	364	480	571	636	2,511	4,579	3,554	3,641	(a)	2,039	(a)	2,051
5	349	998	791	616	2,508	4,236	4,062	3,699	1,994	2,042	2,009	2,044
6	368	918	782	637	(a)	6,047	2,752	3,983	1,983	2,028	2,055	2,043
7	195	843	784	628	2,482	2,944	2,531	4,015	1,984	(a)	2,025	2,027
8	349	607	821	556	2,493	2,911	5,155	4,104	2,035	1,983	2,082	2,044
9	343	686	785	644	2,493	3,328	4,882	4,614	(a)	2,043	2,083	1,988
10	355	835	776	624	2,702	5,973	2,534	4,540	2,039	2,034	2,078	2,044
11	360	554	549	641	2,516	6,155	2,521	4,270	2,036	2,031	(a)	1,993
12	358	800	789	636	2,671	6,028	3,927	4,027	2,034	(a)	2,057	2,019
13	355	802	792	640	4,797	5,402	4,062		2,039	2,042	2,075	2,030
14	259	763	704	637	5,422	2,753	4,588	3,334	2,055	(a)	2,074	2,025
15	374	634	551	520	9,400	3,510	2,893	2,575	2,032	2,038	2,075	2,022
16	373	645	795	1,122	15,769	6,551	2,479	2,575	2,030	2,040	2,074	(a)
17	374	791	618	1,061	17,972	3,667	2,504	2,575	2,041	2,030	2,062	2,032
18	363	516	634	1,030	18,635	3,737	2,502	2,575	2,039	2,045	(a)	2,032
19	357	811	802	1,198	18,110	4,781	2,492	2,618	2,035	2,042	2,050	2,030
20	363	640	801	1,202	15,819	4,573	2,494	2,575	2,044	2,034	2,054	2,033
21	230	657	651	1,249	11,154	6,230	2,492	2,575	2,024	(a)	2,063	2,047
22	343	818	646	1,055	4,068	6,694	3,322	2,575	2,032	2,033	2,056	2,004
23	347	647	654	2,036	6,815	5,313	2,502	2,299	(a)	2,037	2,055	2,024
24	350	825	653	2,044	11,800	3,495	2,421	2,030	2,029	2,032	2,056	(a)
25	352	483	557	2,372	9,376	6,062	2,493	2,043	2,031	2,038	(a)	(a)
26	360	795	652	2,494	6,655	6,380	2,513	(a)	2,052	2,039	(a)	(a)
27	356	790	636	2,490	5,505	6,314	2,690	2,035	2,040	2,045	(a)	2,045
28	257	786	637	2,502	5,379	4,250	4,188	2,037	2,045	(a)	2,043	2,051
29	726		635	(a)	5,379	5,428	3,692	2,030	2,025	2,065	2,039	2,063
30	1,075		643	2,495	6,319	2,887	5,556	2,031	(a)	2,032	2,031	2,055
31	1,195		635		5,098		5,578	2,028		2,032		2,057

a Owing to incompleteness of records discharge rate can not be computed.

Monthly discharge of Penobscot River at Millinocket, Me., for 1906.

[Drainage area, 1,880 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	1,200	195	403	0.214	0.25
February	998	480	746	.397	.41
March	821	549	688	.366	.42
April	2,500	520	1,200	.638	.71
May	18,600	2,480	6,900	3.67	4.23
June	6,690	2,750	4,820	2.56	2.86
July	7,710	2,420	3,630	1.93	2.22
August	6,330	2,030	3,220	1.71	1.97
September	2,050	1,980	2,030	1.08	1.20
October	2,060	1,980	2,040	1.09	1.26
November	2,080	2,010	2,060	1.10	1.23
December	2,060	1,990	2,030	1.08	1.24
The year	18,600	195	2,480	1.32	18.00

NOTE.—Discharges for missing days have been interpolated.

PENOBSCOT RIVER AT WEST ENFIELD, ME.

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

Piscataquis River.   The conditions and the bench marks are described in Water-Supply Paper No. 165, page 35, where are given also references to publications that contain data for previous years.

Discharge measurements of Penobscot River at West Enfield, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
September 22 [a]	University of Maine students, under direction of Prof. H. S. Boardman	690	2,640	2.60	4,130
September 26 [a]	....do	670	2,500	2.40	3,640
September 29 [a]	....do	665	2,510	2.30	3,590
October 4 [a]	....do	650	2,320	2.10	3,210
October 6 [a]	....do	625	2,230	2.05	2,940
October 11 [a c]	....do	865	6,800	6.80	18,600
October 13 [b]	....do	850	5,300	5.60	12,600
October 24	....do	843	4,040	4.15	8,320
October 31 [b]	....do	860	5,340	5.65	12,800

[a] Average of three measurements.
[b] Average of two measurements.
[c] Gage height at beginning 6.5 feet, at end 7.1 feet; poor measurement.

Daily gage height, in feet, of Penobscot River at West Enfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					11.45	7.65	4.25	4.5	3.45	2.1	5.45	4.2
2	2.3				11.95	7.5	3.75	4.4	3.0	2.2	5.4	4.35
3				[a]5.8	12.35	7.45	4.55	4.25	2.95	2.2	5.85	4.7
4				5.9	12.5	7.55	4.25	4.0	3.15	2.1	6.15	5.1
5				6.05	12.4	7.3	4.5	3.9	3.4	2.0	5.95	6.0
6		4.9	3.9	6.25	12.35	7.2	4.7	3.75	3.25	2.1	5.65	6.0
7				6.6	12.25	7.7	4.25	3.65	3.1	2.1	5.4	6.0
8				6.7	12.3	6.9	4.4	3.85	3.0	2.3	5.1	5.9
9	2.2			6.65	12.1	6.8	5.15	3.95	2.75	2.3	5.0	5.9
10				6.7	12.25	6.7	4.85	4.05	2.6	2.8	4.75	5.9
11				6.75	13.4	6.65	4.25	3.9	2.6	6.3	4.7	5.7
12				6.3	12.2	6.65	3.75	3.95	2.65	6.6	4.7	......
13		4.6		6.1	11.45	6.4	4.65	3.7	2.5	5.55	4.8	......
14			4.4	6.3	11.35	5.4	5.5	3.6	2.6	5.0	4.7	......
15				6.85	11.65	4.5	5.2	3.35	2.55	4.5	4.9	......
16	2.8			9.4	11.2	4.05	4.5	3.35	2.4	4.35	5.0	......
17				11.45	11.6	4.25	4.15	3.35	2.4	4.15	5.25	5.0
18				12.15	11.3	4.7	4.15	3.4	2.3	3.9	5.25	......
19			4.1	12.05	11.4	4.7	4.05	3.05	2.3	3.75	5.25	......
20				11.95	10.75	4.75	4.0	3.3	2.35	3.55	5.5	......
21				11.6	10.0	4.9	4.0	3.4	2.6	3.45	5.4	......
22		3.8		11.65	8.85	5.55	4.05	3.5	2.55	3.5	5.5	......
23	3.8			11.65	7.8	5.85	4.5	3.55	2.3	3.75	5.35	......
24	5.2			11.25	8.35	5.4	4.4	3.8	2.4	4.15	5.25	6.0
25	6.6			10.8	8.75	5.05	4.3	3.5	2.4	4.4	4.75	......
26	7.3		4.0	10.8	8.2	5.45	4.05	3.3	2.35	5.4	4.5	......
27		4.1	4.2	10.85	7.75	5.05	3.85	3.45	2.35	6.0	4.4	......
28				10.9	7.65	4.7	3.75	3.65	2.3	6.05	4.0	......
29				11.1	7.8	4.35	4.0	3.8	2.3	6.2	4.0	......
30	6.0			11.25	8.0	4.7	3.5	3.9	2.2	6.15	4.25	......
31					8.15		4.2	4.1		5.6		5.5

NOTE.—The following ice conditions prevailed during 1906:
River frozen from January 1 to April 15, except that narrow channel remained open near the right bank; river again frozen December 4-31, inclusive.
During frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 2................	2.3	....	0.9	March 6................	3.9	4.0	(*a*)
January 9................	2.2	....	1.0	March 14...............	4.4	4.0	(*a*)
January 16...............	2.8	....	0.9	March 19...............	4.1	4.2	1.8
January 23...............	3.8	4.0	0.8	March 26...............	4.0	3.9	1.7
January 25...............	6.6	6.8	0.6	April 3 *b*.............	....	5.8	....
January 30...............	6.0	6.2	0.6	December 10...........	5.9	5.7	*c* 0.6
February 8..............	4.65	4.7	1.2	December 17...........	5.0	5.1	*c* 0.8
February 13.............	4.6	4.7	1.3	December 24...........	6.0	6.1	*c* 0.8
February 22.............	3.8	3.9	1.0	December 31...........	5.5	5.6	*c* 0.6
February 27.............	4.1	4.2	(*a*)				

a Open water in places and water on ice; unsafe to go upon.
b River open on east side under gage.
c River not entirely frozen over.

Rating table for Penobscot River at West Enfield, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	3,000	3.30	5,740	4.60	9,430	6.80	17,390
2.10	3,170	3.40	5,960	4.70	9,750	7.00	18,260
2.20	3,350	3.50	6,240	4.80	10,070	7.20	19,170
2.30	3,530	3.60	6,500	4.90	10,390	7.40	20,120
2.40	3,720	3.70	6,770	5.00	10,720	7.60	21,110
2.50	3,920	3.80	7,050	5.20	11,380	7.80	22,040
2.60	4,130	3.90	7,330	5.40	12,060	8.00	23,200
2.70	4,340	4.00	7,620	5.60	12,750	9.00	29,000
2.80	4,560	4.10	7,910	5.80	13,460	10.00	35,450
2.90	4,790	4.20	8,210	6.00	14,200	11.00	42,350
3.00	5,020	4.30	8,510	6.20	14,960	12.00	49,750
3.10	5,260	4.40	8,810	6.40	15,740	13.00	57,600
3.20	5,500	4.50	9,120	6.80	16,550	13.40	60,800

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1901–6 and is well defined.

Monthly discharge of Penobscot River at West Enfield, Me., for 1906.

[Drainage area, 6,630 square miles.*a*]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (16–31)	50,900	31,500	44,300	6.68	3.73
May...................................	60,800	21,400	40,600	6.12	7.06
June..................................	21,600	7,760	14,100	2.13	2.38
July..................................	12,400	6,240	8,560	1.29	1.49
August................................	9,120	5,140	6,850	1.03	1.19
September.............................	6,120	3,350	4,240	.640	.71
October...............................	16,600	3,000	8,230	1.24	1.43
November..............................	14,800	7,620	11,000	1.66	1.85

a Includes Chamberlain Lake drainage. (See description of St. John River drainage basin, Water-Supply Paper No. 165, p. 20.)

NOTE.—The above values are rated as excellent.

EAST BRANCH PENOBSCOT RIVER AT GRINDSTONE, ME.

This station was established October 23, 1902. It is located at the Bangor and Aroostook Railroad bridge, one-half mile south of the railroad station. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 38, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of East Branch Penobscot River at Grindstone, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					9.4	7.1	4.85	4.6	6.0	4.9	4.75	5.3
2		5.4			9.6	7.2	5.45	4.5	5.9	4.9	4.9	5.3
3			5.6		9.7	7.9	6.2	4.6	5.7	4.8	5.05	5.2
4					9.8	7.1	6.85	4.5	5.6	4.8	5.2	5.15
5		5.1			9.85	8.4	6.65	4.5	5.45	4.7	5.35	5.1
6	4.5		5.15	6.3	9.9	8.25	6.7	4.4	5.3	4.6	5.45	5.0
7					10.25	8.65	7.85	4.35	5.15	4.6	5.7	4.95
8					10.4	8.7	7.8	4.35	5.1	4.7	5.8	4.9
9					9.9	8.65	7.85	4.2	5.0	4.7	5.9	4.85
10		5.1			9.6	8.65	7.5	4.25	4.9	5.05	6.3	4.85
11					9.3	8.7	7.45	4.3	4.9	5.85	6.25	4.8
12				5.7	9.3	8.65	7.4	4.4	4.8	6.4	6.1	4.8
13			5.2		9.3	7.35	7.7	4.4	4.8	6.8	6.0	4.7
14					9.3	7.75	7.85	4.4	4.7	6.7	6.0	4.7
15					9.0	7.25	7.65	4.35	4.7	6.5	5.95	4.7
16	4.5			8.3	9.0	6.85	7.65	4.3	4.7	6.4	5.9	4.6
17					9.0	6.55	7.6	4.25	4.7	6.15	5.9	4.5
18			5.2	8.7	8.8	7.8	7.5	4.2	4.8	6.1	5.85	4.5
19					8.7	6.55	7.3	4.2	4.85	5.8	5.9	4.45
20		5.0			8.6	6.45	7.35	4.1	4.9	5.55	5.95	4.4
21				8.7	8.55	6.4	7.35	4.1	5.0	5.45	6.15	4.4
22	5.0			8.7	9.3	6.5	7.1	4.2	5.1	5.4	6.25	4.4
23				8.7	9.0	5.6	7.3	4.2	5.1	5.2	6.2	4.4
24				7.8	8.7	5.85	6.9	4.2	5.1	5.15	6.1	4.4
25			6.3	8.05	8.9	5.75	6.55	4.2	5.05	5.1	5.9	4.4
26				8.4	8.75	5.45	6.4	4.5	5.0	5.0	5.85	4.4
27				8.7	8.8	5.25	6.2	4.65	5.0	5.05	5.75	4.3
28				8.9	8.4	5.4	6.15	4.9	4.95	5.15	5.7	4.3
29				9.1	8.35	4.85	5.75	5.3	4.9	5.05	5.6	4.3
30				9.35	7.3	4.85	5.25	5.45	4.8	4.9	5.5	4.3
31					7.2		4.85	5.75		4.8		4.3

NOTE.— The following ice conditions prevailed during 1906: River frozen January 1 to April 21, and November 25 to December 31, inclusive. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 6	4.5	4.5	0.8	March 25	6.3	6.3	2.0
January 16	4.5	4.5	.9	April 6	6.3	6.3	1.8
January 22	5.0	5.0	.9	April 12	5.7	5 7	1.4
February 2	5.4	5.4	.9	April 16	8.3	8.3	1.2
February 5	5.1	5.1	1.2	November 25	5.85		.1
February 10	5.1	5.1	1.4	December 2	5.3		.2
February 20	5.0	5.0	1.8	December 9	4.85		.3
March 3	5.6	5.6	2.1	December 16	4.6		.8
March 6	5.15	5.15	1.9	December 23	4.4	4.4	1.0
March 13	5.2	5.2	2.0	December 30	4.3		1.2
March 18	5.2	5.2	2.0				

Gage heights were probably affected by log jams on Grindstone Falls during June and up to July 26, when the river was reported clear. From August 27 to October 16, inclusive, a jam of poles and ties at the bridge was reported.

Rating table for East Branch of Penobscot River at Grindstone, Me., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.10	210	5.30	855	6.50	2,285	8.40	6,110
4.20	240	5.40	940	6.60	2,445	8.60	6,630
4.30	275	5.50	1,030	6.70	2,610	8.80	7,190
4.40	315	5.60	1,130	6.80	2,780	9.00	7,780
4.50	360	5.70	1,235	6.90	2,955	9.20	8,380
4.60	405	5.80	1,345	7.00	3,130	9.40	8,980
4.70	455	5.90	1,460	7.20	3,495	9.60	9,580
4.80	510	6.00	1,580	7.40	3,880	9.80	10,180
4.90	570	6.10	1,705	7.60	4,285	10.00	10,780
5.00	630	6.20	1,840	7.80	4,710	10.20	11,380
5.10	700	6.30	1,980	8.00	5,155	10.40	12,000
5.20	775	6.40	2,130	8.20	5,620		

NOTE.—The above table is applicable only for open-channel conditions. It is based on thirteen discharge measurements made during 1902–5 and is well defined.

Monthly discharge of East Branch Penobscot River at Grindstone, Me., for 1906.

[Drainage area, 1,130 square miles.a]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April 21–30	8,830	4,710	6,810	6.03	2.24
May	12,000	3,500	8,150	7.21	8.31
June	6,900	540	3,540	3.13	3.49
July	4,820	540	3,100	2.74	3.16
August	1,290	210	377	.334	.39
September	1,580	455	708	.627	.70
October	2,780	405	1,040	.920	1.06
November 1–24	1,980	482	1,380	1.22	1.09

a Includes Chamberlain Lake drainage. See description of St. John River drainage basin, pp. 22–23.

NOTE.—Values are rated as follows: April and May, excellent; June to October, fair; November, good.

MATTAWAMKEAG RIVER AT MATTAWAMKEAG, ME.

This station was established August 26, 1902. It is located at the Maine Central Railroad bridge in the village of Mattawamkeag. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 41, where are given also references to publications that contain data for previous years.

A measurement was made August 23, 1906, by F. E. Pressey, with the following results:

Width, 257 feet; area, 220 square feet; gage height, 3.08 feet; discharge, 250 second-feet.

Daily gage height, in feet, of Mattawamkeag River at Mattawamkeag, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		8.7		9.7	10.4	7.2	4.45	3.6	3.35	2.7	6.2	5.4
2		8.4			10.6	7.05	4.2	3.8	3.25	2.6	6.1	5.45
3		8.0			10.7	6.7	4.0	3.8	3.2	2.6	6.0	5.5
4		7.7	9.2		10.8	6.8	4.2	3.75	3.3	2.6	6.0	
5					11.05	7.35	4.5	3.7	3.6	2.6	6.1	
6					11.1	7.1	4.35	3.7	3.6	2.5	6.2	
7	3.7				11.1	6.9	4.4	3.7	3.7	2.7	6.05	
8		9.5		9.9	11.1	6.7	4.25	3.65	3.6	3.0	5.9	
9					10.9	6.6	3.95	3.6	3.5	3.3	5.8	5.7
10					10.7	6.2	4.2	3.45	3.5	3.65	5.85	

Daily gage height, in feet, of Mattawamkeag River at Mattawamkeag, Me., for 1906—
Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11					10.7	5.8	4.1	3.4	3.4	4.4	6.0	
12		8.5		8.5	10.4	5.4	4.2	3.4	3.4	5.75	6.0	
13		9.5			10.1	4.9	4.3	3.4	3.2	6.0	5.9	
14	3.7			8.6	9.9	4.6	4.4	3.35	3.1	6.0	5.8	
15				8.6	9.95	4.45	4.5	3.3	3.0	5.9	5.8	
16					9.8	9.55	4.3	4.4	3.3	3.0	5.8	5.8	6.6
17					9.6	9.25	4.1	4.3	3.3	2.8	5.65	5.9	
18			8.6		9.75	8.9	3.9	4.3	3.3	2.6	5.45	5.9	
19					10.1	8.8	3.8	4.2	3.3	2.5	5.2	6.0	
20		8.8			10.55	8.25	4.05	4.2	3.2	2.6	4.85	6.2	
21					10.65	7.5	4.65	4.5	3.1	2.6	4.8	6.3	
22	3.8				10.7	7.2	5.05	4.2	3.05	2.6	4.7	6.3	
23					10.7	7.05	5.5	4.2	3.15	2.65	4.8	6.2	6.9
24					10.75	7.4	5.6	4.2	3.2	2.7	5.0	6.1	
25	11.6	9.3	8.4	10.8	7.2	5.6	4.2	3.2	2.7	5.1	6.0	
26	11.6				10.6	6.55	5.6	4.2	3.2	2.7	5.55	5.8	
27	11.4				10.6	6.5	5.2	4.2	3.2	2.7	5.95	5.7	
28	11.05				10.4	6.4	4.9	4.1	3.3	2.7	6.15	5.7	
29	11.0				10.4	6.45	4.8	4.1	3.4	2.7	6.3	5.5	
30	10.75				10.3	6.8	4.55	3.85	3.45	2.7	6.2	5.3	6.7
31	9.0					6.8		3.7		3.5		6.2	

NOTE.—The following ice condition prevailed during 1906: River frozen over January 1 to 24; open January 25 to February 3; frozen February 4 to April 13; clear of ice April 17. River frozen December 4 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 7	3.7	3.7	1.1	March 12	8.5	8.7	1.2
January 14	3.7	3.7	1.3	March 18	8.6	8.7	1.5
January 22	3.8	3.8	1.5	March 25	8.4	8.5	1.4
February 4	7.7	7.7	.6	April 1	9.8	9.7	1.2
February 8	9.5	9.7	.8	April 8		9.9	
February 13	9.5	9.3	.8	December 9	5.7	5.8	.5
February 20	8.8	8.6	1.1	December 16	6.6	6.7	.7
February 25	9.3	9.5	.9	December 23	6.9	7.0	.9
March 4	9.2	9.4	1.0	December 30	6.7	6.8	1.0

Rating table for Mattawamkeag River at Mattawamkeag, Me., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.50	86	3.90	590	5.20	1,949	7.00	5,075
2.60	100	4.00	660	5.30	2,083	7.20	5,495
2.70	114	4.10	736	5.40	2,219	7.40	5,920
2.80	134	4.20	818	5.50	2,359	7.60	6,360
2.90	160	4.30	906	5.60	2,505	7.80	6,810
3.00	190	4.40	1,000	5.70	2,658	8.00	7,275
3.10	223	4.50	1,100	5.80	2,818	8.20	7,750
3.20	258	4.60	1,206	5.90	2,985	8.40	8,235
3.30	295	4.70	1,318	6.00	3,160	8.60	8,730
3.40	334	4.80	1,436	6.20	3,525	8.80	9,235
3.50	375	4.90	1,559	6.40	3,900	9.00	9,750
3.60	420	5.00	1,687	6.60	4,285	10.00	12,520
3.70	470	5.10	1,817	6.80	4,675	11.00	15,590
3.80	525						

NOTE.—The above table is applicable only for open-channel conditions. It is based on twenty-three discharge measurements made during 1902–6 and is well defined between gage heights 2.6 feet and 9.5 feet.

Monthly discharge of Mattawamkeag River at Mattawamkeag, Me., for 1906.

[Drainage area, 1,510 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (17–30)	14,900	11,400	13,800	9.14	4.76
May	15,900	3,900	10,300	6.82	7.86
June	5,810	525	2,650	1.75	1.95
July	1,100	470	834	.552	.64
August	525	206	345	.228	.26
September	470	86	223	.148	.17
October	3,710	86	1,720	1.14	1.31
November	3,710	2,080	3,080	2.04	2.28

NOTE.—Values for 1906 are rated as excellent.

PISCATAQUIS RIVER NEAR FOXCROFT, ME.

This station was established August 17, 1902. It is located at Low's bridge, about halfway between Guilford and Foxcroft. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 44, where are given also references to publications that contain data for previous years.

Discharge measurements of Piscataquis River near Foxcroft, Me., in 1906.

Date	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
August 22	F. E. Pressey	100	210	2.73	320
August 31	......do	102	205	2.81	330

Daily gage height, in feet, of Piscataquis River near Foxcroft, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	3.8	3.5	3.8	5.8	3.3	2.0	2.6	2.6	2.3	3.5	3.2
2	2.2	3.6	3.2	3.8	6.2	3.0	2.4	2.6	2.6	2.8	3.6	3.8
3	2.2	3.4	3.2	3.8	6.1	3.4	2.4	2.5	2.7	2.8	3.6	3.8
4	2.2	2.9	2.8	3.8	6.1	3.4	2.4	2.4	2.7	1.9	3.6	3.8
5	2.8	3.4	3.5	3.8	6.2	3.4	2.3	2.3	2.7	1.9	3.6	3.7
6	2.2	3.4	3.6	4.0	6.2	3.5	2.2	2.3	2.7	1.8	3.4	3.7
7	2.2	3.2	3.4	4.0	5.9	4.8	2.2	2.2	2.6	1.6	3.4	3.5
8	2.2	3.0	3.4	3.8	5.5	4.2	1.8	2.1	2.5	2.2	3.2	3.4
9	2.2	3.0	3.1	3.8	5.2	3.8	2.1	2.0	2.4	2.2	3.2	3.4
10	2.2	3.0	3.1	3.6	8.1	3.5	2.1	2.2	2.5	3.8	3.0	3.2
11	2.2	2.8	2.8	3.4	6.5	3.0	2.2	2.2	2.5	4.2	3.0	3.2
12	2.2	3.1	2.8	3.3	5.1	3.0	3.4	2.2	2.5	3.5	3.1	3.2
13	2.2	3.1	3.0	3.2	4.6	3.0	2.8	2.3	2.4	3.3	3.1	3.2
14	2.2	3.1	3.0	3.2	5.1	2.8	2.8	2.3	2.6	2.8	3.1	3.4
15	2.2	3.0	3.0	3.8	4.8	2.8	2.5	2.2	2.5	2.8	3.1	3.8
16	2.4	3.2	3.0	8.0	4.7	2.6	2.6	2.2	2.0	2.7	3.0	3.6
17	2.5	3.4	2.8	10.0	4.6	2.6	2.6	2.2	2.0	2.4	3.3	3.2
18	3.0	2.5	3.0	7.6	4.5	2.6	2.6	2.2	2.4	2.4	3.4	3.4
19	3.2	3.4	3.2	6.4	3.5	2.6	2.6	2.7	2.4	2.4	3.4	3.4
20	3.3	3.4	3.4	6.3	3.5	2.3	2.5	2.4	3.2	2.0	3.4	3.4
21	3.3	3.4	3.4	6.3	3.6	2.0	2.4	2.4	3.0	2.8	3.4	3.5
22	3.4	3.4	3.4	6.5	3.6	2.3	3.2	2.4	2.6	2.9	3.3	3.6
23	3.6	3.4	3.4	6.5	3.6	2.3	2.9	2.5	2.4	3.0	3.2	3.7
24	3.8	3.6	3.2	6.0	3.0	2.6	2.9	2.7	2.2	3.0	3.1	3.7
25	4.4	3.4	3.1	4.2	3.0	2.9	2.9	2.6	2.8	3.3	3.1	3.6

Daily gage height, in feet, of Piscataquis River near Foxcroft, Me., for 1906—Cont'd.

Day.	Jan	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	4.6	3.1	3.2	4.6	3.2	2.6	2.6	2.5	2.7	4.2	3.3	3.6
27	4.6	3.0	3.4	4.8	3.2	2.6	2.6	3.0	2.8	3.8	3.3	3.4
28	4.2	3.4	3.5	5.6	3.8	2.2	2.6	3.2	2.4	3.7	3.3	3.4
29	4.2	....	3.8	5.6	3.8	2.2	2.4	2.9	2.2	3.8	3.2	3.4
30	3.8	....	3.8	5.4	3.8	2.1	2.6	2.8	1.7	3.4	3.2	3.4
31	3.8	....	4.0	....	3.5	....	2.6	2.7	....	3.4	....	3.4

NOTE.—River frozen over through February and probably through January. Gage heights are to water surface in hole cut in ice. River open on April 7. The following thicknesses of ice were obtained: February 17, 1.4; February 24, 1.1; March 3, 1.2; March 10, 1.0; March 17, 1.5; March 24, 1.7; March 31, 1.5.

Rating table for Piscataquis River near Foxcroft, Me., for 1904–6.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	24	2.90	374	4.20	1,403	6.00	3,970
1.70	31	3.00	437	4.30	1,508	6.20	4,335
1.80	40	3.10	502	4.40	1,615	6.40	4,705
1.90	51	3.20	569	4.50	1,725	6.60	5,080
2.00	64	3.30	638	4.60	1,840	6.80	5,460
2.10	81	3.40	709	4.70	1,960	7.00	5,840
2.20	100	3.50	782	4.80	2,085	7.20	6,230
2.30	123	3.60	858	4.90	2,215	7.40	6,620
2.40	148	3.70	938	5.00	2,350	7.60	7,010
2.50	180	3.80	1,023	5.20	2,635	7.80	7,410
2.60	220	3.90	1,113	5.40	2,940	8.00	7,810
2.70	267	4.00	1,208	5.60	3,265	9.00	9,860
2.80	318	4.10	1,303	5.80	3,610	10.00	11,960

NOTE.—The above table is applicable only for open-channel conditions. It is based on 24 discharge measurements made during 1902–1906 and is well defined below gage heights 6.0 feet.

Monthly discharge of Piscataquis River near Foxcroft, Me., for 1906.

[Drainage area, 280 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (16–30)	12,000	1,400	4,610	16.46	9.18
May	8,020	437	2,320	8.29	9.56
June	2,080	64	461	1.65	1.84
July	709	40	220	.786	.91
August	569	64	185	.661	.76
September	569	31	207	.739	.82
October	1,400	24	464	1.66	1.91
November	858	437	628	2.24	2.50
December	1,020	569	776	2.77	3.19

NOTE.—Values are rated as follows: April, good; May to December, excellent.

COLD STREAM AT ENFIELD, ME.

This station was established June 14, 1904, and was located at the highway bridge about three-fourths mile south of Enfield on the road to Passadumkeag. On September 12, 1904, to avoid backwater effects from Passadumkeag stream the gage was taken from the highway bridge and placed about 200 feet below the old mill near Enfield post-office. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 46, where are given also references to publications that contain data for previous years.

· *Discharge measurements of Cold Stream at Enfield, Me., in 1904–1906.*

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
September 9...	H. K. Barrows		17	2.72	36
October 12....	F. E. Pressey		20	2.75	37
October 21....	.....do		23	2.92	56
November 4...	.....do		25	2.90	54
1905.					
April 28.......	F. E. Pressy	33	19.7	2.68	22.6
May 3..........	.....do	41	44	3.33	168
May 8..........	.....do	33	19.3	2.63	29.3
May 26.........	.....do	32	23	2.78	52
May 26.........	.....do	28	18.2	2.78	55
May 26.........	.....do	16.5	22	2.78	42
June 24........	.....do	32	23	2.80	52
October 23....	.....do	30	14.1	2.68	21.3
November 28..	.....do	31	12.4	2.64	15.9
1906.					
February 24...	F. E. Pressy	34	11.3	2.66	17
April 13........	.....do	35	26	3.04	77
April 30........	.....do	36	27	3.10	83

Daily gage height, in feet, of Cold Stream at Enfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1...............	2.6	2.7	2.6	2.8	3.1	3.2	3.0	2.8	2.7	2.8	2.6	2.6
2...............	2.4	2.7	2.7	2.8	3.1	3.2	3.0	2.8	2.7	2.8	2.6	2.6
3...............	2.6	2.6	2.7	2.8	3.1	3.1	3.0	2.8	2.7	2.9	2.6	2.6
4...............	2.6	2.6	2.7	2.8	3.1	3.1	3.1	2.8	2.8	2.8	2.6	2.6
5...............	2.6	2.6	2.6	2.7	3.2	3.2	3.1	2.9	2.8	2.8	2.6	a 4.0
6...............	2.5	2.6	2.6	2.9	3.2	3.2	3.1	2.9	2.7	2.7	2.7	a 2.9
7...............	2.6	2.6	2.7	2.9	3.2	3.2	3.0	2.9	2.7	2.7	2.7	2.7
8...............	2.6	2.5	2.7	3.0	3.2	3.2	3.0	2.8	2.7	2.7	2.7	2.7
9...............	2.6	2.7	2.7	2.9	3.1	3.2	3.0	2.8	2.7	2 7	2.7	2.6
10..............	2.6	2.7	2.7	3.0	3.1	3.4	3.0	2.8	2.7	2.8	2.7	2.6
11..............	2.6	2.7	2.6	2.9	3.0	3.9	3.0	2.8	2.7	2.7	2.6	2.7
12..............	2.7	2.7	2.6	2.9	3.0	3.8	3.0	2.8	2.7	2.7	2.6	2.7
13..............	2.7	2.6	2.6	3.3	3.1	3.8	3.0	2.8	2.7	2.7	2.7	2.6
14..............	2.7	2.7	2.6	3.0	3.1	3.8	3.0	2.8	2.7	2.7	2.7	2.7
15..............	2.7	2.7	2.5	3.0	3.1	3.7	3.0	2.8	2.7	2.7	2.7	2.7
16..............	2.6	2.7	2.5	3.0	3.2	3.6	3.1	2.7	2.7	2.6	2.7	2.7
17..............	2.7	2.7	2.5	3.3	3.3	3.7	3.1	2.7	2.8	2.8	2.7	2.7
18..............	2.7	2.7	2.7	3.1	3.3	3.7	3.0	2.7	2.7	2.8	2.7	2.7
19..............	2.6	2.7	2.7	2.9	3.4	3.6	3.0	2.7	2.7	2.8	2.7	2.6
20..............	2.6	2.7	2.7	2.9	3.4	3.6	3.0	2.8	2.8	2.7	2.7	2.6
21..............	2.7	2.6	2.7	2.9	3.4	3.4	3.0	2.8	2.7	2.7	2.8	2.6
22..............	2.7	2.7	2.5	2.9	3.3	3.1	3.0	2.8	2.8	2.6	2.8	2.8
23..............	2.7	2.7	2.6	3.3	3.3	3.0	3.0	2.8	2.8	2.6	2.8	2.8
24..............	2.6	2.7	2.7	3.3	3.2	3.0	2.9	2.8	2.8	.2.7	2.8	2.8
25..............	2.6	2.7	2.7	3.3	3.2	3.1	2.9	2.8	2.8	2.7	2.7	2.7
26..............	2.7	2.7	2.7	3.1	3.2	3.1	2.9	2.8	2.8	2.6	2.7	2.7
27..............	2.7	2.6	2.6	3.1	3.2	3.1	2.9	2.8	2.8	2.7	2.7	2.6
28..............	2.6	2.6	2.6	3.1	3.2	3.2	2.8	2.7	2.8	2.8	2.7	2.6
29..............	2.6		2.8	3.1	3.2	3.2	2.8	2.7	2.8	2.8	2.7	2.7
30..............	2.6		2.7	3.1	3.2	3.1	2.8	2.8	2.8	2.7	2.6	2.7
31..............	2.6		2.7		3.1		2.8	2.8				2.8

a Backwater from anchor ice on riffles below station.

NOTE.—Ice does not usually form at this station. It sometimes forms to a thickness of 0.2 foot during the night but invariably goes out during the day. The following thicknesses of ice were obtained: February 3, 2 inches; February 15, 2 inches; March 12, 2 inches; March 13, 1 inch; March 23, 2 inches.

Rating table for Cold Stream at Enfield, Me., for 1904–1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.49	2	2.90	52	3.40	158	3.90	316
2.50	6	3.00	69	3.50	186	4.00	353
2.60	12	3.10	88	3.60	216		
2.70	24	3.20	109	3.70	248		
2.80	37	3.30	132	3.80	281		

NOTE.—The above table is applicable only for open-channel conditions. It is based on eight discharge measurements made during 1904–1906 and is fairly well defined between gage heights 2.6 feet and 3.2 feet. Below gage height 2.6 feet it is very uncertain.

Monthly discharge of Cold Stream at Enfield, Me., for 1904–1906.

[Drainage area, 26 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
September (10–30)	69	2	39.9	1.53	1.19
October	69	6	53.2	2.05	2.36
November	69	12	33.5	1.29	1.44
December	37	12	22.6	.869	1.00
1905.					
January	52	12	22.8	.877	1.01
February	37	12	24.1	.927	.97
March	37	12	26.3	1.01	1.16
April	248	12	42.2	1.62	1.81
May	316	12	66.5	2.56	2.95
June	52	24	35.9	1.38	1.54
July	52	12	36.1	1.39	1.60
August	24	2	6.65	.256	.30
September	37	6	27.3	1.05	1.17
October	24	12	19.0	.731	.84
November	24	12	17.6	.677	.76
December [a]	24	10	13.7	.527	.61
The year	316	2	28.2	1.08	14.72
1906.					
January	24	2	15.7	.604	.70
February	24	6	19.5	.750	.78
March	37	6	11.8	.454	.52
April	132	24	72.4	2.78	3.10
May	158	69	107	4.12	4.75
June	316	69	153	5.88	6.56
July	88	37	65.7	2.53	2.92
August	52	24	35.9	1.38	1.59
September	37	24	29.6	1.14	1.27
October	52	12	26.9	1.03	1.19
November	37	12	22.5	.865	.97
December [b]	37	12	20.6	.792	.91
The year	316	2	48.4	1.86	25.26

[a] River frozen December 11 to 13, 1905; discharge estimated 10 second-feet.
[b] Backwater December 5 and 6; discharge corrected.

NOTE.—Values 1904 to 1906, approximate, owing to local changes in control which could not be covered by meter measurements.

PHILLIPS LAKE AND OUTLETS IN HOLDEN AND DEDHAM, ME.

The United States Geological Survey maintains gages at the two outlets of Phillips Lake; also a gage for obtaining a record of lake level. The station at the northern outlet was established July 7, 1904. It is located about 1¼ miles from the lake, one-fourth mile south of the village of East Holden, and 175 feet south of an old mill.

The station at the southeastern outlet was established July 19, 1904. It is located at the highway bridge about 1½ miles southeast of Lake House railroad station, and is about 700 feet southeast of the Maine Central Railroad crossing. The station on Phillips Lake was established July 19, 1904. It is located about one-fourth mile west of Lake House railroad station. The conditions at these stations and the bench marks are described in Water-Supply Paper No. 165, page 48, where are given also references to publications that contain data for previous years.

Discharge measurements of Phillips Lake, northern outlet at East Holden, Me., in 1904-6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 19	H. K. Barrows		7.86	1.55	9.66
August 18	F. E. Pressey		6.54	1.45	6.29
October 17	.....do		4.36	1.46	5.64
1905.					
April 17	F. E. Pressey	15.5	9.9	1.84	24.2
April 29 a	.....do	17.0	11.1	1.90	27.2
May 25 a	.....do	17.0	12.2	1.90	30.7
June 17	Pressey and Adams	12.5	11.5	1.82	21.5
August 11	F. E. Pressey	12.5	9.2	1.77	15.0
August 15	Barrows and Pressey	9.3	8.6	1.67	11.0
September 2	F. E. Pressey	9.5	9.3	1.74	12.6
October 21	.....do	5.7	3.0	1.41	1.8
1906.					
February 23	F. E. Pressey	18	16.6	2.38	59
March 5	.....do	14	12.3	2.34	46
April 14	.....do	14	13.1	2.34	44
April 27	.....do	14	12.9	2.28	40
May 23	.....do	16	17.8	2.52	52
August 24	Barrows and Pressey	11	14.4	1.85	17.2

a From log across stream 100 feet below gage.

Discharge measurements of Phillips Lake, southeastern outlet near Lake House railroad station, Me., in 1904-06.

Date.	Hydrographer.	Width.	Area of section.	Gage height. Outlet.	Gage height. Phillips Lake.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Feet.*	*Sec.-ft.*
July 19	H. K. Barrows		1.23	1.42	7.05	1.09
August 18	F. E. Pressey		.20	1.14	6.40	.07
October 17	.....do		1.25	1.49	7.34	1.48
1905.						
April 17	F. E. Pressey	8.0	19.3	2.80	9.40	42.7
April 29	.....do	8.0	15.4	2.28	8.94	12.2
May 25	.....do	8.0	14.3	2.20	8.97	11.9
June 17	Pressey and Adams	4.0	1.8	1.62	8.48	3.3
August 11	F. E. Pressey	2.5	1.19	1.38	7.37	1.25
August 15	Barrows and Pressey	2.5	1.06	1.35	7.20	1.04
September 2	F. E. Pressey	.5	.08	1.06	6.40	.05
October 31	.....do	.35	.05	1.10	6.00	.03
1906.						
February 23	F. E. Pressey	3	1.26	1.50	7.55	1.69
March 5	.....do	3	1.17	1.94	7.25	1.21
April 27	.....do	8	18.2	2.90	9.35	44.2
May 23	.....do	12	10.2	2.20	8.80	13.5
August 24	Barrows and Pressey	3	.60	1.15	6.05	.01

Daily gage height, in feet, of Phillips Lake, northern outlet, at East Holden, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	2.3	2.4	2.4	2.5	2.5	1.8	1.65	1.8	1.55	1.9	1.7
2	2.0	2.3	2.45	2.45	2.2	2.35	2.45	1.65	1.8	1.55	2.1	1.7
3	2.3	2.5	2.4	2.4	2.5	2.0	1.8	1.65	1.8	1.55	2.3	1.8
4	1.85	2.2	2.5	2.15	2.2	2.45	2.3	1 65	1 8	1.55	2 3	1 8
5	1.85	2.2	2.35	1.8	2.2	2.4	2.3	1.65	1.8	1.55	2.3	1.8
6	1.85	2.2	2.3	2.45	2.2	2.5	2.35	1.65	1.75	1.55	2.3	1.8
7	2.0	2.1	2.05	2.5	2.5	2.55	2.2	1.65	1.7	1.55	2.3	1.8
8	2.2	2.05	2.05	1.8	2.3	2.3	1.8	1.65	1.7	1.55	2.4	1.7
9	1.85	2.05	2.3	2.3	2.25	2.0	1.7	1.65	1.65	1.55	2.4	1.7
10	2.6	2.05	2.4	2.35	2.5	2.0	1.7	1.65	1.6	1.55	2.4	1.7
11	2.0	2.0	2.5	2.3	2.4	2.4	1.8	1.7	1.6	1.55	1.9	1.7
12	1.9	2.0	2.45	2.3	2.2	2.3	1.7	1.65	1.6	1.55	2.4	1.7
13	1.8	2.05	2.4	2.4	2.2	2.4	1.7	1.65	1.6	1.55	2.4	1.7
14	1.8	2.5	2.5	2.3	2.25	2.25	1.7	1.65	1.6	1.55	2.4	1.7
15	1.8	2.5	2.45	2.15	2.45	2.4	1.7	1.65	1.6	1.6	2.4	1.7
16	2.2	2.2	2.3	2.55	2.3	2.4	1.7	1.65	1.6	1.55	2.25	1.7
17	2.3	2.5	2.3	2.32	2.05	2.0	1.7	1.65	1.6	1.55	2.4	1.7
18	•2.1	2.3	2.3	2.38	2.05	2.3	1.7	1.7	1.6	1.55	1.9	1.7
19	2.1	2.35	2.3	2.38	2.05	2.4	1.7	1.9	1.6	1.55	2.5	1.7
20	2.1	2.5	2.25	2.42	2.0	2.35	1.7	1.9	1.6	1.55	2.5	1.7
21	2.1	2.2	2.1	2.42	2.0	2.4	1.7	1.9	1.6	1.55	2.4	1.75
22	2.1	2.5	2.5	2.2	2.05	2.4	1.7	1.9	1.55	1.55	2.4	1.75
23	2.1	2.35	2.3	2.4	2.25	2.45	1.7	1.9	1.55	1.5	2.4	1.75
24	2.55	2.4	2.2	2.15	2.4	1.9	1.7	1.9	1.55	1.45	2.4	1.8
25	2.4	2.2	2.2	2.4	2.5	2.3	1.65	1.9	1.55	1.5	1.9	1.8
26	2.4	2.3	2.3	2.5	2.4	2.4	1.65	1.9	1.55	1.95	1.7	1.8
27	2.5	2.5	2.3	2.3	2.0	2.3	1.65	1.85	1.55	1.95	1.7	1.8
28	2.4	2.5	2.5	2.2	2.05	2.4	1.65	1.85	1.55	1.6	1.7	1.8
29	2.4	......	2.5	2.2	2.3	2.55	1.65	1.8	1.55	1.75	1.7	1.8
30	2.4	......	2.5	2.4	2.3	2.15	1.65	1.8	1.55	1.6	1.7	1.8
31	2.4	......	2.55	......	2.4	......	1.65	1.8	......	1.9	......	1.8

NOTE.—The outlet does not freeze over near the gage, but during short periods the gage height may be affected by ice conditions downstream.

Daily gage height, in feet, of Phillips Lake near East Holden, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	......	......	9.3	......	......	5.8	......	......	5.9
2	......	......	......	......	......	......	......	......	......	......	......	......
3	......	8.7	7.1	......	......	......	......	......	......	......	5.35	......
4	......	......	......	......	......	......	......	6.7	......	......	......	......
5	......	......	......	......	9.4	......	......	......	......	......	......	......
6	7.8	......	......	......	......	......	......	......	5.35	......	......	......
7	......	......	......	6.8	......	......	7.2	......	......	......	......	......
8	......	......	......	......	......	......	......	......	5.7	......	......	6.1
9	......	......	......	......	......	9.1	......	......	......	......	......	......
10	......	8.4	7.4	......	......	......	......	......	......	5.3	......	......
11	......	......	......	......	......	......	......	6.6	......	......	......	......
12	......	......	......	......	......	9.4	......	......	......	......	......	......
13	7.9	......	......	......	......	......	......	......	5.35	......	......	......
14	......	......	......	7.3	......	......	7.1	......	......	......	......	......
15	......	......	......	......	......	......	......	......	5.5	......	......	6.1
16	......	......	......	......	......	8.6	......	......	......	......	......	......
17	......	8.1	6.8	......	......	......	......	......	......	......	5.35	......
18	......	......	......	......	......	......	......	6.4	......	......	......	......
19	......	......	......	......	......	9.1	......	......	......	......	......	......
20	8.3	......	......	......	......	......	......	......	......	5.3	......	......
21	......	......	......	......	9.2	......	6.9	......	......	......	......	......
22	......	......	......	......	......	......	......	......	5.4	......	......	6.4
23	......	7.6	......	......	8.8	8.1	......	......	......	......	......	......
24	......	7.5	6.4	......	......	......	......	......	......	......	5.7	......
25	......	......	......	......	......	......	......	6.2	......	......	......	......
26	......	......	......	......	8.7	......	......	......	......	......	......	......
27	8.8	......	......	......	......	......	......	......	......	4.1	......	......
28	......	......	9.4	......	......	......	6.9	......	......	......	......	......
29	......	......	......	......	......	......	......	......	5.35	......	......	6.8
30	......	......	......	......	......	7.6	......	......	......	......	......	......
31	......	......	6.4	......	......	......	......	......	......	......	......	......

NOTE.—The lake did not freeze over at the gage during the year.

Rating table for Phillips Lake, northern outlet, at East Holden, Me., for 1904–1906.

Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	1.3	1.80	15.8	2.20	36.5	2.50	53
1.50	3.6	1.90	20.5	2.30	42	2.60	59
1.60	7.2	2.00	25.5	2.40	47.5	2.70	65
1.70	11.3	2.10	31				

NOTE.—The above table is applicable only for open-channel conditions. It is based on ten discharge measurements made during 1904-1906, and is fairly well defined.

Rating table for Phillips Lake, southeastern outlet, near Lake House railroad station, Me., for 1904–1906.

Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
6.00	0.02	7.00	0.80	8.00	2.4	8.90	13
6.10	.03	7.10	.95	8.10	2.6	9.00	17
6.20	.04	7.20	1.10	8.20	2.9	9.10	23
6.30	.05	7.30	1.25	8.30	3.2	9.20	29
6.40	.07	7.40	1.40	8.40	3.6	9.30	37
6.50	.10	7.50	1.55	8.50	4.2	9.40	46
6.60	.20	7.60	1.70	8.60	5.3	9.50	55
6.70	.35	7.70	1.85	8.70	7.0	9.60	65
6.80	.50	7.80	2.0	8.80	9.5	9.70	75
6.90	.65	7.90	2.2				

NOTE.—The above table is applicable only for open-channel conditions. It is based on sixteen discharge measurements made during 1904-1906, and is fairly well defined. It applies to gage heights of Philips Lake.

Monthly discharge of Phillips Lake outlets, in Holden and Dedham, Me., for 1904–1906.

[Drainage area, 12.3 square miles.]

Month.	Discharge in second-feet.					Run-off.	
	Northern outlet.			Southeastern outlet.		Sec.-ft. per sq. mile.	Depth in inches.
	Maximum.	Minimum.	Mean.	Mean.	Total.		
1904.							
July (7–31).............	11.3	3.6	6.11	[a]0.61	....	....	....
August.................	11.3	1.3	4.62	[b].14	....	....	....
September.............	3.6	1.3	1.71	....	....	....	....
October................	2.4	1.8	2.09	([c])	....	....	....
November..............	13.5	2.4	4.41	....	....	....	....
December..............	25.5	7.2	11.3	([d])	....	....	....
1905.							
January................	65.0	7.2	19.2	....	....	....	....
February...............	13.6	7.2	10.3	6.44	16.7	1.36	1.42
March..................	42	3.6	10.3	8.38	18.7	1.52	1.75
April...................	36.5	15.8	21.8	5.01	71.9	5.85	6.53
May....................	28.2	18.2	22.6	1.46	37.2	3.02	3.48
June...................	25.5	18.2	20.2	4.59	24.8	2.02	2.25
July...................	20.5	3.6	7.36	2.18	9.54	.776	.89
August................	20.5	5.4	14.1	1.04	15.1	1.23	1.42
September.............	15.8	1.3	4.03	.069	4.10	.333	.37
October................	15.8	1.3	2.98	.036	3.02	.246	.28
November..............	11.3	1.3	4.05	.044	4.09	.333	.37
December..............	42.0	3.6	14.9	1.52	16.4	1.33	1.53
The year.........	65.0	1.3	12.7	....	....	....	....

[a] July 19–31.   [b] August 1–22.   [c] Discharge October 17, 1.31 sec.-ft.   [d] Discharge December 6, 3.2 sec.-ft.

Monthly discharge of Phillips Lake outlets, in Holden and Dedham, Me., for 1904–1906—
Continued.

Month.	Discharge in second-feet.					Run-off.	
	Northern outlet.			Southeastern outlet.		Sec.-ft. per sq. mile.	Depth in inches.
	Maximum.	Minimum.	Mean.	Mean.	Total.		
1906.							
January	59.0	15.8	33.2	4.22	37.4	3.04	3.50
February	53.0	25.5	40.8	3.70	44.5	3.62	3.77
March	56.0	28.2	44.8	.60	45.4	3.69	4.25
April	56.0	15.8	42.6	19.2	61.8	5.02	5.60
May	53.0	25.5	39.6	30.8	70.4	5.72	6.60
June	56.0	20.5	43.0	13.9	56.9	4.63	5.17
July	50.2	9.2	16.8	.84	17.6	1.43	1.65
August	20.5	9.2	13.5	.16	13.7	1.11	1.28
September	15.8	5.4	8.65	0	8.65	.703	.78
October	23.0	2.4	7.25	0	7.25	.589	.68
November	53.0	11.3	36.5	0	36.5	2.97	3.31
December	15.8	11.3	13.4	.13	13.5	1.10	1.27
The year	59.0	2.4	28.3	6.13	34.5	2.80	37.86

NOTE.—Above values for both stations, 1904–6, are approximate, owing to local changes in conditions of flow, which could not be covered by meter measurements.

KENNEBEC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kennebec River is one of the best streams in the United States for the development of water power. Its basin, which lies wholly within the State of Maine, between those of the Androscoggin and the Penobscot, is 150 miles in length and from 50 to 80 miles in width in the main portion, embracing a total area of 5,970 square miles. Of this area, 1,240 square miles are tributary to Moosehead Lake, in which the river has its source. The upper tributaries, however, rise in the hilly forested areas lying to the east and west of that lake. Of these, Moose River is the most important.

Below the outlet of Moosehead Lake the hills close in on the river, forming a narrow rocky chasm, with steep and precipitous sides. From Moosehead Lake to the upper end of Indian Pond, a distance of about 4.5 miles, there is a fall of about 90 feet, this being a very rough, rocky, and turbulent part of the river. Indian Pond is a stretch of quiet water about 5 miles long, with a maximum width of one-half mile. From Indian Pond to the Forks the river is a torrent, falling in a rough and rocky bed about 350 feet in a distance of about 15 miles. Dead River is tributary to the Kennebec at the Forks. Below this junction the river flows with a lesser slope in a narrow winding bed about 20 miles to Bingham; thence through a broader valley, in which are located many farms. Between Bingham and tide water there are a number of large falls, at which water power has been developed.

For a detailed report on Kennebec River drainage, including all data available up to December, 1906, see Water-Supply Paper No. 198.

RIVER SURVEYS IN KENNEBEC DRAINAGE.

In order to point out the power and storage possibilities in the Kennebec River drainage basin, surveys have been made as follows

From tide water to Moosehead Lake, for the determination of the profile and plan of the river.

Moose River from Moosehead Lake to near Long Pond.

Surveys of Wood and Attean ponds and Brassua Lake, to determine their storage capacity.

Surveys of Holeb, Long, Lower and Middle Roach, West Carry, and Spencer ponds, and Flagstaff and Spring lakes, to determine their areas.

From the data collected by the river surveys sheets have been prepared, showing as far as available the profile of water surface, plan of the river, contours along the banks, and prominent natural or artificial features.

From the lake surveys sheets have been prepared, showing as far as possible the shore lines and bank contours, covering from 10 to 20 feet depth of storage.

The results of these surveys have been published on sheets, and may be had on application to the Director of the Geological Survey.

MOOSEHEAD LAKE AT EAST OUTLET, MAINE.

A record of gage heights of Moosehead Lake level at Moosehead Lake east outlet has been kept since April, 1895, by the Hollingsworth & Whitney Company, supplemented for a portion of this time by gage readings at Greenville, furnished for publication by this company.

These gages are cast-iron staff gages set to the same datum; that at Moosehead Lake east outlet is referred to the following bench mark: Copper bolt set in a large rock near left end of dam at elevation 18.428 of gage datum, zero of gage datum being approximately 10 feet below the gate sills and 1,011.30 feet above mean sea level. Gage readings in the following list are referred to a datum 10 feet higher, i. e., with zero at sill of gates. For gage heights previous to 1906 see Water-Supply Paper No. 198.

Daily gage height, in feet, of Moosehead Lake at East Outlet and at Greenville, Me., for 1906.

Day.	January. East outlet.	February. East outlet.	March. East outlet.	April. East outlet.	May. East outlet.	May. Green-ville.	June. East outlet.	June. Green-ville.
1						3.0	7.46	7.45
2	0.5	0.5		0.9	3.3	3.15		7.45
3			0.8					
4	.5			.95	3.75	4.4	7.45	7.4
5	.45	.45	.7			3.85		7.45
6				.95			7.42	7.5
7		.4	.7			4.58		7.5
8						4.6	7.4	7.4
9		.35	.7	1.0	5.05	4.9		7.4
10	.4					5.35		
11				1.0	5.9	5.75	7.4	7.5
12		.3	.7			6.0		7.5
13	.35		.75				7.4	7.5
14		.5			5.95	6.55		7.4
15	.4					6.85	7.35	7.4
16		.6	.8		7.15	7.1		7.35
17	.3			1.1		7.2		
18				1.2	7.32	7.35	7.25	7.3
19	.3	.7				7.4		7.25
20			.86				7.1	7.2
21		.7	.9			7.5		7.1
22	.25					7.5	7.0	7.1
23				1.8	7.5	7.5		7.0
24	.25		.9			7.5		
25				2.05		7.55	7.1	7.0
26	.5		.9			7.55		7.15
27		.8		2.4		7.4	7.05	7.15
28		.8	.8		7.5			7.1
29	.45					7.55	6.95	7.0
30			.8	2.88	7.45	7.6		7.0
31	.5					7.5		

Day.	July. East outlet.	July. Green-ville.	August. East outlet.	August. Green-ville.	September. East outlet	September. Green-ville.	October. East outlet.	October. Green-ville.	November. East outlet.	November. Green-ville.	December. East outlet.	December. Green-ville.
1	6.85		4.9	4.95		3.2		2.0		2.4		
2	6.7			4.95				2 0	2.8	2.5		
3		6.7	4.8	4.9	3.1	3.1	2.05	2.0		2.5	3.25	
4	6.55	6.55		4.8		3.1		2.0				
5		6.6			2.95	3.1	2.0	1.9	2.85	2.8		
6	6.35	6.5	4.65	4.65		3.0		1.8		2.8	3.3	3 3
7		6.35		4.65	2.85	3.0		2.9		2.9	3.3	3.3
8			4.5	4.65		3.0	1.9	1.9		2.9		
9	6.15			4.5				1.6	3.0	2.9		
10		6.1	4.35		2.75	2 9	2.1	1.9		2.9		
11	6.0	6.1		4.25		2.8		1.9		2.9		
12		6.0			2.75	2.8	2.15	1.9	3.0	2.9	3.25	
13	5.9	5.95	4 1	4.25		2.8		2.1		2.9	3.2	
14		5.9		4.2	2.50	2.8		2.9		2.9		
15			3.95	4.15		2.8	2.2			2.9		
16	5.7	5.75		4.0		2.8		2.2	3.0	2.9		
17		5.6	3.85	3.9	2.45	2.5	2.2	2.2		2.9	3.2	
18	5.6	5.7		3.85		2.5		2.2				
19		5.6			2.4	2.5	2.15	2.2	3.05	3.0	3.2	
20	5.5	5.55	3.75	3.75		2.5		2.2		3.0		
21		5.5		3.7	2.4	2.4		3.0	3.1		3.2	
22				3.65		2.2	2.10	2.2	3.0			
23	5.4	5.4		3.65				2.2	3.2	3.2		
24		5.4	3.6	3.7	2.3		2.2			3.3	3.15	
25	5.33	5.4		3.6				2.2				
26		5.35			2.2	2.1	2.5			3.3	3.3	
27	5.2		3.4	3.45		2.1		2.3		3.3		
28		5.2			2.15	2.1			3.3	3.3	3.35	
29			3.3			2.0	2.6	2.5		3.3		
30	5.0	4 45		3.2	2.1			2.4	3.3	3.3		
31		5.05	3.15	3.2			2.8	2.4				

NOTE.—Lake frozen over January 1 to May 13 and December 2 to 31.

KENNEBEC RIVER AT THE FORKS, MAINE.

This station was established September 28, 1901, at the wooden highway bridge across Kennebec River at The Forks, above the mouth of Dead River. Of the drainage area at this station, 1,240 square miles are tributary to Moosehead Lake and the remaining 330 square miles drain into the Kennebec by small streams with steep slopes and no storage. The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 53, and in Water-Supply Paper No. 198, where are given also references to publications that contain data for previous years. Gage datum, revised during July, 1906, is 565.44 feet above mean sea level. Length of chain, formerly 17.18 feet, was changed to 17.08 feet May 8, 1906.

A measurement was made September 5, 1906, by F. E. Pressey with the following results:

Width, 124 feet; area, 799 square feet; gage height, 2.70 feet; discharge, 2,200 second-feet.

Daily gage height, in feet, of Kennebec River at The Forks, Maine, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					3.45	4.8	4.3	3.9	3.3	1.6	1.05	0.8
2					4.25	5.4	5.0	3.9	3.3	1.7	0.75	0.8
3			4.7		4.45	5.2	4.8	3.95	3.15	1.7	1.0	1.0
4					4.45	3.9	4.6	3.25	3.0	1.7	1.45	1.45
5					4.65	5.0	4.9	3.6	2.75	1.7	1.3	1.8
6	2.9				4.75	6.05	4.7	3.7	2.7	1.6	1.3	1.85
7				2.4	4.55	6.2	4.65	3.3	2.7	1.6	1.25	
8					3.8	5.85	4.7	3.1	2.7	1.6	1.3	
9			4.3		3.85	4.9	4.7	3.75	2.7	1.6	1.3	
10		4.7			5.1	4.95	4.9	2.9	1.8	2.25	1.6	
11					6.0	5.0	4.75	2.8	2.6	2.9	1.55	
12					4.0	5.1	4.8	2.8	2.5	3.35	1.6	3.5
13	1.8				4.05	4.7	4.65	2.75	2.65	2.65	1.6	
14				2.2	4.5	4.35	4.15	2.7	2.6	1.75	1.1	
15				2.3	4.4	4.7	4.1	3.4	2.6	0.9	1.0	
16			4.5	3.9	4.8	4.25	3.95	3.15	2.55	1.1	0.7	
17			5.5	5.15	5.95	3.95	3.65	3.0	2.5	1.2	0.6	
18				5.95	6.9	4.35	3.4	2.95	2.35	1.2	0.6	
19				4.75	6.5	4.65	3.15	2.8	2.3	1.45	0.95	
20	2.7			3.35	6.4	4.65	2.85	2.75	1.65	1.75	0.75	
21				3.25	6.4	4.65	2.75	2.7	1.4	2.0	1.0	3.0
22				3.4	6.7	4.7	2.75	2.7	1.35	2.2	1.4	
23				3.45	5.9	4.65	2.7	2.85	1.4	2.2	1.45	
24		4.6	4.5	3.3	6.75	3.8	2.55	2.9	1.4	2.3	1.4	
25				3.0	6.4	1.9	3.1	2.8	1.4	2.55	0.85	
26				3.0	5.6	2.15	3.8	2.8	1.4	2.85	0.7	
27				2.75	6.05	4.95	3.4	2.8	1.4	2.25	0.7	
28	4.6			2.7	6.2	4.6	3.4	3.35	1.4	2.0	0.7	
29				2.7	5.95	4.5	3.7	3.5	1.4	1.9	0.8	2.8
30				3.15	4.95	3.75	3.9	3.4	1.4	1.5	0.8	
31			2.9		5.35		3.9	3.4		1.25		

NOTE.—The following ice conditions prevailed during 1906: River frozen January 1 to April 19 and December 7 to 31, inclusive; the ice went out April 20. During the frozen period gage heights were taken to water surface through a hole in the ice.

The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 6	2.9	2.9	0.9	February 28	4.28	4.3	1.9
January 13	1.8	1.6	1.2	March 9	4.3	4.3	2.1
January 20	2.7	2.6	1.5	March 24	4.5	4.4	2.5
January 28 *a*	4.6	4.6		April 7 *b*	2.4	1.8	
February 3 *a*	4.7	4.7	1.5	April 14 *c*	2.2	2.2	
February 10 *a*	4.7	4.7	1.7	December 12	3.5	3.2	.4
February 17 *a*	5.5	5.5	1.5	December 21	3.0		.9
February 24	4.6	4.6	1.9	December 29	2.8	2.8	1.0

a Ice jam 1 mile long extended above and below the station January 28 to February 17.
b Water over top of ice; ice settled and not safe.
c Ice not safe.

From April to August considerable fluctuations in gage heights occur daily, due to the regulating of the flow at Indian Pond dam for the purpose of log driving. The gage heights from April 23 to August 9, inclusive, are the mean of four readings daily.

Rating table for Kennebec River at The Forks, Me., for 1901 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.60	340	1.90	1,220	3.20	2,775	5.00	6,525
.70	390	2.00	1,305	3.30	2,935	5.20	7,050
.80	445	2.10	1,395	3.40	3,100	5.40	7,560
.90	505	2.20	1,490	3.50	3,270	5.60	8,145
1.00	565	2.30	1,590	3.60	3,450	5.80	8,720
1.10	630	2.40	1,700	3.70	3,635	6.00	9,315
1.20	695	2.50	1,815	3.80	3,825	6.20	9,930
1.30	765	2.60	1,935	3.90	4,020	6.40	10,550
1.40	835	2.70	2,060	4.00	4,220	6.60	11,190
1.50	910	2.80	2,190	4.20	4,635	6.80	11,850
1.60	985	2.90	2,325	4.40	5,070	7.00	12,520
1.70	1,060	3.00	2,470	4.60	5,535		
1.80	1,140	3.10	2,620	4.80	6,020		

NOTE.—The above table is applicable only for open-channel conditions. It is based on fourteen discharge measurements made during 1901-6, and is well defined between gage heights 1.1 feet and 5 feet. Above gage height 5 feet it is based on an extension of the curves of area and mean velocity, the latter determined with the aid of Kutler's formula.

Monthly discharge of Kennebec River at The Forks, Me., for 1906.

[Drainage area, 1,570 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (21-30)	3,180	2,060	2,640	1.68	0.69
May	12,200	3,180	7,440	4.74	5.46
June	9,930	1,220	5,720	3.64	4.06
July	6,520	1,880	4,300	2.74	3.16
August	4,120	2,060	2,740	1.75	2.02
September	2,940	800	1,610	1.03	1.15
October	3,020	505	1,270	.808	.93
November	985	340	633	.403	.45

NOTE.—Values are rated as excellent, except during the log-driving season, when they should be classed as good.

KENNEBEC RIVER NEAR NORTH ANSON, ME.

This station was established October 18, 1901. It is located 1½ miles east of North Anson and about 1 mile above the mouth of Carrabassett River. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 56, and in Water-Supply Paper No. 198, where are given also data for previous years.

Numerous measurements under ice cover have been made at this station at a section some 500 feet below the bridge, and a rating curve constructed for such conditions. For further details of winter measurements at this point and of rating curve used see Water-Supply Paper No. 187.

Considerable fluctuations in the gage heights at this station occur from about May 1 to July 31, as at The Forks, but in less marked degree, due to regulation of the flow at Indian Pond dam for log-driving purposes. The discharge during this period is a mean of the discharges corresponding to gage heights of the high and low daily periods, considering each period as lasting twelve hours.

Gage readings were made twice each day by Mrs. C. S. Benjamin, the toll collector at the bridge, until July 1; after that time by H. C. Stetson. The length of the chain was 30.13 feet January 9, 1906. The gage datum is 243.83 feet above mean sea level, as determined by the Kennebec River survey of 1904, and readjusted in 1906. The datum of the three gages is the same. The reference point is a marked point on the bottom chord of the bridge near the chain gage; elevation, 24.81 feet January 9, 1906. Elevations refer to the datum of the gage. The reference point, and hence the bridge at that point, has settled about 0.3 foot in eighteen months. The gage has been corrected several times by level during this time, however, and it is believed that no error of consequence in gage readings has resulted.

Discharge measurements of Kennebec River near North Anson, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height. a	Gage height. b	Thickness of ice.	Discharge.
		Feet.	Sq. ft.	Feet.	Feet.	Feet.	Sec.-ft.
January 9.....	Pressey and Adams.......	440	1,100	3.58	3.66	1.28	1,290
January 10....	.....do...............	440	1,030	3.40	3.52	1.30	1,120
March 2.......	F. E. Pressey...........	445	1,140	4.26	4.40	1.97	1,590
March 3.......	.....do...............	445	1,050	4.08	4.25	1.98	1,380
March 30......	.....do...............	447	1,180	4.77	4.93	2.26	1,600
March 30......	.....do...............	447	1,200	4.80	4.96	2.26	1,660
April 11.......	.....do...............	450	1,210	4.70	4.75	1.95	1,660
April 11.......	.....do...............	450	1,240	4.70	4.75	1.95	1,710
May 10........	.....do...............	325	3,000	7.06	....	....	11,700

a To water surface.   b To top of ice.

Daily gage height, in feet, of Kennebec River near North Anson, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1...............	2.5	....	....	....	6.3	5.9	4.1	3.4	3.7	2.55	3.15	2.35
2...............	....	....	2.4	....	7.1	5.85	4.3	3.45	3.6	2.5	2.95	3.95
3...............	....	2.3	2.3	2.4	7.75	6.8	4.5	3.35	3.45	2.4	2.75	......
4...............	....	....	....	....	8.25	5.1	4.35	3.45	3.5	2.35	3.0	......
5...............	....	....	....	....	7.4	5.0	4.2	3.35	3.4	2.3	3.05	3.85
6...............	....	....	....	....	8.0	5.25	3.95	3.05	3.3	2.35	2.95	3.8
7...............	....	....	....	2.7	7.5	6.75	4.2	3.0	3.3	2.45	2.75	3.7
8...............	2.5	....	2.2	....	6.8	7.45	4.35	2.95	3.25	2.5	2.75	3.65
9...............	2.4	....	....	....	6.4	7.1	4.4	2.95	3.25	2.5	2.75	3.45
10...............	2.2	2.2	....	....	7.25	6.2	4.15	3.65	3.25	4.45	2.9	......

Daily gage height, in feet, of Kennebec River near North Anson, Me., for 1906—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11				2.8	9.2	6.15	3.45	3.25	3.2	4.5	2.85	
12					7.7	5.75	4.7	3.2	3.15	4.25	2.9	3.25
13			2.2		6.75	5.15	4.7	3.25	3.15	3.55	3.0	
14	2.5			2.8	6.8	5.15	4.65	3.2	3.1	3.1	2.7	
15					7.0	4.75	4.25	3.45	2.95	2.7	2.6	
16					6.5	5.0	3.9	3.45	2.85	2.65	2.4	2.75
17	2.5	2.1	2.3		6.8	4.0	3.65	3.35	2.85	2.35	2.4	
18				10.0	7.7	4.1	3.9	3.3	2.85	2.5	2.05	
19				9.5	8.05	4.15	3.8	3.25	2.85	2.5	2.2	
20	1.9		2.0	8.05	7.35	4.5	3.85	3.2	2.85	2.6	2.45	
21				6.85	7.55	4.0	3.8	3.2	2.75	3.1	2.7	
22				7.2	7.35	4.05	4.15	3.15	2.65	3.3	2.85	
23				7.85	6.35	4.05	4.3	3.15	2.5	3.35	2.85	2.95
24		2.5	2.2	7.2	6.9	4.4	4.3	3.15	2.65	3.65	2.8	
25				6.15	6.2	3.25	4.7	3.35	2.6	3.8	2.65	
26				5.85	6.5	3.4	4.25	3.15	2.55	4.9	2.55	
27	3.9		2.2	4.5	6.05	4.6	4.15	3.35	2.5	4.75	2.55	
28				5.25	7.8	4.6	3.4	3.7	2.5	4.4	2.4	
29			2.6	5.35	6.95	4.3	3.3	3.95	2.5	4.1	2.25	
30			2.7	5.55	7.35	4.3	3.15	3.95	2.45	3.75	2.3	2.85
31					6.95		3.35	3.75		3.25		

NOTE.—River frozen January 1 to April 17, and December 3 to 31, inclusive; clear of ice April 18. During the frozen period gage heights are to the bottom of ice.

Thickness of ice was measured as follows:

Thickness of ice.

Date.	Thickness of ice.	Date.	Thickness of ice.	Date.	Thickness of ice.
	Feet.		*Feet.*		*Feet.*
January 1	0.9	February 17	1.9	December 5	0.4
January 8	1.0	February 24	1.8	December 6	.6
January 9	1.3	March 2, 4, 8, 13	2.0	December 7	.7
January 10	1.4	March 17, 20	2.1	December 8	.8
January 14	1.1	March 24, 27, 29, 30	2.3	December 9	1.0
January 17	1.1	April 3, 7	2.1	December 12	1.2
January 20	1.2	April 11	2.0	December 16, 23	1.4
January 27	1.3	April 14	1.9	December 30	1.5
February 3, 10	1.5				

Backwater due to anchor ice reported December 2, and probably continued throughout the month.

Rating table for Kennebec River near North Anson, Me.

OPEN-CHANNEL CONDITIONS, 1904 TO 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.40	1,544	3.80	3,958	5.20	7,316	7.20	13,200
2.50	1,680	3.90	4,169	5.30	7,587	7.40	13,580
2.60	1,822	4.00	4,385	5.40	7,858	7.60	14,080
2.70	1,970	4.10	4,606	5.50	8,136	7.80	15,300
2.80	2,124	4.20	4,832	5.60	8,415	8.00	16,030
2.90	2,284	4.30	5,062	5.70	8,700	8.20	16,780
3.00	2,450	4.40	5,297	5.80	8,984	8.40	17,540
3.10	2,621	4.50	5,536	5.90	9,274	8.60	18,330
3.20	2,797	4.60	5,779	6.00	9,565	8.80	19,130
3.30	2,978	4.70	6,026	6.20	10,130	9.00	19,930
3.40	3,164	4.80	6,277	6.40	10,710	10.00	24,030
3.50	3,355	4.90	6,532	6.60	11,310		
3.60	3,551	5.00	6,790	6.80	11,920		
3.70	3,752	5.10	7,053	7.00	12,550		

a This table is applicable only for open-channel conditions. It is based on seven discharge measurements made during 1904–6, and the form of the 1903 curve. It is well defined below gage height 5 feet.

*Rating table for Kennebec River near North Anson, Me.—*Continued.

UNDER ICE COVER, 1904 TO 1906.[a]

Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.50	590	2.20	1,170	2.90	1,790	3.60	2,460
1.60	670	2.30	1,255	3.00	1,885	3.70	2,560
1.70	750	2.40	1,340	3.10	1,980	3.80	2,660
1.80	830	2.50	1,430	3.20	2,075	3.90	2,760
1.90	915	2.60	1,520	3.30	2,170		
2.00	1,000	2.70	1,610	3.40	2,265		
2.10	1,085	2.80	1,700	3.50	2,360		

[a] This table is applicable only for ice-cover conditions. It is based on thirteen discharge measurements during 1904–6, and is well defined between gage heights (to bottom of ice) 1.5 feet and 3.4 feet.

Monthly discharge of Kennebec River near North Anson, Me., for 1906.

[Drainage area, 2,790 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	2,760	915	1,680	0.602	0.69
February	1,430	1,080	1,240	.445	.46
March	1,610	1,000	1,220	.437	.50
April	24,000	1,340	7,120	2.55	2.84
May	20,700	9,700	13,200	4.75	5.48
June	14,100	2,887	7,100	2.54	2.83
July	6,026	2,709	4,584	1.64	1.80
August	4,277	2,367	3,057	1.09	1.26
September	3,752	1,612	2,455	.880	.98
October	6,532	1,415	2,982	1.07	1.23
November	2,709	1,131	1,966	.704	.78
December	2,810	1,479	2,032	.728	.84
The year	24,000	915	4,057	1.45	19.80

NOTE.—Values are rated as follows: January to March and December, fair; April to November, good.

KENNEBEC RIVER AT WATERVILLE, ME.

Observations of the flow of Kennebec River at Waterville have been made by Hollingsworth & Whitney Company since 1892, and furnish the longest set of continued records of flow of this river. This company manufactures manila paper, ground wood, and sulphite pulp.

The dam is of timber-crib work, the main portion having a vertical downstream face with a horizontal crest about 5.75 feet wide; the upstream slope is about 40 degrees with the horizontal. The average elevation of crest of dam, as determined by levels during July, 1906, was 119.37 of the Hollingsworth & Whitney datum, which corresponds to 71.53 of mean sea level, according to Kennebec datum, as corrected by levels of 1906. The total length of the dam is 800 feet, which includes a width of log-way of 34 feet. Flashboards are kept on the dam the greater part of the time, their average elevation at the above time being 123.73 of Hollingsworth & Whitney datum, or 75.89 of mean sea level. The crest of the dam is in fairly good condition. The leakage has never been measured, but is assumed as

100 second-feet arbitrarily. The water which flows through the canals is used through 46 wheels, most of which have been rated under practically the same head at Holyoke, the average head at Waterville being about 23 feet. Some water is wasted through the canal, through small waste gates, and over waste weirs. A small amount is used for washing and mill purposes, 100 cubic feet per second being arbitrarily added for these last two items.

Methods and diagrams for estimating the flow through the wheels and over the dam were developed by the late Sumner Hollingsworth, engineer for the company.

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

The estimates of flow at this point are probably in error from 10 to 15 per cent on account of the manner in which the flow has been computed and the uncertainty of the constants used. During the past four or five years (up to January 1, 1906) the computations are in error from 10 to 15 per cent where flow has been computed with flashboards, owing to the assumption that the top of the boards were at elevation 124 of the Hollingsworth & Whitney datum; the results as published were too small.

These records are now being furnished by the Hollingsworth & Whitney Company, through the courtesy of their engineer, Mr. James L. Dean.

All records and estimates for this station for years prior to 1907 have been revised and republished in Water-Supply Paper No. 198.

Daily discharge, in second-feet, of Kennebec River at Waterville, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,450	3,792	2,310	4,223	20,350	16,920	7,574	5,240	3,035	1,184	3,863	2,634
2	2,339	3,591	2,553	4,470	24,520	14,430	7,288	4,753	3,041	1,794	3,541	1,075
3	2,694	3,187	2,530	4,055	25,210	15,800	7,829	4,552	4,089	2,105	2,702	2,430
4	1,992	1,528	1,244	3,965	26,380	16,380	6,500	4,286	3,667	1,842	2,711	2,214
5	1,981	2,668	2,638	4,340	25,630	14,770	7,557	3,457	3,699	1,790	3,858	1,899
6	1,809	2,624	2,595	6,743	24,980	14,920	7,768	4,630	3,719	1,810	3,278	1,928
7	633	2,016	2,039	7,897	23,770	21,450	7,626	4,219	2,654	873	2,673	1,450
8	2,908	2,006	2,746	6,924	23,100	20,350	7,133	3,657	3,419	1,836	2,662	1,413
9	2,297	1,778	2,018	7,259	20,390	21,030	7,384	3,884	1,812	1,869	2,989	1,854
10	1,346	1,663	1,623	7,296	22,770	18,150	6,939	3,884	3,481	2,154	3,032	2,713
11	1,571	1,228	1,214	6,021	34,370	18,510	7,605	4,186	3,306	9,178	2,118	2,654
12	2,112	1,747	2,550	5,835	27,760	15,520	7,412	2,159	2,999	7,152	3,804	2,727
13	1,932	2,051	2,849	6,311	20,590	19,130	8,801	3,377	1,850	5,317	3,613	2,623
14	902	2,328	2,006	6,977	22,380	14,710	8,122	3,326	3,848	3,645	3,809	2,732
15	1,612	2,068	2,244	17,180	22,020	12,920	7,218	2,993	2,939	3,873	3,272	2,703
16	2,214	2,024	1,795	39,390	18,650	11,260	6,267	3,036	1,195	2,710	3,587	ª2,700
17	1,643	2,029	1,714	37,080	19,060	10,810	5,285	3,350	2,688	2,402	3,261	2,668
18	3,073	609	906	33,120	21,240	5,326	6,080	3,069	2,299	1,988	2,091	2,439
19	2,553	2,589	2,565	33,010	24,480	6,479	5,928	2,386	2,114	1,863	3,278	2,785
20	2,779	2,656	2,296	32,910	23,670	8,127	5,355	3,761	2,393	2,257	4,066	2,776

ª Approximate.

Daily discharge, in second-feet, of Kennebec River at Waterville, Me., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21............	1,487	2,352	1,975	28,860	20,980	7,337	5,303	3,081	2,421	1,815	4,490	2,406
22............	2,805	2,569	2,288	31,370	19,980	7,378	4,357	2,783	2,131	3,959	4,490	2,350
23............	2,804	2,368	1,988	32,930	18,410	8,803	5,515	3,010	901	3,672	4,734	1,870
24............	8,171	2,236	1,952	28,910	17,090	12,630	5,533	3,347	2,088	3,609	4,482	3,880
25............	8,208	1,505	938	22,690	14,430	11,280	5,805	3,280	1,788	3,916	3,055	2,444
26............	7,833	2,887	2,056	21,210	16,890	8,161	5,286	2,291	2,081	8,360	3,800	4,105
27............	6,946	2,851	1,923	18,240	20,720	5,374	4,851	3,401	1,812	8,608	3,837	3,606
28............	5,899	2,865	2,465	17,160	25,210	9,272	4,666	3,445	2,071	8,068	3,827	3,543
29............	5,917	....	3,714	19,200	25,890	8,504	3,668	5,220	1,758	7,321	2,375	3,292
30............	5,091	....	4,208	20,340	20,980	7,967	3,815	4,909	588	5,678	3,543	2,125
31............	3,560	....	5,016	....	19,080	....	5,113	4,648	....	5,049	....	2,998

Monthly discharge of Kennebec River at Waterville, Me., for 1906.

[Drainage area, 4,270 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January.......................................	8,210	633	3,210	0.752	0.87
February......................................	3,790	609	2,280	.534	.56
March...	5,020	906	2,290	.536	.62
April...	39,400	3,960	17,200	4.03	4.50
May...	34,400	14,400	22,300	5.22	6.02
June..	21,400	5,330	12,800	3.00	3.35
July..	8,800	3,670	6,310	1.48	1.71
August..	5,240	2,160	3,660	.858	.99
September.....................................	4,090	588	2,530	.593	.66
October.......................................	9,180	873	3,800	.889	1.02
November......................................	4,730	2,090	3,430	.803	.90
December......................................	4,100	1,080	2,550	.597	.69
The year.....................................	39,400	588	6,860	1.61	21.89

NOTE.—For accuracy see station description.

KENNEBEC RIVER AT BINGHAM, ME.

A measurement was made September 6, 1906, from the downstream side of the highway bridge at Bingham. The bench mark is top of third floor beam from the pier, 245 feet from the end of the inclined end post, downstream side of bridge, at left bank.

Distance to water surface, 23.55 feet; width, 419 feet; area, 1,680 square feet; discharge, 2,670 second-feet.

MOOSE RIVER NEAR ROCKWOOD, ME.

This station was established September 7, 1902. It is located 4 miles west of Kineo, Me., near the village of Rockwood, and 2 miles from the mouth of the river. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 60, and in Water-Supply Paper No. 198, where are given also data for previous years.

A measurement was made November 13, 1906, by F. E. Pressey, with the following results:

Width, 232 feet; area, 630 square feet; gage height, 3.25 feet; discharge, 765 second-feet.

Daily gage height, in feet, of Moose River near Rockwood, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	2.3	2.1	1.5	6.7	5.85	3.75	2.6	1.9	2.1	3.9	3.0
2	1.8	2.4	2.0	1.5	6.65	5.5	3.6	2.6	1.8	2.1	3.9	3.0
3	1.8	2.4	1.9	1.5	6.85	5.2	3.5	2.5	1.85	2.1	3.9	3.0
4	1.9	2.5	1.9	1.5	7.2	5.25	3.5	2.5	1.95	2.1	3.9	3.0
5	1.9	2.5	1.9	1.5	7.55	5.35	3.4	2.4	2.0	2.1	3.8	3.0
6	1.9	2.6	1.9	1.5	7.85	5.5	3.3	....	1.9	2.1	3.7	2.9
7	1.9	2.6	1.8	1.5	8.0	5.4	3.25	....	1.95	2.1	3.7	2.9
8	1.9	2.6	1.8	1.5	8.0	5.3	3.2	2.3	2.0	2.1	3.6	2.9
9	1.9	2.6	1.8	1.5	8.0	5.35	3.1	2.2	2.05	2.1	3.55	a 2.9
10	1.8	2.6	1.9	1.5	8.2	5.5	3.1	2.2	2.1	2.1	3.4	3.0
11	1.7	2.6	1.9	1.6	8.55	5.65	3.2	2.15	2.1	2.45	3.4	3.0
12	1.7	....	1.8	1.6	8.6	5.6	3.35	2.1	2.1	2.6	3.4	2.9
13	1.7	....	1.8	1.7	8.5	5.55	3.45	2.0	2.1	2.6	3.3	2.9
14	1.7	....	1.8	1.7	8.4	5.35	3.5	2.0	2.1	2.9	3.3	2.9
15	1.7	....	1.7	1.8	8.3	5.2	3.4	1.95	2.1	3.0	3.3	2.9
16	1.7	2.4	2.7	2.0	8.2	5.35	3.4	1.9	2.1	3.0	3.2	2.8
17	1.7	2.4	1.6	2.25	8.2	5.25	3.3	1.9	2.1	3.0	3.2	2.8
18	1.7	2.3	1.6	2.45	8.3	5.05	3.3	1.85	2.1	3.0	3.2	2.8
19	1.7	2.3	1.6	2.65	8.2	4.75	3.25	1.8	2.1	3.0	3.1	2.8
20	1.7	2.3	1.6	3.05	8.2	4.5	3.2	1.8	2.1	3.0	3.1	2.7
21	1.7	2.3	1.6	3.9	8.2	4.4	3.2	1.8	2.1	3.0	3.0	2.6
22	1.7	2.2	1.6	4.8	8.1	4.45	3.1	1.8	2.1	3.0	3.0	2.6
23	....	2.2	1.6	5.3	7.6	4.5	3.1	1.9	2.1	3.0	3.2	2.6
24	....	2.1	1.5	5.5	7.15	4.5	3.05	1.9	2.1	3.1	3.2	2.6
25	....	2.1	1.5	5.75	6.85	4.45	3.0	1.9	2.1	3.2	2.5	2.6
26	1.9	2.1	1.4	5.85	6.6	4.25	2.95	1.8	2.1	3.45	2.2	2.7
27	2.0	2.1	1.4	6.0	6.5	4.2	2.9	1.9	2.1	3.65	3.3	2.7
28	2.0	2.1	1.4	6.35	6.4	4.05	2.85	1.9	2.1	3.8	3.35	....
29	2.1	....	1.4	6.55	6.45	3.9	2.75	1.9	2.1	4.0	3.3	....
30	2.2	....	1.4	6.6	6.25	3.8	2.7	1.9	2.1	4.0	3.25	....
31	2.2	....	1.4	....	6.05	....	2.7	1.9	....	4.0	....	....

a Thickness of ice at gage, 0.4 feet; 10 feet from gage, 0.3 feet.

NOTE.—There was no ice above or below the gage during the winter season, 1905-6, except some along the banks of the river 5 or 6 feet from the gage. River frozen over at gage on December 7. During December the afternoon gage height is used, as the morning height is affected by anchor ice. Open channel through ice throughout December.

Rating table for Moose River near Rockwood, Me., for 1902 to 1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	88	2.50	414	3.60	968	5.40	2,432
1.50	108	2.60	454	3.70	1,032	5.60	2,629
1.60	130	2.70	496	3.80	1,098	5.80	2,830
1.70	154	2.80	539	3.90	1,166	6.00	3,035
1.80	180	2.90	584	4.00	1,236	6.20	3,245
1.90	208	3.00	631	4.20	1,382	6.40	3,455
2.00	238	3.10	681	4.40	1,538	6.60	3,670
2.10	270	3.20	733	4.60	1,703	6.80	3,890
2.20	303	3.30	788	4.80	1,875	7.00	4,110
2.30	338	3.40	846	5.00	2,055	8.00	5,275
2.40	375	3.50	906	5.20	2,240	9.00	6,500

NOTE.—The above table is strictly applicable only for open-channel conditions. It is based on eleven discharge measurements made during 1902-1906 and is well defined between gage heights 1.5 feet and 6.5 feet.

Monthly discharge of Moose River near Rockwood, Me., for 1906.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January..	303	154	191	0.281	0.32
February.......................................	454	270	370	.544	.57
March..	270	88	155	.228	.26
April...	3,670	108	1,040	1.53	1.71
May..	6,000	3,090	4,790	7.04	8.12
June...	2,880	1,100	2,050	3.02	3.37
July..	1,060	496	744	1.09	1.26
August...	454	180	262	.388	.45
September......................................	270	180	255	.375	.42
October..	1,240	270	592	.871	1.00
November......................................	1,170	303	826	1.21	1.35
December......................................	631	454	548	.806	.93
The year.................................	6,000	88	985	1.45	19.76

NOTE.—Discharge interpolated for days on which gage was not read.
Values are rated as follows: January to March and December, good; April to November, excellent.

ROACH RIVER AT ROACH RIVER, ME.

This station was established November 10, 1901. It is located near the village of Roach River. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 63, and in Water Supply Paper No. 198, where are given also data for previous years.

Daily gage height, in feet, of Roach River at Roach River, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1..............					2.5	2.9	2.5	2.3	2.2	2.2	2.5	2.3
2..............					2.5	4.55	3.6	2.3	2.2	2.2	2.5	2.3
3..............					2.6	6.3	3.6	2.6	2.2	2.2	2.5	2.3
4..............					2.6	5.8	3.6	2.6	2.2	2.2	2.5	2.3
5..............					2.6	3.65	3.6	2.6	2.2	2.2	2.5	2.3
6..............					3.6	2.9	3.6	2.8	2.2	2.2	2.5	2.3
7..............					3.6	2.9	3.6	2.8	2.2	2.2	2.5	2.3
8..............					4.2	2.5	3.6	2.8	2.2	2.4	2.3	2.3
9..............					4.7	2.5	2.2	2.8	2.2	2.4	2.3	2.3
10..............					5 6	2.5	2.2	2.2	2.2	2.4	2.3	2.3
11..............					5.2	2.5	2.2	2.2	2.2	2.4	2.3	2.3
12..............					5.4	2.5	2.2	2.2	2.2	2.4	2.3	2.3
13..............					5.4	2.5	2.2	2.2	2.2	2.4	2.3	2.3
14..............					4.15	2.5	2.2	2.2	2.2	2.4	2.3	2.3
15..............				2.2	2.9	2.5	2 2	2.2	2.2	2.4	2.3	2.3
16..............				2.2	2.9	2.5	2.2	2.2	2.2	2.4	2.3	2.3
17..............				2.2	6.3	2.5	2.2	2.2	2.2	2.4	2.3	2.3
18..............				2.2	4.2	2.5	2.2	2.2	2.2	2.4	2.3	2.3
19..............				2.2	2.9	2.5	2.2	2 2	2 2	2.4	2.3	2.3
20..............				2.2	2.9	2.5	3.3	2 2	2 2	2.4	2.3	2.3
21..............				2.2	2.9	2.5	3.3	2 2	2.2	2.4	2.3	2.3
22..............				2.2	6.2	2.5	3.3	2.2	2.2	2.6	2.3	2.3
23..............				2.2	2.9	2.5	3.3	2 2	2.2	2.6	2.3	2.3
24..............				2.3	6.2	2 5	3.3	2 2	2.2	2.6	2.3	2.3
25..............				2.3	2.9	2 5	2.85	2.2	2.2	2.6	2.3	2.3
26..............				2.35	2.9	2.5	2.4	2.2	2 2	2.6	2.3	2.3
27..............				2.35	3.25	2.5	2.4	2.2	2.2	2.6	2.3	2.3
28..............				2.35	3.25	2.5	2.2	2 2	2 2	2.6	2.3	2.3
29..............				2.35	3.25	2 5	2.2	2 2	2 2	2.6	2.3	2.3
30..............				2.35	2.9	2 5	2 2	2 2	2 2	2 6	2.3	2.3
31..............					2.9	....	2 2	....	2 2	2 5	....	2.3

NOTE.—River frozen January 1 to April 15, but a small portion of the channel was open opposite the gage for the greater part of the winter season. The thickness of the ice varied from 0.2 to 0.7 foot.
Flow probably somewhat affected by ice conditions during December.

Rating table for Roach River at Roach River, Me., for 1901 to 1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.20	46	3.10	338	4.00	730	4.90	1,170
2.30	68	3.20	379	4.10	775	5.00	1,225
2.40	94	3.30	421	4.20	820	5.20	1,335
2.50	122	3.40	463	4.30	865	5.40	1,445
2.60	153	3.50	506	4.40	915	5.60	1,555
2.70	186	3.60	550	4.50	965	5.80	1,670
2.80	221	3.70	595	4.60	1,015	6.00	1,790
2.90	258	3.80	640	4.70	1,065	6.20	1,910
3.00	298	3.90	685	4.80	1,115	6.30	1,970

NOTE.—The above table is applicable only for open-channel conditions. It is based on ten discharge measurements made during 1902–1905, and is fairly well defined.

Monthly discharge of Roach River at Roach River, Me., for 1906.

[Drainage area, 85 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (15–30)	81	46	59.7	0.702	0.42
May	1,970	122	596	7.01	8.08
June	1,970	122	293	3.45	3.85
July	550	46	232	2.73	3.15
August	221	46	80.4	.946	1.09
September	46	46	46.0	.541	.60
October	153	46	101	1.19	1.37
November	122	68	80.6	.948	1.06
December	68	68	68.0	.800	.92

NOTE.—Values are rated as follows: April and August to December, fair; May to July, good.

DEAD RIVER NEAR THE FORKS, MAINE.

This station was established September 29, 1901. It is located 1½ miles west of The Forks. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 66, and in Water-Supply Paper No. 198, where are given also data for previous years.

Discharge measurements of Dead River near The Forks, Maine, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 8	F. E. Pressey	258	1,250	4.35	7,700
May 8	....do	260	1,250	4.28	7,490
September 5	....do	220	398	0.85	385

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

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.85	3.55	1.25	0.85	0.75	0.75	1.4	0.95
2		4.4	2.35	1.15	.85	.85	.75	1.3	.95
3		4.1	2.15	1.15	.75	.85	.75	1.25	1.05
4		4.2	1.95	1.15	.75	.8	.75	1.15	1.05
5		3.7	2.95	1.15	.75	.75	.75	1.05	1.05
6		4.35	3.05	1.15	.75	.75	.65	1.05	1.15
7		4.35	3.7	1.05	.75	.75	.65	.95	1.25
8		3.65	3.95	1.05	.65	.75	.65	.95	1.25
9		3.85	3.7	1.05	.65	.75	1.15	.95	1.25
10	2.65	3.9	2.7	1.2	.65	.75	1.4	.95	1.15

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

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
11	2.65	4.25	3.6	1.3	0.65	0.85	1.65	1.05	1.25
12	2.55	4.75	3.95	1.65	.65	.85	1.55	1.05	1.25
13	2.45	3.95	2.5	1.8	.65	.8	1.65	.95	1.25
14	2.45	4.05	2.0	1.65	.65	.75	1.3	.95	....
15	2.35	3.8	1.95	1.6	.65	.75	1.25	1.05	....
16	2.6	3.85	1.6	1.35	.65	.75	1.15	1.05	....
17	3.0	3.85	1.7	1.35	.6	.75	.95	1.05	....
18	3.2	4.35	1.55	1.35	.55	.75	.95	1.05	....
19	3.4	3.9	1.45	1.35	.65	.75	.9	1.05	....
20	3.6	3.65	1.4	1.25	.65	.75	.85	1.05	....
21	3.85	3.85	1.35	1.25	.75	.75	.85	1.15	....
22	4.55	3.4	1.25	1.25	.75	.75	1.25	1.25	....
23	4.65	4.0	1.5	1.25	.75	.75	1.5	1.35	....
24	4.15	3.4	1.65	1.25	.85	.85	1.8	1.25	....
25	3.8	3.55	2.0	1.15	.85	.85	1.85	1.15	....
26	3.4	2.6	1.9	1.15	.85	.75	1.95	1.15	....
27	3.0	3.0	1.8	1.05	.75	.75	2.05	1.15	....
28	3.25	3.05	1.6	.95	.75	.75	1.9	1.05	....
29	3.55	3.95	1.4	.95	.75	.75	1.85	1.05	....
30	3.45	3.25	1.35	.85	.75	.65	1.7	1.05	....
31	....	3.15	....	.85	.75	....	1.55	....	....

NOTE.—The river was frozen from January 1 to April 10, when the ice broke up.

On February 27, 1906, cakes of ice were piled up on the shore and the river was full of cakes of ice frozen in an ice field. The ice jam extended from the mouth of the river to about 1,000 feet above the cable. Near the cable and gage the ice cakes formed drifts along the channel of the river 2 to 3 feet above the normal ice cover. There were 10 feet of open channel opposite the gage. The river at the cable was frozen entirely over. River frozen over December 14–31. The following comparative readings were made:

Comparative ice and water readings.

Date.	Midstream at gage.			Midstream at cable.	
	Water surface.	Top of ice.	Thickness of ice.	Thickness of ice.	Water surface to bottom of ice.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*
February 27	2.2	2.3	1.6	1.0	0.9
March 7	2.3	2.4	1.7	1.2	1.1
March 14	2.2	2.3	1.7	1.2	1.1
March 21	2.4	2.5	1.6	1.8	1.7
March 28	2.5	2.4	1.6	1.6	1.6
April 4	2.5	2.3	1.2	(a)	(a)

a Water over top of ice.

Rating table for Dead River near The Forks, Maine, for 1902 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
0.50	110	1.50	1,225	2.50	2,780	3.50	4,990
0.60	185	1.60	1,365	2.60	2,970	3.60	5,260
0.70	270	1.70	1,505	2.70	3,160	3.70	5,540
0.80	365	1.80	1,650	2.80	3,360	3.80	5,830
0.90	470	1.90	1,795	2.90	3,570	3.90	6,130
1.00	580	2.00	1,945	3.00	3,790	4.00	6,430
1.10	700	2.10	2,100	3.10	4,010	4.20	7,060
1.20	825	2.20	2,260	3.20	4,240	4.40	7,730
1.30	955	2.30	2,430	3.30	4,480	4.60	8,420
1.40	1,090	2.40	2,600	3.40	4,730	4.80	9,140

NOTE.—The above table is applicable only for open-channel conditions. It is based on nineteen discharge measurements made during 1903–1906, and is well defined between gage heights 0.7 foot and 2.0 feet.

Monthly discharge of Dead River near The Forks, Maine, for 1906.

[Drainage area, 870 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (10-30)	8,600	2,520	4,590	5.27	4.12
May	8,960	2,970	5,940	6.82	7.86
June	6,280	890	2,590	2.98	3.32
July	1,650	418	867	.997	1.15
August	418	148	292	.336	.39
September	417	227	337	.387	.43
October	2,020	227	934	1.07	1.23
November	1,090	525	701	.806	.90
December (1-13)	890	525	756	.869	.42

NOTE.—Values are rated as follows: April to September, good; October to December, excellent.

CARRABASSETT RIVER AT NORTH ANSON, ME.

This station was established October 19, 1901. It is located above Embden Brook and below Anson Brook. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 68, and in Water-Supply Paper No. 198, where are given also data for previous years. Length of chain after September 7, 1906, 36.63 feet.

A measurement was made September 7, 1906, by F. E. Pressey, with the following results:

Width, 94 feet; area, 74 square feet; gage height, 0.06 feet; discharge, 107 second-feet.

Daily gage height, in feet, of Carrabassett River at North Anson, Me., for 1906.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.9	3.0	1.5	0.5	1.1	0.3	0.1	0.9	0.9
2	2.7	4.0	1.4	.5	1.0	.2	.0	.8	.4
3	2.4	3.5	1.7	.6	.7	.3	.0	.8	.9
4	2.3	3.8	1.7	.6	.5	.6	.2	.8	1.1
5	2.5	3.5	1.4	.7	.4	.5	.2	.7	1.3
6	3.0	3.1	1.3	.7	.4	.3	.3	.7	1.4
7	3.3	3.2	2.0	.9	.3	.1	.4	.6	1.4
8	2.9	2.8	1.9	.7	.2	.1	.2	.7	1.5
9	2.8	2.3	1.8	.6	.1	.1	.5	.5	1.3
10	2.9	4 1	1.8	.9	.2	.2	4 0	.5	1.1
11	2.7	3.6	1.4	.8	.1	.4	3.1	.5	1.0
12	2.5	2.7	1.2	1.6	.1	.2	2.2	.6	.9
13	2.4	2.3	1.3	1.2	.1	.1	1.5	.6	1.0
14	2.3	2.6	1.1	1.0	.0	.0	1.1	.6	.9
15	3.0	1.9	.8	.8	.2	.1	.9	.5	.9
16	5.1	1.8	.7	.6	.0	—.1	.8	.6	.9
17	5.5	1.8	.6	.5	.0	—.1	.7	.7	.9
18	5.1	2.2	.6	.5	.0	.0	.5	.6	.9
19	4.8	2.2	.7	.7	.0	.0	.5	.7	1.0
20	4.8	2.1	.6	.5	.0	.0	.6	1.4	1.0
21	4.8	1.5	.6	.4	.0	.0	.8	1.2	1.1
22	4.9	1.4	.3	.9	.5	—.1	.7	1.2	1.4
23	5.1	1.3	.4	.7	.3	.0	.8	1.2	1.8
24	3.4	1.3	2.3	1.3	.3	.1	.7	1.1	2.1
25	2.8	1.3	1.8	1.0	.3	.0	.7	1.1	1.9
26	2.7	1.8	1.3	.7	.2	—.1	3.5	1.1	1.9
27	2.6	1.8	1.2	.6	.1	.0	2.4	.9	1.8
28	2.5	3.2	.7	.4	1.7	.0	2.2	.8	1.8
29	2.8	3.0	.6	.4	.9	.0	2.1	1.0	1.8
30	3.3	2.3	.6	.3	.5	.0	1.6	.6	1.7
31	....	1.8	....	1.7	.4	....	1.1	....	1.5

NOTE.—River frozen January 1 to April 16, when ice broke up; river clear of ice April 18.

Rating table for Carrabassett River near North Anson, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
−0.10	77	1.10	595	2.30	1,690	4.00	3,750
.00	92	1.20	675	2.40	1,795	4.20	4,020
.10	110	1.30	755	2.50	1,900	4.40	4,290
.20	133	1.40	840	2.60	2,010	4.60	4,560
.30	160	1.50	925	2.70	2,120	4.80	4,830
.40	193	1.60	1,015	2.80	2,235	5.00	5,100
.50	233	1.70	1,105	2.90	2,350	5.20	5,370
.60	280	1.80	1,195	3.00	2,470	5.40	5,640
.70	335	1.90	1,290	3.20	2,710	5.60	5,910
.80	395	2.00	1,385	3.40	2,955		
.90	455	2.10	1,485	3.60	3,210		
1.00	520	2.20	1,585	3.80	3,480		

NOTE.—The above table is applicable only for open-channel conditions. It is the same as the 1905 table above gage height 1 foot. Below gage height 1 foot it is based on one measurement made during 1906, and probably represents closely the conditions of flow as they existed during that year.

Monthly discharge of Carrabassett River at North Anson, Me., for 1906.

[Drainage area, 340 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April a	5,780	1,690	2,980	8.75	9.76
May	3,880	755	1,960	5.77	6.65
June	1,690	160	708	2.08	2.32
July	1,100	160	389	1.14	1.31
August	1,100	92	215	.632	.73
September	280	77	119	.350	.39
October	3,750	92	774	2.28	2.63
November	840	233	408	1.20	1.34
December	1,480	193	759	2.23	2.57

a Open-channel rating was applied April 1 to 18 which probably gave daily discharges somewhat in excess of their true values.

NOTE.—Values are rated as follows: April, August, September, and December fair; remainder of period good.

SANDY RIVER NEAR MADISON, ME.

This station was established March 23, 1904, by F. E. Pressey. It is located at the dam of the Madison Electric works, just over the town line in Stark, but is nearer the Madison post-office. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 71, and in Water-Supply Paper No. 198, where are given also data for previous years.

Daily discharge, in second-feet, of Sandy River near Madison, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Oct.	Nov.	Dec.
1	231	539	593	1,223	2,458	2,478		244	396
2	231	467	595	1,292	2,761	2,353		266	194
3	200	374	517	1,050	2,252	3,747		312	246
4	229	372	363	1,141	2,252	3,203		397	339
5	263	361	444	1,711	1,609	2,312		322	304
6	286	407	360	2,882	2,974	2,166		243	279
7	236	491	339	2,985	2,901	3,219		206	359
8	286	595	326	2,243	2,741	2,994		213	373
9	373	555	303	2,371	2,607	3,391		213	393
10	429	564	321	2,280	4,050	2,788	346	256	270

*Daily discharge, in second-feet, of Sandy River near Madison, Me., for 1906—*Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Oct.	Nov.	Dec.
11...................	304	478	182	1,727	3,584	2,520	933	329	304
12...................	351	565	294	1,748	2,780	2,067	516	295	304
13...................	339	698	229	1,862	2,576	1,536	310	311	339
14...................	294	582	406	2,813	2,830	1,202	216	334	304
15...................	229	442	453	6,018	2,124	906	140	300	281
16...................	317	373	384	8,844	1,757	688	127	300	324
17...................	491	296	320	8,497	1,629	656	113	369	259
18...................	555	208	222	7,304	1,902	601	99	381	282
19...................	530	274	252	6,312	2,246	601	91	492	271
20...................	469	273	262	5,972	1,720	594	108	983	222
21...................	418	274	192	4,954	1,502	497	204	919	260
22...................	406	294	183	5,791	1,174	638	264	743	489
23...................	715	327	159	4,840	974	1,556	169	871	591
24...................	2,655	419	166	3,319	868	4,212	154	635	482
25...................	2,540	423	144	2,620	944	3,089	368	477	544
26...................	1,736	361	191	2,574	565	2,355	1,614	479	459
27...................	1,505	442	252	2,274	4,280	1,338	806	667	435
28...................	1,000	504	443	2,503	4,787	890	804	583	405
29...................	732	....	1,070	2,503	5,082	677	711	428	353
30...................	627	....	1,388	2,504	3,611	608	516	303	350
31...................	567	....	1,406	....	2,607	....	335	....	306

NOTE.—Flashboards 1.33 feet high were used for two-thirds of the length of the dam May 5 to June 30. From July 1 to October 9 repairs of dam and construction of a log way were in progress and no records are available.

Monthly discharge of Sandy River near Madison, Me., for 1906.

[Drainage area, 650 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January........................	2,660	200	630	0.969	1.12
February.......................	698	208	427	.657	.68
March..........................	1,410	144	412	.634	.73
April..........................	8,840	1,050	3,470	5.34	5.96
May............................	5,080	565	2,460	3.78	4.36
June...........................	4,210	497	1,860	2.86	3.19
October (10-31)................	1,610	91	407	.626	.51
November.......................	983	206	429	.660	.74
December.......................	591	194	346	.532	.61

NOTE.—During February to March the values of monthly discharge are only approximate, owing to accumulation of ice on dam crest. During the remainder of the period discharges under about 500 second-feet vary from good to approximate; above 500 second-feet they are good.

COBBOSSEECONTEE STREAM AT GARDINER, ME.

Records of the flow of Cobbosseecontee Stream have been kept at the plant of the Gardiner Water Power Company since 1890, and these records have been furnished to the Survey by S. D. Warren & Co., through Mr. Joseph A. Warren.

The dam, which is the uppermost of eight on the last three-fourths mile of the river just before it enters the Kennebec, is of stone masonry with a timber apron at the toe. The downstream face has an approximate slope of one horizontal to four vertical. The crest is horizontal and is about 6 feet wide. The upstream slope is about one vertical to eight horizontal. The total length of the dam is about 100 feet, and flashboards 4.5 feet high are maintained continuously. The total head obtained is about 10 feet. The head-bay entrance is on

the right bank and from this runs a wooden penstock in which is situated a 39-inch Hercules wheel. In the head bay there is also a gatehouse with two gates which are kept partially open most of the time to regulate the proper flow down the river.

The records of flow are made up by considering:

(1) The flow over the dam—which is nothing except usually for a short time in the spring.

(2) The flow through the gates, which is regulated by means of tables drawn up for the company by Hiram F. Mills, showing the discharge through the two gates for different pond levels. The practical application of this method is to obtain a given flow at any time by setting these gates at the required gate opening, taking into account the flow through the wheel.

(3) The flow through the 39-inch wheel, which is ascertained from this gate opening and pond level, a table also being provided for this purpose by Mr. Mills.

The water pumped for the Gardiner supply is neglected in computations, being a small percentage of the flow. It is also assumed that the tail-water level remains constant. The leakage by the dam was measured during 1905 and found to be 10 second-feet. Since that time records have been corrected accordingly. On Sundays and legal holidays gates are closed and no water is allowed to run unless the lake is full.

It is considered that the estimates of flow at this point are ordinarily correct within 5 per cent. The very low water estimates may be in error as much as 10 per cent or more.

The conditions at this station are described in Water-Supply Paper No. 165, page 74, and in Water-Supply Paper No. 198, where are given also data for previous years.

Daily discharge, in second-feet, of Cobbosseecontee Stream at Gardiner, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	195	220	260	10	795	1,100	440	735	285	280	280	275
2	195	230	260	270	722	1,080	600	780	10	280	280	10
3	195	250	260	270	724	1,020	670	380	285	280	280	275
4	195	250	10	270	724	860	660	300	285	280	10	275
5	195	250	270	270	592	650	360	10	285	280	280	275
6	195	265	265	270	294	510	300	290	285	280	280	275
7	10	265	270	270	300	630	285	290	285	10	280	275
8	195	265	270	10	582	645	10	290	285	280	280	275
9	195	265	270	270	567	620	280	285	10	280	280	10
10	195	265	270	270	545	610	275	285	290	280	280	275
11	195	10	10	610	535	585	275	285	290	280	10	275
12	195	265	270	625	381	460	275	10	290	280	280	275
13	195	265	270	625	320	350	275	285	290	280	280	275
14	10	265	270	625	290	346	275	285	290	10	280	270
15	210	265	270	625	290	310	10	285	290	280	280	270
16	210	265	270	1,010	290	290	275	285	10	280	280	10
17	210	280	270	1,049	285	16	275	285	290	280	280	270
18	210	10	10	757	280	290	275	285	290	280	10	270
19	210	280	270	516	280	290	275	10	290	280	280	270
20	210	280	270	547	10	280	275	285	290	280	280	270

Daily discharge, in second-feet, of Cobbosseecontee Stream at Gardiner, Me., for 1906.—
Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	10	280	270	677	280	280	275	290	290	10	280	270
22	210	280	270	800	280	280	10	290	290	280	280	270
23	210	280	270	800	280	280	275	290	10	280	286	10
24	303	270	270	800	280	260	720	290	280	280	280	270
25	303	10	10	1,040	275	985	910	290	280	280	10	10
26	284	260	270	1,026	275	1,280	880	10	280	280	280	270
27	284	260	270	1,051	10	1,160	760	290	280	280	275	270
28	250	260	270	1,061	310	980	450	290	280	10	275	270
29	236	....	270	1,000	717	310	15	285	280	280	160	270
30	216	....	270	867	970	324	400	285	10	280	275	10
31	210	....	270	....	1,110	....	640	285	....	280	....	270

NOTE.—Leakage of dam taken at 10 second-feet, as determined by measurements during 1905.

Monthly discharge of Cobbosseecontee Stream at Gardiner, Me., for 1906.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	303	10	198	0.825	0.95
February	280	10	236	.983	1.02
March	270	10	235	.979	1.13
April	1,060	10	610	2.54	2.83
May	1,110	10	436	1.82	2.10
June	1,280	16	569	2.37	2.64
July	910	10	377	1.57	1.81
August	780	10	285	1.19	1.37
September	290	10	240	1.00	1.12
October	280	10	245	1.02	1.18
November	280	10	240	1.00	1.12
December	275	10	221	.921	1.06
The year	1,280	10	324	1.35	18.33

NOTE.—For accuracy see station description.

ANDROSCOGGIN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Androscoggin River is formed by the junction of Magalloway River and the outlet of the Umbagog-Rangeley lakes, near the Maine-New Hampshire boundary line. For about 35 miles it flows southward into the State of New Hampshire, then turns abruptly to the east and flows into the State of Maine, then turns to the south and joins the Kennebec in Merrymeeting Bay. The last fall on the Androscoggin is at Brunswick, Me., above which place the drainage area is 3,470 square miles, about 80 per cent of this being in Maine. The greatest length of the basin is 110 miles, the greatest width 70 miles, while the river itself measures about 200 miles in length from the sources of Magalloway River to the coast. The drainage areas of the river and of some of its chief tributaries are given in Water-Supply Paper No. 165, page 75.

RIVER SURVEYS IN ANDROSCOGGIN DRAINAGE.

In order to point out the power and storage possibilities in the Androscoggin River drainage basin, surveys have been made as follows: A survey for the determination of the profile only was made from tide-water to Livermore Falls. A survey for the determination of the profile and plan of the river has been made from Livermore Falls to Errol dam at the outlet of Umbagog Lake.

From the data collected, sheets have been prepared showing, as far as available, profile of water surface, plan of the river, contours along the banks, and prominent natural or artificial features. The results of these surveys have been published on sheets and may be had on application to the Director of the Geological Survey.

ANDROSCOGGIN RIVER AT SHELBURNE, N. H.

This station was established May 30, 1903. It is located at the steel highway bridge about one-half mile north of the railway station at Shelburne, N. H. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 76, where are given also references to publications that contain data for previous years. Length of chain on April 30, 1906, was 20.67 feet.

Discharge measurements of Androscoggin River at Shelburne, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 30	T. W. Norcross	394	1,730	5.98	5,100
June 5	F. E. Pressey	394	1,920	6.18	6,110
August 23	G. M. Brett	390	966	4.12	1,600

Daily gage height, in feet, of Androscoggin River at Shelburne, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		4.85		4.05	6.4	6.9	4.7	4.1	4.1	4.1	4.05	4.15
2		5.45		4.15	6.3	7.0	4.65	4.1	4.0	4.1	4.0	5.7
3				4.2	6.4	7.0	4.6	4.1	4.2	4.1	3.95	6.4
4			5.8	4.15	6.2	6.6	4.6	4.15	4.1	4.15	3.9	6.85
5				4.1	6.5	6.2	4.7	3.6	4.1	4.1	4.0	
6				4.05	6.4	6.3	4.55	4.05	4.2	4.1	4.0	
7	6.3			4.05	6.7	6.95	4.5	4.2	4.1	4.1	3.95	
8				3.9	6.7	6.9	4.4	4.1	4.15	4.1	3.95	
9				4.05	7.05	6.7	4.5	4.2	4.05	4.1	4.0	6.8
10				4.0	7.55	6.5	4.4	4.2	4.2	4.15	4.15	
11		6.9	5.7	4.05	7.25	6.5	4.4	4.1	4.15	4.15	4.2	
12				3.95	6.95	6.35	4.35	3.7	4.1	4.1	4.1	
13				4.05	7.8	6.05	4.3	4.1	4.1	4.0	4.05	
14	6.2			4.05	7.5	5.8	4.25	4.1	4.1	3.95	4.1	
15				5.05	7.15	5.65	3.9	4.2	4.1	4.05	4.2	
16				5.75	7.0	5.6	4.2	4.1	4.0	4.05	4.2	7.2
17				5.8	7.05	5.5	4.3	4.2	4.0	4.15	4.2	
18		6.8	5.7	5.85	7.0	5.4	4.2	4.2	4.1	4.1	4.1	
19				5.85	7.5	5.3	4.3	3.5	4.05	4.0	4.2	
20				5.85	7.4	5.2	4.3	4.4	4.1	4.0	4.15	

Daily gage height, in feet, of Androscoggin River at Shelburne, N. H., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	6.25			6.35	7.2	5.2	4.2	4.25	4.0	4.0	4.1	
22				6.45	7.0	5.05	3.75	4.2	4.1	4.1	4.1	
23	7.1			6.35	6.8	5.2	4.05	4.1	4.0	4.0	4.05	7.05
24	7.9			5.95	6.6	5.8	4.2	4.1	4.1	4.0	4.05	
25	7.3	6.9	5.4	5.85	6.9	5.5	4.2	4.1	4.0	4.2	3.95	
26	6.35			5.7	7.6	5.1	4.3	3.6	4.1	4.1	4.05	
27	5.7			5.75	8.1	5.0	4.2	4.45	4.1	4.1	4.05	
28	4.85			6.05	8.3	4.9	4.15	4.75	4.0	4.0	4.0	
29	5.2		4.6	5.75	7.7	4.8	3.5	4.45	4.05	4.1	4.15	
30	5.1		4.45	6.1	7.3	4.8	4.05	4.1	3.95	4.0	4.25	6.9
31	4.75		4.35		7.0		4.05	4.15		4.0		

NOTE.—The following ice conditions prevailed during 1906: River frozen over January 1 to 23; clear of ice January 24 to February 2; frozen over February 3 to March 28; clear of ice the afternoon of March 29. River frozen over December 5 to 31. During the frozen period gage heights were taken to water surface through a hole cut in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	Feet.	Feet.		Feet.	Feet.	Feet.
January 7	6.3	6.5	0.95	March 11	5.7	5.95	1.05
January 14a	6.2	6.35	1.25	March 18d	5.7	5.85	1.45
January 21	6.25	6.4	1.3	March 25d	5.4	5.6	1.65
January 23b	7.1			March.29e	4.6		
February 11c	6.9	6.95	.85	December 2-4e			
February 18	6.8	6.9	1.05	December 9	6.8	7.0	.8
February 25b	6.9			December 16g	7.2		
March 4d	5.8	5.9	.8	December 23	7.05	7.4	1.5
				December 30	6.9	7.1	1.4

a Left channel partly open.
b Water flowing over ice.
c Possible backwater from ice jam 1,000 feet below gage. About 6 inches of snow on ice.
d Left channel open.
e River open at gage; one reading.
f Backwater due to anchor ice below gage.
g Water about 1 foot deep flowing over ice.

Rating table for Androscoggin River at Shelburne, N. H., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
3.50	740	4.70	2,290	5.90	4,970	7.10	8,240
3.60	820	4.80	2,480	6.00	5,225	7.20	8,530
3.70	905	4.90	2,680	6.10	5,480	7.30	8,830
3.80	998	5.00	2,890	6.20	5,740	7.40	9,130
3.90	1,100	5.10	3,105	6.30	6,000	7.50	9,430
4.00	1,212	5.20	3,325	6.40	6,265	7.60	9,730
4.10	1,336	5.30	3,545	6.50	6,535	7.70	10,030
4.20	1,472	5.40	3,775	6.60	6,810	7.80	10,330
4.30	1,618	5.50	4,005	6.70	7,090	7.90	10,630
4.40	1,774	5.60	4,240	6 80	7,375	8.00	10,930
4.50	1,938	5.70	4,480	6.90	7,660	8.30	11,860
4.60	2,110	5.80	4,725	7.00	7,950		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906 and is well defined between gage heights 4.3 feet and 7.7 feet.

UPPER AND LOWER DAMS ON ANDROSCOGGIN RIVER AT RUMFORD FALLS, ME.

Monthly discharge of Androscoggin River at Shelburne, N. II., for 1906.

[Drainage area, 1,500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	6,400	1,100	3,270	2.18	2.43
May	11,900	5,740	8,200	5.47	6.31
June	7,950	2,480	4,970	3.31	3.69
July	2,290	740	1,620	1.08	1.24
August	2,380	740	1,390	.927	1.07
September	1,470	1,160	1,310	.873	.97
October	1,470	1,160	1,300	.867	1.00
November	1,540	1,100	1,310	.873	.97

NOTE.—Values are rated as follows: April to June, good; July to November, fair, owing to measurement of August 23 indicating a possible change in conditions of flow.

ANDROSCOGGIN RIVER AT RUMFORD FALLS, ME.

The discharge of Androscoggin River at Rumford Falls since 1892 has been computed by Charles A. Mixer, resident engineer of the Rumford Falls Power Company. These statistics are obtained by adding the actual measured quantities passing through the wheels to the computed flow over the dam, using the customary Francis weir formula with modified coefficient. A view of the upper and lower dams is shown in Pl. IV. The conditions at the station are described in Water-Supply Paper No. 165, page 80, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Androscoggin River at Rumford Falls, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,861	2,582	1,459	1,863	8,285	8,089	3,760	2,221	1,683	1,419	1,560	1,610
2	1,842	2,384	1,524	1,684	7,864	8,412	3,379	1,990	1,529	1,423	1,514	987
3	1,637	1,850	1,579	1,832	7,523	8,484	3,124	1,879	1,359	1,467	1,429	918
4	1,673	1,808	1,480	1,903	8,018	7,160	2,252	1,813	2,082	1,426	1,429	1,078
5	1,839	1,805	1,277	2,384	7,603	6,272	3,068	1,675	2,137	1,421	1,294	1,086
6	1,982	1,970	1,471	3,142	7,819	6,196	2,927	1,703	1,848	1,513	1,380	1,207
7	1,794	1,850	1,378	2,697	7,493	9,157	2,578	1,867	1,680	1,448	1,348	1,222
8	1,663	1,857	1,368	2,428	7,502	8,086	2,128	1,887	1,618	1,528	1,403	1,192
9	1,638	1,835	1,352	2,485	7,888	7,924	2,371	1,779	1,548	1,670	1,365	1,156
10	1,492	1,844	1,278	2,364	11,312	7,467	2,511	1,767	1,540	3,328	1,430	1,102
11	1,602	1,846	1,200	2,270	10,202	7,342	3,071	1,715	1,590	2,885	1,370	1,252
12	1,636	1,734	1,154	2,366	8,463	6,740	2,811	1,649	1,500	2,266	1,454	1,203
13	1,727	1,855	1,235	2,480	9,803	5,953	2,430	1,518	1,473	2,066	1,567	1,238
14	1,738	1,784	1,186	3,366	9,956	5,215	2,186	1,605	1,461	1,939	1,435	1,266
15	1,611	1,788	1,186	5,993	8,804	4,671	1,908	1,473	1,406	1,892	1,403	1,284
16	1,779	1,732	1,162	11,513	7,922	4,393	1,630	1,454	1,373	1,913	1,505	1,266
17	1,847	1,769	1,150	10,085	8,043	4,141	2,200	1,442	1,340	1,848	1,484	1,292
18	1,840	1,689	1,141	9,009	8,541	6,387	2,695	1,467	1,402	1,799	1,373	1,432
19	1,779	1,661	1,111	8,716	9,476	5,466	2,195	1,368	1,335	1,758	2,060	1,346
20	1,747	1,784	1,186	9,033	8,419	4,625	1,986	1,208	1,326	1,959	2,855	1,326
21	1,731	1,724	1,136	9,421	7,194	4,059	2,246	1,910	1,299	2,230	2,406	1,340
22	2,027	1,845	1,148	10,961	7,214	3,658	2,424	1,690	1,403	2,009	2,238	1,404
23	3,612	2,043	1,129	9,960	7,079	4,122	2,353	1,576	1,433	1,715	2,187	1,498
24	7,749	1,913	1,164	7,254	6,654	7,243	2,308	1,611	1,516	1,628	1,842	1,404
25	4,908	1,788	1,115	6,191	7,843	6,746	2,114	1,660	1,582	2,275	1,638	1,378
26	3,636	1,653	1,050	5,564	9,851	5,111	2,146	1,500	1,506	3,248	1,233	1,217
27	3,296	1,772	1,225	5,802	11,274	4,442	1,957	2,046	1,454	2,540	1,888	1,393
28	3,142	1,578	1,598	6,167	15,443	4,008	1,899	3,579	1,428	2,223	1,859	1,420
29	2,846	....	2,318	6,410	14,310	3,684	1,738	2,707	1,519	2,112	1,399	1,461
30	2,548	....	2,330	7,003	10,158	3,668	2,070	2,012	1,391	1,862	1,239	1,417
31	2,551	....	2,138	....	8,460	....	2,595	1,754	....	1,637	....	1,362

Monthly discharge of Androscoggin River at Rumford Falls, Me., for 1906.

[Drainage area, 2,090 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	7,750	1,490	2,350	1.12	1.29
February	2,580	1,580	1,850	.885	.92
March	2,330	1,050	1,360	.651	.75
April	11,500	1,680	5,410	2.59	2.89
May	15,400	6,650	8,920	4.27	4.92
June	9,160	3,660	5,960	2.85	3.18
July	3,760	1,630	2,420	1.16	1.34
August	3,580	1,210	1,790	.856	.99
September	2,140	1,300	1,530	.732	.82
October	3,330	1,420	1,950	.933	1.08
November	2,860	1,230	1,620	.775	.86
December	1,500	918	1,280	.612	.71
The year	15,400	918	3,040	1.45	19.75

ANDROSCOGGIN RIVER AT DIXFIELD, ME.

This station was established August 22, 1902. It is located about one-half mile west of Dixfield, at the highway bridge on the road to West Peru. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 82, where are given also references to publications that contain data for previous years.

Discharge measurements of Androscoggin River at Dixfield, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 3	F. E. Pressey	496	3,220	10.24	9,250
June 7	....do	487	2,970	9.71	7,140
September 10 [a]	H. K. Barrows	356	1,130	7.64	1,620

[a] By wading in two channels.

Daily gage height, in feet, of Androscoggin River at Dixfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.9	10.0			10.45	10.45	9.15	8.3	7.8	7.75	7.85	7.8
2	8.1			7.8	10.45	10.4	9.0	8.2	7.8	7.75	7.8	7.4
3	[a]8.6		9.3	8.0	10.4	10.6	8.75	8.05	7.75	7.7	7.8	7.65
4	[a]10.25			8.0	10.2	10.25	8.5	8.0	8.05	7.8	7.85	[b]8.4
5	[a]9.7			8.2	10.2	9.95	8.75	8.0	8.2	7.75	7.8	[b]8.5
6	[a]9.05			8.6	10.3	9.7	8.65	7.85	8.05	7.7	7.8	
7	8.4			8.8	10.25	10.5	8.45	7.95	7.95	7.75	7.7	
8	8.7	10.6	9.1	8.4	10.2	10.6	8.25	8.0	7.85	7.9	7.7	8.7
9			8.9	8.4	10.35	10.4	8.35	8.0	7.9	7.85	7.8	8.7
10	[c]8.9			8.25	11.3	10.4	8.55	8.0	7.8	8.75	7.75	
11			8.9	8.15	11.0	10.2	8.8	8.0	7.9	8.8	7.7	
12				8.3	10.5	10.1	8.8	7.85	7.85	8.3	7.8	
13	[c]8.9			8.3	10.7	9.85	8.45	7.9	7.8	8.1	8.0	
14				8.85	10.95	9.6	8.25	7.9	7.8	8.15	7.85	
15				9.5	10.6	9.4	8.15	7.75	7.7	7.95	7.75	
16				11.45	10.4	9.25	8.0	7.75	7.75	8.15	7.85	8.6
17		10.2	8.6	11.3	10.3	9.25	8.15	7.75	7.65	8.1	7.75	
18				11.0	10.5	9.6	8.55	7.75	7.7	8.05	7.85	
19				10.85	10.65	9.7	8.3	7.7	7.7	8.0	7.75	
20	9.1			10.75	10.4	9.45	8.05	7.8	7.65	8.05	8.1	

[a] Ice in channel causes the high water.
[b] Anchor ice causes back water.
[c] To top of ice about 0.3 foot thick.

Daily gage height, in feet, of Androscoggin River at Dixfield, Me., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21				10.9	10.2	9.25	8.3	8.0	7.7	8.4	8.35	
22				11.2	10.15	9.0	8.55	8.0	7.7	8.2	8.3	
23	14.1			11.15	10.1	9.2	8.4	7.9	7.85	8.1	8.25	8.7
24	a15.05	9.3	8.0	10.55	10.05	10.3	8.3	7.9	7.75	7.95	8.15	
25	14.25			10.05	10.15	10.2	8.1	7.9	7.8	8.05	8.05	
26	13.05			9.8	10.8	9.6	8.05	7.8	7.8	9.05	7.95	
27	12.65			9.75	10.95	9.35	8.0	7.75	7.8	8.55	7.95	
28	11.45	9.3		9.75	12.3	9.15	8.0	8.9	7.7	8.40	7.95	
29			8.5	9.95	12.15	8.95	7.95	8.6	7.75	8.2	7.9	
30			8.5	10.1	11.15	8.95	7.9	8.2	7.75	8.15	b7.7	8.8
31			8.3		10.6		8.5	7.95		8.0		

a Ice jam below, open at gage. b Anchor ice running.

NOTE.—The following ice condition prevailed during 1906: River open January 1 to 8; frozen over at gage January 9 to January 23; open at gage January 24 to 28; frozen over January 29 to March 28; open at gage March 29; clear of ice about April 1; frozen over December 6 to 31. During the frozen period gage heights were taken to the water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 20	9.1	9.2	0.5	March 9	8.9	8.9	0.8
January 23	14.1	14.1		March 11	8.9	8.9	.8
February 1	10.0	10.3	.8	March 17	8.6	8.7	.75
February 8	10.6	10.7	1.1	March 24	8.0	8.1	.6
February 17	10.2	10.3	.6	December 8	8.7	9.0	.7
February 24	9.3	9.3	.5	December 9	8.7	9.0	.7
February 28	9.3	9.3	.5	December 16	8.6	8.6	1.1
March 3	9.3	9.4	.7	December 23	8.7	8.8	1.4
March 8	9.1	9.1	.8	December 30	8.8	8.9	1.2

Rating table for Androscoggin River at Dixfield, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
7.70	1,660	8.80	3,970	9.90	7,870	11.00	12,800
7.80	1,790	8.90	4,270	10.00	8,280	11.10	13,300
7.90	1,940	9.00	4,580	10.10	8,700	11.20	13,810
8.00	2,100	9.10	4,900	10.20	9,130	11.40	14,840
8.10	2,280	9.20	5,230	10.30	9,560	11.60	15,880
8.20	2,480	9.30	5,580	10.40	10,000	11.80	16,940
8.30	2,690	9.40	5,940	10.50	10,450	12.00	18,000
8.40	2,910	9.50	6,310	10.60	10,900	12.20	19,060
8.50	3,150	9.60	6,690	10.70	11,360	12.40	20,130
8.60	3,410	9.70	7,080	10.80	11,830		
8.70	3,680	9.80	7,470	10.90	12,310		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 12 discharge measurements made during 1903–1906 and is well defined below gage heights 11.0 feet.

Monthly discharge of Androscoggin River at Dixfield, Me., for 1906.

[Drainage area, 2,230 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	15,100	1,790	6,940	3.11	3.47
May	19,600	8,490	11,000	4.93	5.68
June	10,900	4,420	7,540	3.38	3.77
July	5,060	1,940	2,950	1.32	1.52
August	4,270	1,660	2,120	.951	1.10
September	2,480	1,600	1,810	.812	.491
October	4,740	1,660	2,380	1.07	1.23
November	2,800	1,660	1,950	.874	.98

NOTE.—Values are rated as follows: April to June, excellent; July to November, good.

PRESUMPSCOT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Presumpscot River is one of the most interesting as well as one of the best water-power streams of its size in the United States. It is the outlet of Sebago Lake, which lies about 17 miles northwest of Portland. The lake is fed by Crooked River, a stream heading 35 miles farther north and within 3 miles of the Androscoggin. The area of the lake is 46 square miles; the total water surface on the drainage basin is 97 square miles; the area of the drainage basin at the outlet of the lake is 420 square miles, and at the mouth of the river 600 square miles.

According to the survey made by Joseph A. Warren, of Cumberland Mills, the fall from the crest of the stone dam at the foot of Sebago Lake to mean low tide at the foot of the lower falls is 265.16 feet in a distance of 21.65 miles, or an average of 12.25 feet per mile.

During the past few years several new developments have been made along the river, so that the only portion now unimproved is the fall of 56 feet between Great Falls and Gambo Falls.

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

The chief interest attaching to the river is its regularity of flow which is due to dams at the outlet of the lake. Nowhere in the United States is there a better example of the success of storage of water and regulation of the flow of a stream than on the Presumpscot.

PRESUMPSCOT RIVER AT OUTLET OF SEBAGO LAKE, MAINE.

Since January, 1887, the flow from Sebago Lake has been regularly recorded, the quantity being deduced during most of this time from the openings in the gates at the dam, the discharging capacity of which under different conditions of head has been determined and tabulated by Hiram F. Mills, of Lowell. A continuous record of the Sebago Lake level has been kept since January, 1872, and the records of lake level and discharge make an unusually complete and valuable series of data. These have been furnished from time to time by S. D. Warren & Co. The conditions at this station are described in Water-Supply Paper No. 165, page 85, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Presumpscot River, at outlet of Sebago Lake, Maine, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	450	543	555	392	540	484	507	553	712	766	705	519
2	490	578	668	548	540	510	634	582	358	766	705	406
3	483	597	655	550	540	380	648	750	724	766	705	518
4	493	419	433	555	540	550	571	747	724	766	408	518
5	493	616	605	520	554	549	559	380	726	766	700	462
6	487	630	538	555	397	524	639	767	728	766	699	482
7	297	608	530	534	542	526	559	744	732	600	697	460
8	476	610	533	379	550	636	486	761	700	742	697	450
9	497	616	505	528	543	634	653	736	359	734	692	377
10	505	611	540	530	543	362	650	765	733	625	692	447
11	495	481	480	530	550	635	642	734	735	650	423	433
12	508	598	542	531	543	643	647	369	746	717	690	425
13	513	608	541	531	371	639	647	759	750	717	686	440
14	337	643	533	532	543	650	662	759	730	528	685	446
15	498	671	542	384	543	550	360	729	700	713	681	450
16	517	671	542	534	543	625	648	740	434	713	685	417
17	510	661	539	535	543	392	645	740	734	713	681	455
18	510	452	392	535	600	624	658	759	734	713	515	457
19	523	675	534	537	643	584	640	365	746	710	677	445
20	515	695	540	538	386	600	645	752	746	710	674	458
21	467	685	549	538	618	626	652	741	750	497	670	466
22	483	677	544	370	640	644	382	741	744	710	670	460
23	501	685	540	538	636	656	836	750	422	710	608	415
24	500	667	539	534	636	250	731	735	756	710	523	519
25	520	490	463	540	643	551	786	709	763	710	403	519
26	520	687	537	540	644	549	729	355	766	708	541	517
27	512	687	545	540	400	549	734	734	766	708	560	517
28	663	678	552	534	462	549	728	724	768	572	557	519
29	517	....	550	396	392	550	423	697	768	707	557	517
30	517	....	540	540	288	584	712	700	374	707	532	417
31	521	....	542	....	484	....	530	722	....	707	....	517

Monthly discharge of Presumpscot River at outlet of Sebago Lake, Maine, for 1906.

[Drainage area, 420 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	663	297	494	1.18	1.36
February	695	419	616	1.47	1.53
March	668	392	537	1.28	1.48
April	555	370	512	1.22	1.36
May	644	288	529	1.26	1.45
June	656	250	554	1.32	1.47
July	836	360	624	1.49	1.72
August	767	355	681	1.62	1.87
September	768	358	681	1.62	1.81
October	766	497	698	1.66	1.91
November	705	403	624	1.49	1.66
December	519	377	466	1.11	1.28
The year	836	250	585	1.39	18.90

SACO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Saco River receives its headwaters from the valleys and slopes of the White Mountains, at elevations of 4,000 to 5,000 feet. It drains an area of 1,720 square miles, of which 900 square miles lie in New Hampshire and the remainder in Maine. The slopes at the headwaters are very steep, with no lake storage. In the lower river are many good water powers, part of which are in use. The Great Falls, at Hiram, Me., are shown in Pl. V. (See also Pl. III, *B*.)

SACO RIVER NEAR CENTER CONWAY, N. H.

This station was established August 26, 1903. It is located at the wooden highway bridge between Center Conway and Redstone, N. H., about 2 miles from each place. The conditions and the bench marks are described in New Hampshire Forestry Reports for 1903–1906, and in Water-Supply Paper No. 165, page 87, where are given also references to publications that contain data for previous years. Elevation of bench mark, May 3, 1906, was 27.74 feet above datum of gage.

*Discharge measurements of Saco River near Center Conway, N. H., in 1906.*

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 3............	T. W. Norcross........................	228	896	6.23	2,110
August 20 *a*.....	G. M. Brett...........................	122	153	3.30	185
October 2 *b*......	F. E. Pressey.........................	125	134	3.27	144

a Right channel; measured by wading 300 feet below bridge.
b Right channel; measured by wading 230 feet below bridge.

Daily gage height, in feet, of Saco River near Center Conway, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1................		6.5	....	4.35	6.2	6.2	4.9	4.3	3.4	3.2	4.0	......
2................		5.7	....	4.2	6.3	6.45	4.8	4.05	3.55	3.2	3.9	......
3................			....	4.15	6.3	6.3	4.65	3.9	3.5	3.2	3.75	......
4................			....	4.3	6.45	5.25	4.65	3.8	3.5	3.25	3.8	......
5................			....	4.85	6.55	5.05	4.4	3.75	3.45	3.2	3.75	......
6................			....	5.25	6.55	5.8	4.35	3.7	3.4	3.2	3.7	......
7................	4.95		....	5.45	6.25	6.6	4.3	3.7	3.4	3.2	3.7	......
8................			....	4.7	6.7	6.2	4.3	3.7	3.35	3.5	3.7	......
9................			....	4.7	7.85	5.85	4.2	3.7	3.35	3.6	3.65	......
10................			....	4.65	6.35	5.3	4.2	3.7	3.3	3.55	3.7	......
11................		5.5	....	4.65	5.95	5.1	4.15	3.65	3.35	5.55	3.65	......
12................			....	4.8	6.1	4.95	4.1	3.6	3.45	4.9	3.75	......
13................			....	5.25	6.45	4.85	4.0	3.55	3.4	4.5	3.7	......
14................	5.3		....	5.4	6.4	4.65	3.95	3.5	3.45	4.45	3.75	......
15................			....	7.5	6.3	4.6	3.9	3.4	3.35	3.6	3.7	......
16................			....	9.25	6.55	4.5	3.9	3.4	3.3	3.55	3.65	......
17			....	7.8	6.6	4.5	3.85	3.35	3.3	3.55	3.65	......
18................		5.1	....	7.65	6.65	6.65	3.9	3.4	3.2	3.5	3.7	......
19................			....	7.6	6.75	5.65	3.85	3.35	3.2	3.5	3.9	......
20................			....	7.75	6.65	5.05	3.75	3.3	3.15	3.5	4.3	......
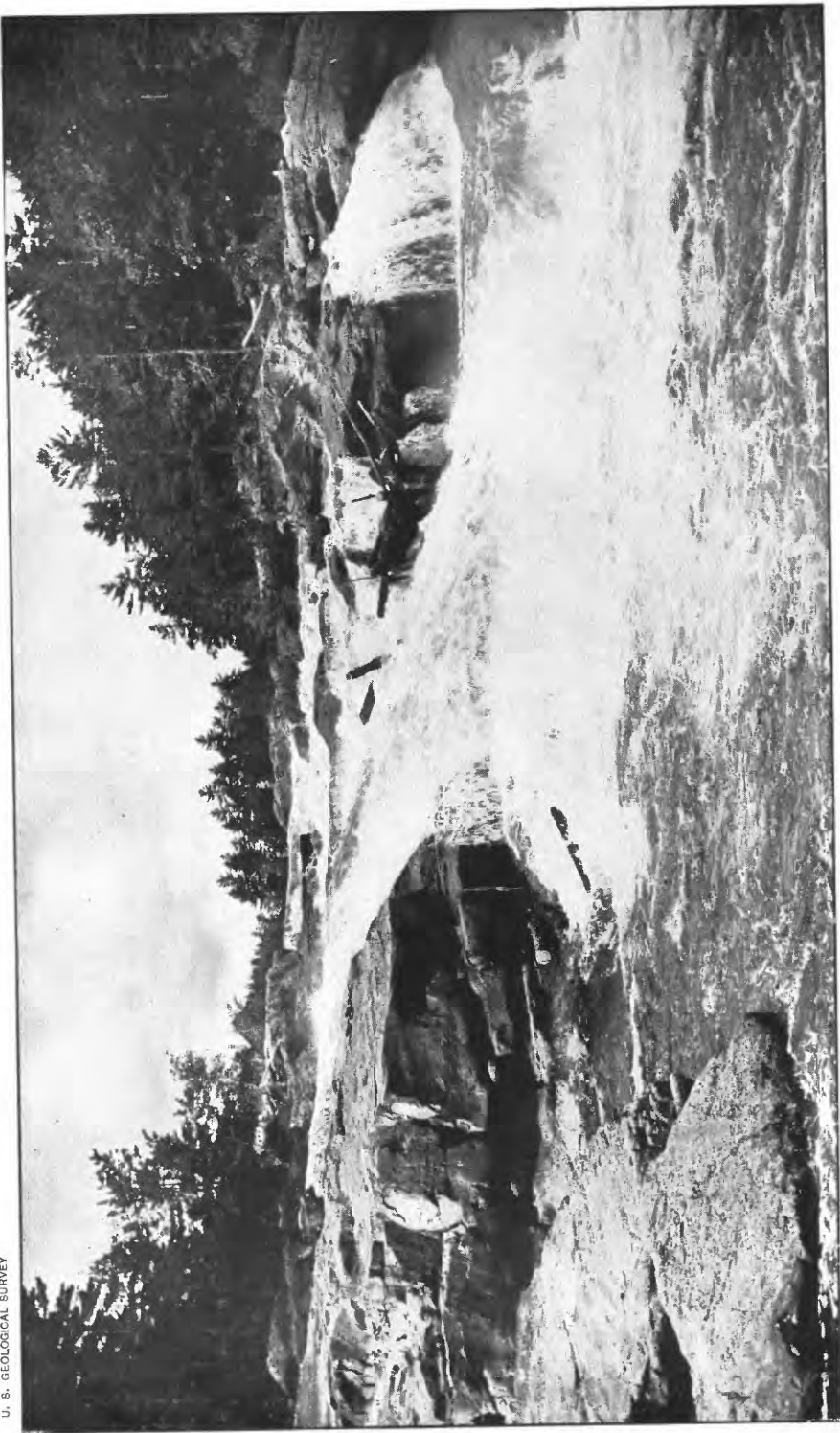
GREAT FALLS OF SACO RIVER AT HIRAM, ME.

Daily gage height, in feet, of Saco River near Center Conway, N. H., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21...............	5.1	......	......	7.8	5.05	4.9	3.9	3.3	3.1	4.45	4.25	......
22...............	......	......	......	6.2	4.9	4.6	5.1	3.35	3.05	4.1	4.2	......
23...............	......	......	......	6.0	4.85	5.0	4.3	3.4	3.2	3.6	4.1	......
24...............	......	......	......	6.0	4.8	6.65	4.25	3.45	3.2	3.55	4.1	......
25...............	9.0	......	......	6.05	5.05	5.9	4.1	3.5	3.2	3.9	4.1	......
26...............	6.65	......	......	6.25	5.4	5.35	3.85	3.4	3.15	5.7	4.1	......
27...............	6.25	......	......	6.55	5.75	4.9	3.7	3.45	3.2	4.55	4.1	......
28...............	6.2	......	......	6.55	7.45	4.75	3.75	4.5	3.2	4.25	4.15	......
29...............	6.35	......	4.85	6.55	8.7	5.05	3.65	4.05	3.2	4.2	4.2	......
30...............	6.8	......	4.65	6.5	7.0	5.3	4.6	3.7	......	4.1	......	......
31...............	6.75	......	4.5	......	6.6	......	4.95	3.45	......	4.0	......	......

NOTE.—The following ice conditions prevailed during 1906: River frozen January 1 to 25, except for small open-water area in left span just above gage; ice went out January 25; river frozen over again February 4. Narrow stretches of open water remained in left channel near gage for the rest of the winter and the ice was thin and weak. Ice went out the morning of March 29. River frozen December 1 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The follow-ing comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thick-ness of ice.	Date.	Water surface.	Top of ice.	Thick-ness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 7................	4.95	5.15	1.1	February 25...............	....	4.95	....
January 14...............	5.3	5.45	1.5	March 4.................	....	4.8	....
January 21...............	5.1	5.2	1.0	March 11................	....	4.25	....
February 4...............	....	6.1	(a)	March 18................	....	4.75	....
February 11..............	5.5	5.55	.65	March 25................	....	4.5	....
February 18..............	5.1	5.15	.8				

a Ice thin.

Rating table for Saco River near Center Conway, N. H., for 1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	100	4.20	504	5.40	1,272	7.20	3,030
3.10	115	4.30	557	5.50	1,349	7.40	3,285
3.20	133	4.40	612	5.60	1,428	7.60	3,555
3.30	154	4.50	669	5.70	1,509	7.80	3,835
3.40	178	4.60	728	5.80	1,592	8.00	4,120
3.50	206	4.70	789	5.90	1,677	8.20	4,425
3.60	238	4.80	852	6.00	1,764	8.40	4,740
3.70	274	4.90	917	6.20	1,950	8.60	5,060
3.80	314	5.00	984	6.40	2,150	8.80	5,395
3.90	358	5.10	1,053	6.60	2,355	9.00	5,735
4.00	404	5.20	1,124	6.80	2,570	10.00	7,600
4.10	453	5.30	1,197	7.00	2,795		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903-1906 and is well defined between gage heights 3.3 feet and 9.0 feet.

Monthly discharge of Saco River near Center Conway, N. H., for 1906.

[Drainage area, 385 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April..	6,180	479	1,950	5.07	5.66
May..	5,220	852	2,150	5.57	6.42
June...	2,410	669	1,320	3.43	3.83
July...	1,050	256	521	1.35	1.56
August..	669	154	261	.678	.78
September.......................................	222	108	157	.408	.46
October...	1,510	133	404	1.05	1.21
November..	557	256	363	.943	1.05

NOTE.—Values are rated as follows: April to June, excellent; July, August, October, November, good; September, fair.

MERRIMAC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Merrimac basin, which has a total drainage area of 5,015 square miles, lies in the States of New Hampshire and Massachusetts, 3,815 square miles being in the former State and 1,200 square miles in the latter. Merrimac River is formed at Franklin, N. H., by the junction of Pemigewasset and Winnepesaukee rivers. The headwaters of the Pemigewasset lie in the White Mountain region at elevations of, approximately, 2,000 feet; thence they flow southward through New Hampshire with very steep slopes. On this branch of the Merrimac there is very little lake storage. Squam and New Found lakes, aggregating about 20 square miles of surface area, are the only bodies of water of any importance. Above Plymouth probably 85 per cent of the basin is in heavy forest. A very insignificant amount of water power is utilized. Winnepesaukee River has its headwaters in the eastern part of the State. A prominent characteristic of its basin is the extent of the lake surface, aggregating 100 square miles. The fall from Winnepesaukee Lake to the junction with Pemigewasset River is 225 feet in a distance of 14 miles.[a]

From Franklin, Merrimac River flows southward through the State of New Hampshire for 56 miles, receiving Contoocook River from the west and Suncook River from the east. After entering Massachusetts the river deflects to the east and flows in an easterly and northeasterly direction for a distance of 40 miles, to Newburyport, where it enters an arm of the sea. Tide flows to Lawrence.

The drainage areas of Merrimac River and some of its principal tributaries are given in Water-Supply Paper No. 165, page 91.

MERRIMAC RIVER AT FRANKLIN JUNCTION, N. H.

This station was established July 8, 1903. It is located at the wooden railway bridge near Franklin Junction, about a mile below the union of Pemigewasset and Winnepesaukee rivers. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 91, where are given also references to publications that contain data for previous years.

Discharge measurements of Merrimac River at Franklin Junction, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	Sq. ft.	Feet.	Sec.-ft.
April 16	T. W. Norcross	270	3,750	15 98	23,300
April 17	.....do	270	2,840	12. 60	16,000
April 17	.....do	270	2,620	11.75	14,400
April 26	.....do	231	1,210	6. 35	4,480
July 20	G. M. Brett	223	815	4.60	1,630
September 28	F. E. Pressey	216	695	4.06	1,080
October 10	.....do	216	772	4.58	1,330

a Tenth Census, vol. 16, p. 50.

Daily gage height, in feet, of Merrimac River at Franklin Junction, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.4	5.3	4.75	......	......	7.3	......	5.5	......	4.1	4.5	4.5
2	5.0	5.35	4.65	5.6	6.4	7.1	5.7	5.1	......	4.0	4.5	.....
3	4.8	5.3	4.7	5.5	6.3	......	5.6	4.8	......	4.05	4.4	4.5
4	4.8	......	......	5.7	......	6.6	......	4.7	4.3	4.05	......	4.3
5	5.3	4.9	4.6	6.3	6.45	6.1	5.75	......	4.3	4.0	4.3	4.2
6	5.1	4.8	4.8	7.3	......	6.0	5.6	4.6	4.3	4.0	4.3	4.25
7	......	4.85	4.7	6.8	6.15	7.3	5.3	4.6	4.3	......	4.3	4.35
8	4.8	4.8	4.7	......	6.2	7.3	......	4.6	4.4	4.1	4.2	4.3
9	5.0	4.8	4.6	6.05	6.0	......	4.9	4.5	......	4.5	4.25	.....
10	4.9	4.7	4.7	5.9	7.35	......	4.9	4.4	4.3	4.5	4.3	5.05
11	4.8	......	......	5.9	7.3	6.4	4.9	4.4	4.2	4.9	......	4.9
12	4.65	5.1	4.65	6.3	6.7	6.2	4.9	......	4.1	4.5	4.45	4.85
13	4.8	4.8	4.5	6.6	......	6.0	4.8	4.6	4.2	4.4	4.5	4.7
14	......	4.6	4.5	7.0	7.6	5.8	4.55	4.45	4.1	......	4.4	4.6
15	4.8	4.6	4.5	......	6.8	5.5	......	4.4	4.0	4.3	4.3	4.5
16	4.85	4.6	4.5	16.2	6.3	5.3	4.5	4.2	......	4.2	4.2	.....
17	5.0	4.5	4.5	12.1	6.3	......	4.5	4.3	4.2	4.2	4.2	4.5
18	5.0	......	......	10.1	6.85	6.2	4.8	4.2	4.15	4.25	......	4.5
19	4.95	4.5	4.4	9.45	......	6.2	4.75	......	4.0	4.2	4.1	4.6
20	4.9	4.5	4.4	8.85	......	6.0	4.6	4.1	4.05	......	4.2	4.5
21	......	4.45	4.45	......	5.9	5.7	4.7	4.1	4.1	......	4.6	4.6
22	5.3	......	4.5	......	5.6	5.6	......	4.15	4.0	5.0	4.95	4.6
23	5.65	4.9	4.4	8.2	5.3	5.4	5.0	4.25	......	4.7	4.8	.....
24	......	4.95	4.4	7.5	5.3	......	4.85	4.3	4.2	4.6	4.8	4.8
25	9.6	......	......	6.8	5.6	6.85	4.7	4.3	4.2	4.5	......	4.5
26	7.15	5.05	4.3	6.45	6.3	6.4	4.6	......	4.1	6.6	4.7	4.4
27	6.05	5.1	4.45	6.2	......	6.15	4.6	4.2	4.0	......	4.6	4.45
28	......	5.0	5.35	6.05	14.7	5.9	......	4.2	4.0	......	4.65	4.45
29	5.6		5.9	......	14.2	5.8	4.15	4.9	4.0	4.65	4.6	4.35
30	5.2	......	6.2	6.2	......	5.8	4.5	4.6	......	4.7	4.5	.....
31	5.1	......	6.1	......	8.15	......	4.5	4.5	......	4.6	......	.....

NOTE.—The river does not usually freeze at or near the gage, and the flow is probably not greatly affected by ice conditions.

Rating table for Merrimac River at Franklin Junction, N. H., for 1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
4.00	950	5.20	2,530	6.30	4,360	7.80	7,200
4.10	1,060	5.30	2,680	6.40	4,540	8.00	7,600
4.20	1,170	5.40	2,840	6.50	4,720	8.20	8,000
4.30	1,290	5.50	3,000	6.60	4,900	8.40	8,400
4.40	1,410	5.60	3,160	6.70	5,080	8.60	8,800
4 50	1,540	5.70	3,320	6.80	5,270	8.80	9,200
4.60	1,670	5.80	3,490	6.90	5,460	9.00	9,600
4 70	1,800	5.90	3,660	7.00	5,650	9.20	10,020
4.80	1,940	6.00	3,830	7.20	6,030	9.40	10,440
4 90	2,080	6.10	4,000	7.40	6,410	9.60	10,860
5 00	2,230	6.20	4,180	7.60	6,800	9.80	11,280
5.10	2,380						

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1905-6 and is well defined. Above gage height 9 feet the rating curve is a tangent, the difference being 210 per tenth. The curve for high stages has been drawn about 5 to 10 per cent greater than the 3 high-water measurements of 1906, all of which were made on a rapidly falling stage. It is considered as closely representing the flow for stationary stages.

Monthly discharge of Merrimac River at Franklin Junction, N. H., for 1906.

[Drainage area, 1,460 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	10,900	1,730	2,950	2.02	2.33
February	2,760	1,170	1,980	1.36	1.42
March	4,180	1,120	1,830	1.25	1.44
April	24,700	3,000	6,610	4.53	5.05
May	21,600	2,680	5,930	4.06	4.68
June	6,220	2,680	4,210	2.88	3.21
July	3,490	1,120	2,140	1.47	1.70
August	3,000	1,060	1,500	1.03	1.19
September	1,410	950	1,130	.774	.86
October	4,900	950	1,620	1.11	1.28
November	2,160	1,060	1,470	1.01	1.13
December	2,300	1,170	1,630	1.12	1.29
The year	24,700	950	2,750	1.88	25.58

NOTE.—The discharge has been estimated for days on which the gage was not read.

Values are rated as follows: January to August, excellent; September, good; October to December, fair, owing to measurement of October 10, indicating a possible change in conditions of flow.

MERRIMAC RIVER AT GARVINS FALLS, N. H.

The power at Garvins Falls—4 miles below Concord—is one of the best on Merrimac River. There has been a dam at this point since 1815, first in connection with the Old Bow Canal and later to furnish power for a pulp mill. This privilege has since become the property of the Manchester Traction, Light and Power Company, and has been more completely developed.

Careful records of the pond and tail-race levels, wheel openings, etc., have been kept by the company since the completion of the new dam in 1904, and have been furnished for computations of flow by J. Brodie Smith, manager. The conditions at this station are described in Water-Supply Paper No. 165, page 94.

Discharge measurements of Merrimac River at Garvins Falls, N. H., in 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Reference point to water surface.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
November 3	T. W. Norcross	358	1,410	25.69	2,520
November 10	....do	320	1,200	26.19	2,070
November 23	....do	345	1,270	25.88	2,330
1906.					
April 18	T. W. Norcross	463	5,070	17.14	23,500
April 18	....do	463	4,960	17.50	23,000
April 18	C. R. Adams	463	5,110	17.14	24,900
October 10	Barrows and Pressey	296	1,120	26.25	2,010
October 11	F. E. Pressey	351	1,260	26.02	2,470
October 11	....do	367	1,300	25.80	2,450

NOTE.—All of these measurements were made from the downstream side of the Hammond Street bridge, Concord, N. H., for the purpose of obtaining the coefficients of the dam.

Daily discharge, in second-feet, of Merrimac River at Garvins Falls, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,480	4,260	3,370	8,300	6,150	13,000	5,480	5,020	2,040	1,220	2,040	2,240
2	4,040	4,230	3,380	7,080	6,310	9,740	6,270	3,720	1,500	1,280	1,970	2,140
3	3,380	4,370	3,360	6,280	6,540	8,530	5,820	3,140	1,380	1,210	1,870	1,580
4	2,940	3,230	3,400	6,260	7,920	8,120	5,440	2,730	1,460	1,290	1,900	1,990
5	3,470	2,890	3,350	6,770	7,240	6,560	5,920	2,540	1,680	1,340	1,550	1,640
6	3,860	2,860	3,720	9,820	6,900	5,800	6,200	2,210	1,740	1,260	1,470	1,980
7	3,780	2,540	3,630	10,810	6,510	6,850	4,910	2,400	1,510	1,270	1,620	1,970
8	3,070	2,430	3,330	9,080	6,110	9,030	4,240	2,370	1,530	1,120	1,580	1,620
9	2,880	2,250	3,080	7,840	5,550	8,920	3,650	3,800	1,370	1,430	1,780	2,090
10	2,890	2,240	3,100	7,540	6,150	8,380	3,520	2,210	1,290	1,820	1,540	1,680
11	2,870	2,400	3,440	6,840	9,050	7,220	3,480	2,120	1,370	2,410	1,580	1,880
12	3,010	2,220	2,960	8,250	7,300	6,500	3,320	1,910	1,350	2,440	1,750	1,780
13	3,130	2,420	2,750	9,490	5,840	5,490	3,080	1,760	1,350	1,910	1,980	1,910
14	3,140	2,570	2,520	10,660	7,930	4,830	2,880	1,970	1,390	1,930	2,100	1,990
15	2,870	2,550	1,860	12,680	7,110	4,300	2,590	2,060	1,310	1,710	2,180	1,980
16	3,260	2,610	2,600	27,820	5,690	3,860	2,400	1,860	1,260	1,610	1,800	2,320
17	3,630	2,830	2,750	29,560	5,410	3,980	2,420	1,900	1,310	1,420	1,900	1,880
18	3,780	2,990	2,400	22,080	5,990	7,640	2,760	1,910	1,260	1,430	1,900	1,900
19	3,520	2,690	2,130	17,630	7,080	8,630	2,950	1,810	1,320	1,480	1,820	1,830
20	3,290	2,650	1,840	15,160	5,820	7,720	2,720	1,460	1,420	1,540	2,770	1,860
21	3,140	2,700	2,520	14,060	5,150	6,500	2,540	1,800	1,450	2,140	4,060	1,920
22	3,090	3,020	2,470	14,410	4,280	5,440	2,640	1,720	1,320	2,610	3,720	1,960
23	5,540	3,600	2,180	13,570	3,730	4,750	2,780	1,720	1,240	2,300	3,530	2,270
24	15,660	4,160	2,190	10,940	3,400	6,140	3,230	1,850	1,360	2,020	3,350	1,890
25	17,100	3,970	2,320	8,860	3,660	9,570	3,100	1,770	1,210	1,990	3,050	2,060
26	10,800	3,990	2,230	7,640	4,990	8,360	2,750	1,720	1,340	3,440	2,540	1,550
27	8,380	4,710	2,230	6,800	5,750	7,010	2,560	1,660	1,310	3,940	2,280	2,030
28	6,800	3,750	3,290	6,240	17,950	5,850	2,570	1,780	1,340	2,910	2,540	1,930
29	6,040	....	8,010	5,980	28,010	5,020	2,290	2,420	1,350	2,220	2,760	2,110
30	5,180	....	8,880	5,720	25,260	4,630	1,770	2,370	1,340	2,140	2,520	2,460
31	4,410	....	9,090	....	18,360	....	3,270	2,160	....	2,040	....	1,710

Monthly discharge of Merrimac River at Garvins Falls, N. H., for 1906.

[Drainage area, 2,340 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	17,100	2,870	4,950	2.12	2.44
February	4,710	2,220	3,110	1.33	1.38
March	9,090	1,840	3,370	1.44	1.66
April	29,600	5,720	11,100	4.74	5.29
May	28,000	3,400	8,170	3.49	4.02
June	13,000	3,860	6,950	2.97	3.31
July	6,270	1,770	3,530	1.51	1.74
August	5,020	1,460	2,260	.966	1.11
September	2,040	1,240	1,400	.598	.67
October	3,940	1,120	1,900	.812	.94
November	4,060	1,470	2,250	.962	1.07
December	2,460	1,550	1,940	.829	.96
The year	29,600	1,120	4,250	1.81	24.59

NOTE.—Values are rated as good.

MERRIMAC RIVER AT LAWRENCE, MASS.

Records of flow of the Merrimac at Lawrence have been kept for more than fifty years, but have never been published in full. Data in regard to the flow are furnished by R. A. Hale, principal assistant engineer of the Essex Water Power Company. The conditions at the station are described in Water-Supply Paper No. 165, page 95, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Merrimac River at dam at Lawrence, Mass., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7,791	6,484	7,473	15,770	7,945	20,079	6,426	5,374	2,202	2,288	3,344	2,397
2	6,896	6,201	6,268	15,330	8,162	15,347	9,087	7,314	1,251	2,379	3,167	1,776
3	8,152	4,087	5,698	13,070	8,359	12,957	8,739	5,357	1,635	2,237	2,126	4,441
4	5,827	3,692	8,095	11,970	8,641	12,471	7,183	4,339	3,764	2,206	452	3,395
5	6,091	5,227	12,552	11,950	9,198	10,974	8,890	4,044	2,816	2,266	3,438	2,644
6	6,175	3,693	14,218	13,940	7,998	9,410	8,980	5,335	2,716	1,514	3,352	2,622
7	5,923	4,062	11,207	17,000	9,276	9,015	7,386	4,468	2,451	132	3,246	2,605
8	6,595	3,753	9,714	14,290	8,735	11,016	5,663	3,945	1,535	1,977	2,686	1,654
9	5,551	3,734	8,499	13,940	8,277	11,419	5,945	3,969	101	1,936	2,460	386
10	5,042	2,301	7,765	13,840	7,965	10,575	5,125	3,643	2,205	2,155	1,652	2,900
11	4,560	2,158	7,313	14,800	9,914	10,623	4,729	2,251	2,256	2,652	334	3,054
12	4,383	4,978	8,534	17,900	9,501	9,212	4,614	1,986	2,246	2,723	2,851	2,816
13	3,013	3,803	7,052	19,400	7,803	8,018	4,596	4,435	2,282	1,574	2,842	2,901
14	3,800	3,681	6,352	19,200	8,312	6,897	3,361	3,327	2,127	662	3,270	2,777
15	5,578	3,761	5,020	17,000	8,974	6,352	2,825	2,877	1,433	3,508	3,285	1,903
16	5,025	3,503	4,542	25,800	7,852	4,720	4,548	2,946	76	3,127	3,638	487
17	6,174	2,345	3,436	35,400	6,797	5,283	3,229	2,850	2,145	3,011	2,406	3,564
18	7,145	2,497	4,322	29,298	6,863	12,608	3,102	1,995	2,184	2,540	941	3,066
19	6,781	4,921	5,416	22,112	7,087	15,349	3,649	839	2,134	2,471	4,121	3,120
20	5,587	3,663	4,424	19,839	6,785	13,500	4,137	3,641	2,174	1,497	3,405	2,910
21	4,958	3,680	4,301	17,289	7,014	10,995	3,522	2,945	2,107	133	4,995	3,002
22	6,467	5,161	4,482	15,786	5,657	9,087	3,138	2,734	1,367	2,525	5,048	2,031
23	7,437	8,029	4,851	16,601	4,715	7,374	4,701	2,571	103	2,850	5,269	478
24	13,845	9,200	3,030	14,856	4,818	7,361	3,796	2,709	2,143	3,337	4,072	4,223
25	23,900	7,210	3,219	12,634	4,588	10,934	4,456	1,581	2,189	3,186	3,518	850
26	19,804	9,980	5,317	10,785	4,451	11,674	4,285	753	2,309	3,201	5,094	3,999
27	13,643	11,131	4,410	9,749	6,184	9,747	3,932	3,456	2,518	2,671	4,011	3,271
28	10,626	10,085	7,508	8,474	12,300	8,050	2,620	2,804	2,386	3,449	3,629	3,289
29	9,629		17,100	7,621	35,650	6,779	2,599	2,596	1,515	4,738	1,459	2,239
30	6,770		18,600	8,537	36,910	5,595	4,002	2,619	167	3,648	4,823	551
31	6,403		17,500		27,639		3,004	3,040		3,398		4,054
Total	237,571	143,020	238,218	484,781	314,348	303,421	153,469	102,743	56,537	75,991	95,024	79,285
Average	7,664	5,108	7,684	16,159	10,140	10,114	4,951	3,314	1,885	2,451	3,167	2,558

Average weekly flow, arranged in order of discharge, of Merrimac River at Lawrence, Mass., for 1906.

Week ending Sunday—	Merrimac River at Lawrence (total drainage area=4,664 sq. m.).	Wasting into Merrimac from—				Net yield of Merrimac River from 4,452 square miles, in second-feet.	
		Nashua River at Clinton (drainage area=118 sq. m.).	Sudbury River at Dam 1 (drainage area=75 sq. m.).	Lake Cochituate Bannister Brook (drainage area=19 sq. m.).	Total waste of these watersheds (total drainage area=212 sq. m.).		
		Second-feet for seven days.				Seven days.	Per sq. m.
September 23	1,745	6	2	0	8	1,737	0.390
September 16	1,804	6	2	0	8	1,796	.405
October 7	1,859	6	2	0	8	1,851	.416
September 30	1,890	6	2	0	8	1,882	.423
October 14	1,954	8	2	0	10	1,944	.437
September 9	2,145	6	2	0	8	2,137	.480
October 21	2,327	6	2	0	8	2,319	.521
December 16	2,405	5	2	0	7	2,398	.539
August 26	2,419	7	3	0	10	2,409	.541
November 11	2,453	5	2	0	7	2,446	.549
December 9	2,518	5	2	0	7	2,511	.564
September 2	2,567	6	3	0	9	2,558	.575
December 23	2,596	5	72	0	77	2,519	.566
December 30	2,632	4	42	0	46	2,586	.581
November 18	2,748	5	31	0	36	2,712	.609
August 19	2,753	7	8	0	15	2,738	.615
November 4	2,980	5	2	0	7	2,973	.668
October 28	3,031	5	2	0	7	3,024	.679
December 2	3,327	5	5	0	10	3,317	.745
February 18	3,510	4	28	0	32	3,478	.781
February 11	3,561	3	39	0	42	3,519	.790
July 22	3,618	7	11	0	18	3,600	.809
August 12	3,657	7	30	0	37	3,620	.813
July 29	3,770	6	2	0	8	3,762	.845
March 25	4,246	4	92	32	128	4,118	.925
November 25	4,347	5	30	0	35	4,312	.968
July 15	4,456	5	24	0	29	4,427	.994
January 14	4,706	4	51	0	55	4,651	1.045
August 5	4,948	7	2	0	9	4,939	1.110
May 27	5,344	6	6	0	12	5,332	1.198
March 18	5,608	5	128	36	169	5,439	1.222
January 21	5,893	4	72	0	76	5,817	1.307
February 25	5,981	6	104	0	110	5,871	1.319
February 4	6,181	4	55	0	59	6,122	1.375
January 7	6,408	5	77	0	82	6,326	1.421
June 17	7,301	7	20	0	27	7,274	1.634
May 20	7,524	8	10	0	18	7,506	1.686
July 8	7,990	6	55	0	61	7,929	1.781
March 4	8,390	6	142	0	148	8,242	1.851
May 6	8,406	6	8	0	14	8,392	1.885
July 1	8,458	7	16	0	23	8,435	1.895
May 13	8,782	5	9	0	14	8,768	1.969
March 17	10,181	5	209	34	248	9,933	2.231
June 10	10,697	6	45	0	51	10,646	2.391
June 24	10,896	5	28	0	33	10,863	2.440
April 29	11,531	6	72	8	86	11,445	2.571
April 1	12,315	7	248	96	351	11,964	2.657
January 28	13,675	5	79	0	84	13,591	3.053
April 8	13,936	7	136	27	170	13,766	3.092
April 15	16,669	9	214	58	281	16,388	3.681
June 3	22,983	6	175	0	181	22,802	5.122
April 22	23,646	6	127	34	167	23,479	5.274
Total (52 weeks)	325,767	297	2,532	325	3,154	322,613	72.466
Weekly average	6,255	6	49	6	61	6,204	1.393

PEMIGEWASSET RIVER AT PLYMOUTH, N. H.

This station was established September 5, 1903. It is located at the wooden highway bridge below the mouth of Bakers River in the town of Plymouth. The height of water at Plymouth has been recorded daily since January 1, 1886, during which time extensive deforestation in the basin above has taken place. This record of gage height has been given to the United States Geological Survey by the Locks and Canals Company, of Lowell, Mass. The conditions at the station and the bench marks are described in the New Hampshire Forestry Reports for 1903–1906, and in Water-Supply Paper No. 165, page 98, where are given also references to publications that contain data for previous years.

Discharge measurements of Pemigewasset River at Plymouth, N. H., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 4.........	Murphy and Barrows......................	202	777	3.94	2,060
August 3 a.....	H. K. Barrows...........................	178	387	2.75	826
August 23 b....	T. W. Norcross..........................	124	257	1.80	370
September 5....	.....do.................................	224	1,400	6.88	5,840
October 7 a....	.....do.................................	142	282	2.01	466
October 28 a...	.....do.................................	113	208	1.51	240
October 28 a...	.....do.................................	113	208	1.57	272
1906.					
April 17..	C. R. Adams.............................	228	1,770	8.36	8,550
April 17........	.....do.................................	228	1,590	7.56	7,350
April 28........	T. W. Norcross..........................	212	813	4.00	2,140
July 21.........	G. M. Brett.............................	168	312	1.69	328
August 24 a....	.....do.................................	106	181	1.42	199
September 29 a.	F. E. Pressey...........................	102	174	1.42	212
October 9 a....	.....do.................................	108	194	1.60	262

a In left channel by wading.
b In left channel by wading; meter fastened to a rod.

Daily gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1...............	3.4	3.0	3.4	3.1	4.8	4.4	3.35	2.8	1.6	1.3	2.2	2.35
2...............	3.2	2.9	3.55	2.9	4.8	4.05	2.9	2.4	1.55	1.35	2.1	2.25
3...............	2.85	2.8	2.8	3.0	4.9	4.1	2.6	2.2	1.5	1.4	1.9	1.7
4...............	2.9	3.15	2.75	3.3	5.2	3.7	2.65	2.1	1.6	1.35	1.9	2.1
5...............	3.5	3.45	2.8	3.55	4.9	3.4	3.3	1.95	1.7	1.2	1.9	2.05
6...............	3.5	3.55	2.9	4.7	4.7	3.85	2.8	1.85	1.55	1.2	1.85	2.05
7...............	3.2	3.4	2.7	3.7	4.45	5.8	2.45	1.8	1.5	1.1	1.8	2.2
8...............	2.9	3.5	2.5	3.35	4.1	4.7	2.3	1.7	1.5	1.2	1.8	a 2.1
9...............	2.8	3.5	2.35	3.3	4.4	4.75	2.2	1.75	1.45	1.3	1.8	2.25
10...............	3.0	3.7	2.25	3.1	6.6	4.0	2.3	1.7	1.5	2.6	1.8	2.4
11...............	3.0	3.6	2.2	3.1	5.0	3.85	2.2	1.7	1.4	2.6	1.9	2.5
12...............	3.1	3.4	2.1	3.25	3.4	3.4	2.1	1.7	1.4	2.15	1.9	2.4
13...............	2.85	3.4	2.2	3.35	6.2	3.15	2.0	1.65	1.5	1.95	2.0	2.5
14...............	3.05	3.35	2.15	4.15	5.5	3.0	1.9	1.7	1.5	1.75	1.9	2.5
15...............	2.8	3.3	2.4	9.0	4.5	2.75	1.85	1.6	1.45	1.65	1.85	2.6
16...............	2.85	3.2	2.15	12.35	4.3	2.6	1.8	1.55	1.5	1.65	1.8	b 2.4
17...............	3.05	3.15	2.0	8.35	4.5	2.65	1.9	1.5	1.4	1.5	1.8	2.5
18...............	2.9	3.15	1.9	7.8	5.85	3.7	2.1	1.5	1.4	1.6	1.75	2.8
19...............	2.8	3.1	2.3	6.9	5.05	3.2	1.9	1.45	1.4	1.6	2.1	2.65
20...............	2.7	3.1	2.2	6.6	4.2	2.8	1.8	1.4	1.3	1.8	3.25	2.6

a About one-half of section frozen over; open under gage and around pier.
b Almost frozen over at gage.

Daily gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21................	2.75	3.0	2.0	7.1	3.7	2.55	1.8	1.45	1.3	3.2	2.8	2.35
22................	3.25	3.1	1.9	7.2	3.5	2.4	2.8	1.5	1.25	2.5	2.7·	2.7
23................	6.05	3.6	1.85	6.2	3.2	2.7	2.2	1.4	1.3	2.2	2.55	a 2.7
24................	10.75	3.3	1.7	4.95	3.3	5.1	1.9	1.5	1.4	1.95	2.4	......
25................	6.25	3.1	1.85	4.25	3.9	3.8	1.9	1.6	1.3	2.3	2.3	......
26................	4.75	2.9	1.9	4.0	4.2	3.5	1.8	1.5	1.3	4.25	2.2	......
27................	4.25	3.35	1.95	4.0	5.6	2.85	1.7	1.55	1.3	3.0	2.45	......
28................	3.75	3.2	2.6	4.05	11.45	2.6	1.7	3.65	1.3	2.7	2.9	b 1.4
29................	3.35	......	3.8	3.9	9.75	2.55	1.7	2.3	1.4	2.5	2.6	......
30................	2.9	......	4.1	4.35	6.6	2.8	2.7	1.8	1.3	2.3	2.0	......
31................	3.1	......	3.8	......	5.2	......	4.2	1.7	......	2.25	......	......

a Gage height to top of ice, open channel 10 feet wide near pier.
b River entirely frozen over; gage height to top of ice 1.5 feet.

NOTE.—The following ice conditions prevailed during 1906: River frozen over part of time in left channel only, January 1 to 23; ice went out January 23. During February left channel near gage was frozen over, right channel near gage was open for a width of about 70 feet; open-water strip extended upstream nearly to Bakers River, and some 500 feet downstream from gage. During March the open-water strip in right channel narrowed down to 60 feet width and extended but a short distance above and below the gage. Ice began to wear away again about March 24, and went out completely during the morning of April 6. River commenced to freeze from the sides about December 1, the ice gradually creeping toward the middle until December 28, when the river was entirley frozen. Until December 23 it was open under the gage.

During the frozen season gage readings are to water surface, the gage being over the right channel, which remained open. The average thickness of ice for the left channel and for the frozen portion near the gage upstream and downstream was as follows:

Thickness of ice.

Date.	Thickness of ice.	Date.	Thickness of ice.
	Feet.		*Feet.*
February 7.............................	0.3	March 17.............................	1.1
February 17.............................	.7	December 8.............................	.3
February 24.............................	.7	December 23.............................	.9
March 3.............................	.9	December 28.............................	.8
March 10.............................	.9		

Rating table for Pemigewasset River at Plymouth, N. H., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.10	140	2.40	720	3.70	1,830	6.00	4,590
1.20	158	2.50	790	3.80	1,930	6.20	4,890
1.30	183	2.60	865	3.90	2,030	6.40	5,200
1.40	211	2.70	945	4.00	2,130	6.60	5,520
1.50	243	2.80	1,025	4.20	2,340	6.80	5,850
1.60	278	2.90	1,105	4.40	2,555	7.00	6,185
1.70	317	3.00	1,190	4.60	2,780	8.00	7,970
1.80	361	3.10	1,275	4.80	3,010	9.00	9,970
1.90	410	3.20	1,365	5.00	3,250	10.00	12,050
2.00	465	3.30	1,455	5.20	3,500	11.00	14,150
2.10	525	3.40	1,545	5.40	3,760	12.00	16,250
2.20	585	3.50	1,640	5.60	4,030	13.00	18,350
2.30	650	3.60	1,735	5.80	4,305		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1905–6 and is well defined.

Monthly discharge of Pemigewasset River at Plymouth, N. H., for 1905–6.

[Drainage area, 615 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
April	7,140	1,500	3,180	5.18	5.78
May	3,440	865	1,690	2.74	3.16
June	5,040	650	1,280	2.07	2.31
July	4,590	317	920	1.50	1.73
August	2,500	317	702	1.14	1.31
September	9,570	790	2,460	4.00	4.46
October	2,030	386	732	1.19	1.37
November	3,250	361	687	1.12	1.25
December	5,040	361	1,470	2.39	2.76
1906.					
April (6-30)	17,000	1,280	4,180	6.80	6.32
May	15,100	1,360	3,700	6.01	6.93
June	4,300	720	1,700	2.76	3.08
July	2,340	317	688	1.12	1.29
August	1,780	211	394	.641	.74
September	317	170	222	.361	.40
October	2,390	140	542	.881	1.02
November	1,410	339	573	.932	1.04

NOTE.—Values for 1905 and 1906 are excellent.

CONTOOCOOK RIVER AT WEST HOPKINTON, N. H.

This station was established July 9, 1903. It is located at the wooden highway bridge near the railway station at West Hopkinton. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 101, where are given also references to publications that contain data for previous years. Length of chain, April 27, 1906, 26.02 feet.

Discharge measurements of Contoocook River at West Hopkinton, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	Sq. ft.	Feet.	Sec.-ft.
April 27	T. W. Norcross	124	320	3.97	920
July 19	G. M. Brett	120	230	3.22	508

Daily gage height, in feet, of Contoocook River at West Hopkinton, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.55	3.5	3.5	5.05	3.6	5.55	3.7	3.25	2.5	2.3	2.75	2.95
2	3.55	3.6	3.5	4.6	3.6	4.8	4.1	3.15	2.4	2.3	2.65	2.8
3	3.4	3.5	3.5	4.3	3.85	4.5	4.0	2.85	2.4	2.35	2.6	2.95
4	3.6	3.5	3.4	4.2	4.0	4.3	3.9	2.85	2.3	2.3	2.55	a 3.9
5	3.8	3.3	3.65	4.65	3.9	3.9	4.4	2.8	2.3	2.2	2.6	3.7
6	3.75	3.5	3.6	5.2	3.7	3.7	4.1	2.85	2.3	2.2	2.5	3.55
7	3.7	3.4	3.6	5.2	3.7	3.6	3.7	2.85	2.3	2.3		3.75
8	3.8	3.5	3.55	5.0	3.8	3.65	3.4	2.9	2.3	2.3		a 3.85
9	3.7	3.6	3.55	4.75	3.8	3.8	3.3	2.8	2.3	2.3	2.55	a 4.05
10	3.7	3.3	3.5	4.5	3.95	3.9	3.2	2.75	2.2	2.65	2.5	a 4.2
11	3.75	3.3	3.45	4.4	4.0	3.95	3.2	2.7	2.3	2.95	2.5	a 4.15
12	3.9	3.65	3.4	5.0	3.8	3.8	3.2	2.65	2.3	2.85	2.6	a 4.3
13	4.05	3.9	3.35	5.3	3.7	3.6	3.15	2.6	2.2	2.8	2.85	4.35
14	4.0	3.75	3.2	5.75	3.6	3.4	3.0	2.5	2.3	2.7	2.85	3.95
15	3.65	3.6	3.3	6.9	3.5	3.2	2.9	2.45	2.3	2.5	2.8	3.85

a Anchor ice in river.

Daily gage height, in feet, of Contoocook River at West Hopkinton, N. H., for 1906—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16...............	3.6	3.65	3.1	8.4	3.4	3.1	2.8	2.5	2.2	2.4	2.7	3.95
17...............	3.8	3.75	3.05	8.0	3.45	3.55	2.85	2.4	2.3	2.3	2.75	3.85
18...............	3.75	3.8	3.0	6.55	3.6	4.8	2.95	2.5	2.25	2.35	2.7	3.75
19...............	3.7	3.9	2.9	5.8	3.5	5.0	3.15	2.4	2.2	2.4	3.2	3.7
20...............	3.6	3.8	3.0	5.35	3.4	4.65	3.1	2.5	2.3	2.55	4.1	3.6
21...............	3.5	3.9	3.1	5.05	3.3	4.1	3.05	2.4	2.3	2.85	4.0	3.55
22...............	3.8	4.1	3.0	4.85	3.2	3.75	3.0	2.4	2.3	2.8	3.9	3.5
23...............	6.0	4.0	3.05	4.65	3.1	3.5	2.95	2.4	2.3	2.95	3.85	3.5
24...............	7.3	3.8	3.0	4.6	3.1	4.0	3.0	2.7	2.3	2.8	3.5	3.45
25...............	6.3	3.9	3.05	4.3	3.4	4.7	3.1	2.65	2.3	2.9	3.3	3.5
26...............	4.9	3.75	2.9	4.15	3.6	4.1	2.9	2.6	2.35	2.85	3.0	3.6
27...............	4.6	3.7	3.45	3.95	3.75	3.6	2.85	2.6	2.3	3.05	2.95	3.45
28...............	4.1	3.5	5.3	3.8	6.3	3.4	2.8	....	2.3	2.9	3.05	3.4
29...............	3.8	....	5.4	3.8	7.65	3.3	2.75	....	2.35	2.8	3.0	3.4
30...............	3.6	....	5.5	3.6	7.65	3.25	2.8	....	2.3	2.8	3.0	3.5
31...............	3.6	....	5.2	....	7.0	....	2.95	2.5	....	2.85	....	3.55

NOTE.—During the winter months considerable trouble is experienced from anchor ice forming around rocks and forming backwater.

Rating table for Contoocook River at West Hopkinton, N. H., for 1905–6.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.20	143	3.40	651	4.60	1,805	6.60	4,694
2.30	165	3.50	724	4.70	1,925	6.80	5,022
2.40	185	3.60	801	4.80	2,045	7.00	5,350
2.50	209	3.70	882	4.90	2,165	7.20	5,678
2.60	237	3.80	967	5.00	2,290	7.40	6,006
2.70	270	3.90	1,056	5.20	2,550	7.60	6,334
2.80	308	4.00	1,150	5.40	2,820	7.80	6,662
2.90	352	4.10	1,250	5.60	3,100	8.00	6,990
3.00	402	4.20	1,355	5.80	3,395	9.00	8,630
3.10	457	4.30	1,465	6.00	3,710		
3.20	517	4.40	1,575	6.20	4,038		
3.30	582	4.50	1,690	6.40	4,366		

NOTE.—The above table is applicable only for open-channel conditions. It is based on twelve discharge measurements made during 1905–6 and is well defined between gage heights 2.4 feet and 9.0 feet.

Monthly discharge of Contoocook River at West Hopkinton, N. H., for 1906.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April..............................	7,650	801	2,500	6.10	6.81
May...............................	6,420	457	1,430	3.49	4.02
June..............................	3,030	457	1,170	2.85	3.18
July..............................	1,580	289	583	1.42	1.64
August............................	550	185	265	.646	.74
September.........................	209	143	164	.400	.45
October...........................	430	143	254	.620	.72
November..........................	1,250	209	429	1.05	1.17

NOTE.—Values are rated as follows: September, good; remainder of the period, excellent.

SUDBURY RIVER AT FRAMINGHAM AND LAKE COCHITUATE AT COCHITUATE, MASS.

Sudbury River and Lake Cochituate have been studied by the engineers of the city of Boston, the State board of health of Massachusetts, and the metropolitan water and sewerage board; records of rainfall in the Sudbury basin have been kept since 1875 and in the Cochituate basin since 1852, but the latter are considered of doubtful accuracy previous to 1872.

The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 104, where are given also references to publications that contain data for previous years.

The accompanying tables, furnished by Frederic P. Stearns, give the results for 1906, also the averages for thirty-two years for Sudbury River and for forty-four years for Lake Cochituate.

Yield and rainfall in Sudbury River watershed at Framingham, Mass.

[Drainage area, 75.2 square miles.]

Month.	Total yield in million gallons.	Average yield of 1 square mile.		Rainfall in inches.a	Rainfall collected in inches.a	Per cent collected.
		Million gallons per day.	Second-feet.			
1906.						
January	2,629.5	1.128	1.745	2.47	2.012	81.5
February	2,190.9	1.041	1.610	2.92	1.676	57.5
March	5,615.7	2.409	3.727	6.32	4.297	68.1
April	4,396.1	1.949	3.015	2.88	3.364	116.6
May	2,469.5	1.059	1.639	5.66	1.890	33.4
June	1,594.0	.707	1.093	3.91	1.220	31.2
July	927.0	.398	.615	3.42	.709	20.7
August	420.0	.180	.279	3.02	.321	10.6
September	43.9	.019	.030	3.30	.034	1.0
October	702.8	.301	.466	3.40	.538	15.8
November	1,089.6	.483	.747	2.69	.834	31.1
December	1,535.4	.659	1.019	4.49	1.175	26.2
The year	23,614.4	.860	1.331	44.48	18.070	40.6
1875–1906.						
January	91,014.7	1.220	1.888	4.19	2.176	52.0
February	121,403.4	1.788	2.766	4.22	2.903	68.7
March	220,293.6	2.953	4.569	4.60	5.268	114.5
April	151,296.9	2.096	3.242	3.56	3.618	101.7
May	82,987.5	1.113	1.721	3.35	1.984	59.2
June	37,975.4	.526	.814	3.17	.908	28.6
July	14.853.9	.199	.308	3.72	.355	9.6
August	21,025.6	.282	.436	3.98	.503	12.6
September	18.971.7	.263	.407	3.43	.454	13.2
October	36.465.7	.489	.756	4.12	.872	21.2
November	60,496.0	.838	1.296	3.86	1.446	37.5
December	79,300.3	1.063	1.645	3.84	1.896	49.3
The period	936,084.7	1.065	1.648	46.04	22.384	48.6

a Total for month for 1906; average of totals per calendar month 1875 to 1906.

Yield and rainfall in Cochituate Lake watershed at Cochituate, Mass.

[Drainage area, 18.87 square miles.]

Month.	Total yield in million gallons.	Average yield of 1 square mile.		Rainfall in inches.[a]	Rainfall collected in inches.[a]	Per cent collected.
		Million gallons per day.	Second-feet.			
1906.						
January	515.2	0.881	1.363	2.66	1.57	59.0
February	418.5	.792	1.226	2.59	1.28	49.3
March	1,140.7	1.950	3.017	6.47	3.48	53.8
April	873.9	1.544	2.388	2.60	2.66	102.5
May	527.5	.902	1.395	4.98	1.61	32.3
June	282.3	.499	.772	3.44	.86	25.0
July	241.9	.414	.640	3.04	.74	24.3
August	185.3	.317	.490	2.37	.57	23.8
September	156.8	.277	.429	2.84	.48	16.8
October	279.2	.477	.738	3.26	.85	26.1
November	264.0	.466	.722	2.50	.80	32.2
December	266.5	.456	.705	4.68	.81	17.4
The year	5,151.8	.748	1.157	41.43	15.71	37.9
1863–1906.						
January	28,826.8	1.120	1.733	3.95	2.00	50.6
February	36,490.5	1.532	2.371	3.95	2.53	64.8
March	57,206.9	2.222	3.438	4.47	3.97	88.7
April	42,941.9	1.724	2.667	3.65	2.97	81.5
May	25,244.0	.980	1.516	3.71	1.75	47.2
June	11,642.5	.467	.723	3.08	.81	26.2
July	7,639.5	.297	.459	1.09	.53	13.0
August	10,871.0	.422	.653	4.32	.75	17.4
September	10,791.4	.433	.670	3.57	.75	20.9
October	14,836.4	.576	.892	4.31	1.03	23.9
November	20,070.4	.806	1.247	4.09	1.39	34.0
December	24,446.7	.950	1.469	3.58	1.69	47.3
The period	290,988.0	.959	1.485	46.77	20.17	43.1

[a] Total per month for 1905; average of totals per calendar month 1863–1906.

SOUTH BRANCH OF NASHUA RIVER AT CLINTON, MASS.

Since July, 1896, the flow of South Branch of Nashua River has been measured at Clinton by the engineers of the metropolitan water and sewerage board. The results of these measurements have been furnished by Frederic P. Stearns, chief engineer. Beginning with 1897 the flow has been corrected for loss and gain of storage in ponds and mill reservoirs on the watershed, so that the results show the natural flow of the stream. The accompanying tables give the results for 1906, also the average for the years 1897–1906, inclusive. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 108, where are given also references to publications that contain data for previous years.

Yield and rainfall in South of Branch Nashua River watershed at Clinton, Mass.

[Drainage area, 119 square miles.]

Month.	Total yield in million gallons.	Average yield of 1 square mile.		Rainfall in inches.[a]	Rainfall collected in inches.[a]	Per cent collected.
		Million gallons per day.	Second-feet.			
1906.						
January	4,174.7	1.132	1.751	2.59	2.018	78.1
February	3,420.3	1.027	1.588	2.74	1.654	60.5
March	6,861.7	1.860	2.878	5.17	3.317	64.2
April	7,528.2	2.109	3.263	3.12	3.640	116.5
May	5,654.2	1.533	2.371	6.58	2.734	41.5
June	4,225.4	1.184	1.831	5.95	2.043	34.3
July	2,686.3	.728	1.127	5.52	1.299	23.5
August	2,180.8	.591	.915	. 4.34	1.055	24.3
September	988.6	.277	.428	2.61	.478	18.3
October	1,954.9	.530	.820	3.95	.945	23.9
November	2,675.6	.749	1.160	2.25	1.294	57.5
December	2,930.7	.794	1.229	4.26	1.417	33.3
The year	45,281.4	1.043	1.613	49.08	21.894	44.6
1897–1906.						
January	43,398.4	1.177	1.820	3.76	2.098	55.8
February	46,781.4	1.399	2.164	3.75	2.262	60.2
March	111,969.4	3.035	4.696	4.94	5.413	109.6
April	88,208.7	2.471	3.822	4.17	4.265	102.2
May	46,487.3	1.260	1.949	3.50	2.248	64.2
June	32,706.7	.916	1.417	4.60	1.582	34.4
July	19,658.7	.533	.825	4.64	.951	20.5
August	19,194.2	.520	.805	4.43	.928	21.1
September	15,590.1	.437	.675	3.78	.754	20.0
October	21,432.1	.581	.899	3.58	1.036	28.9
November	28,836.4	.808	1.249	3.49	1.394	39.9
December	53,683.2	1.455	2.251	4.71	2.596	55.1
The period	527,946.6	1.215	1.880	49.32	25.527	51.8

[a] Total per month for 1906; average of totals per calendar month 1897–1906.

BLACKSTONE RIVER DRAINAGE BASIN.

BLACKSTONE RIVER NEAR WOONSOCKET, R. I.

A gaging station was established on Blackstone River near Woonsocket, R. I., April 5, 1904. During 1905 it was found that the flow was considerably influenced by backwater from the dam at Woonsocket, and the station was discontinued December 31, 1905. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 109, where are given also references to publications that contain data for previous years.

CONNECTICUT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Connecticut River has its source in Connecticut Lake in northern New Hampshire. Its extreme headwaters, however, lie in the Province of Quebec and in the mountains on the northern boundary of New Hampshire; thence the river flows in a southerly direction between New Hampshire and Vermont and through Massachusetts and Connecticut into Long Island Sound. The total drainage area is 11,085 square miles, of which 155 square miles lie in the Province of Quebec.

Its total length from Connecticut Lake to Long Island Sound is 345 miles. Water power is used at several points, notably at Windsor Locks, Conn.; Holyoke and Turners Falls, Mass.; and Bellows Falls and Wilder, Vt.

The drainage areas of the river and of several of its tributaries are given in Water-Supply Paper No. 165, page 114.

CONNECTICUT RIVER NEAR ORFORD, N. H.

This station was established August 6, 1900. It is located at the wooden highway bridge between Orford, N. H., and Fairlee, Vt., and is about 75 miles from the source of the stream. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 115, where are given also references to publications that contain data for previous years. Length of chain changed October 4, 1906, to 42.80 feet, owing to movement of bridge to which it is attached.

Discharge measurements of Connecticut River near Orford, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.[a]	Gage height.[b]	Thickness of ice.	Discharge.
		Feet.	Sq. ft.	Feet.	Feet.	Feet.	Sec.-ft.
February 8.....	T. W. Norcross..........	327	1,920	6.84	6.99	1.48	2,250
February 15....	Norcross and Adams.....	327	1,879	6.80	6.80	1.48	2,240
February 17....	.....do..................	327	1,790	6.56	6.58	1.52	2,040
March 14.......	Barrows and Norcross ...	327	1,560	6.00	6.11	1.55	1,680
March 15.......	T. W. Norcross..........	327	1,440	5.59	5.70	1.55	1,490

<p style="text-align:center">^a To water surface.   ^b To top of ice.</p>

Daily gage height, in feet, of Connecticut River near Orford, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1..............	a 8.0	9.8	....	a 11.3	9.3	13.9	6.5	5 5	4.5	2.8	5.6	5.6
2..............	a 11.0	8.7	....	a 10.1	9.9	12.3	6.5	5.5	3.9	2.9	5.5	5.5
3..............	a 12.7	7.8	....	a 9.9	12.4	10.6	6.3	5.5	4.2	3.1	4.8	5.3
4..............	a 11.3	a 7.7	6.8	a 9.5	13.9	9.3	5 9	4.5	6.1	3.8	4.5	5.0
5..............	a 9.2	a 7.4	....	a 11.7	13.7	9.9	6.1	3.9	5.8	3.9	4.5	5.0
6..............	a 8.1	....	....	a 11.9	13.0	9.8	6.2	4.3	5.5	3.6	4.3	4.8
7	a 7.4	....	....	a 12.7	12.8	10.7	5.9	3.7	4.9	3.1	4.2	4.7
8..............	....	6.85	....	a 11.9	12.5	11.4	5.5	3.6	4.5	3.1	4.0	4.2
9..............	....	....	6.4	a 11.3	11.6	12.3	5.4	3.9	4.3	3.4	3.9	4.3
10..............	....	7.1	....	a 11.1	13.3	11.9	4.9	3.9	4.3	4.2	3.7	4.3
11..............	....	....	6.4	a 10.5	14.1	10.8	5.5	3.6	3.6	4.3	3.9	4.4
12..............	a 5.9	7.0	....	a 9.9	13.7	9.4	5.5	3.1	3.9	5.8	4.0	4.5
13..............	....	....	....	a 9.8	13.1	8.9	5.6	3.5	4.0	6.6	3.7	......
14..............	5.9	....	6.0	a 9.8	15.7	8.5	5.1	3.1	3.5	6.2	4.0	......
15..............	....	6.8	5.6	14.8	16.2	7.9	4.9	3.2	3.4	5.7	4.3	......
16..............	....	....	....	21.4	15.4	7.4	5.0	2.9	3.3	5.1	4.5	a 4.8
17..............	....	....	....	21.6	16.4	6.8	4.5	3.0	3.5	4.9	4.0	......
18..............	....	6.6	5.7	21.4	16.6	6.4	4.3	3.1	3.3	4.5	3.7	......
19..............	....	....	....	20.2	13.7	6.1	4.0	3.2	3.2	4.6	5.0	......
20..............	....	....	....	19.1	13.1	5.8	4.0	3.4	3.0	4.1	5.7	......
21..............	5.9	....	....	18.4	12.3	6.2	3.9	2.9	2.7	5.1	6.4	......
22..............	a 6.9	....	....	18.7	11.3	6.5	4.5	3.0	2.8	5.4	7.1	......
23..............	a 10.0	....	....	17.9	10.1	6.9	5.1	2.9	2.7	6.3	6.7	a 5.0
24..............	17.7	....	....	15.4	9.8	7.2	4.8	3.0	2.9	6.7	6.4	......
25..............	20.2	8.4	5.2	13.7	9.4	6.9	4.4	2.9	3.0	6.6	6.1	......

<p style="text-align:center">^a To top of ice.</p>

Daily gage height, in feet, of Connecticut River near Orford, N. H., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	19.0			11.6	12.0	6.7	4.0	3.3	2.9	6.9	6.3	
27	17.4			10.9	13.2	6.4	4.5	4.5	2.8	7.4	6.3	
28	14.9			10.5	18.6	6.2	4.5	6.5	2.8	7.2	6.4	
29	12.7		a 11.6	9.9	20.4	5.9	4.0	6.0	2.9	6.9	6.5	
30	11.2		a 12.0	9.4	16.9	6.0	4.6	5.9	2.8	6.7	5.9	4.8
31	10.4		a 12.1		15.8		5.2	5.0		6.7		

a To top of ice.

NOTE.—The following ice conditions prevailed during 1906: River frozen over January 1 to 23; ice went out January 24. Frozen over at gage February 3; right channel open about 100 feet wide; left channel frozen over; river entirely covered with ice above the bridge. River entirely frozen over at gage about March 1; ice went out about April 15. River frozen over December 12 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	Feet.	Feet.		Feet.	Feet.	Feet.
January 14	5.9	6.1	0.7	March 9	6.4	6.5	
January 21	5.9	5.9	.8	March 11	6.4	6.5	1.5
February 8	6.85	7.0	1.5	March 14	6.0	6.1	1.55
February 15	6.8	6.85	1.5	March 15	5.6	5.7	1.55
February 18	6.6	6.6	1.5	March 18	5.7	5.9	1.6
February 25	8.4	8.6	1.5	March 25	5.2	5.4	1.7
March 4	6.8	6.9	1.5	December 30	4.8	4.9	.7

Rating table for Connecticut River near Orford, N. H.

FOR OPEN-CHANNEL CONDITIONS FROM 1904 TO 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.70	950	4.20	1,880	5.70	3,170	10.00	8,250
2.80	1,000	4.30	1,950	5.80	3,270	11.00	9,700
2.90	1,050	4.40	2,030	5.90	3,370	12.00	11,200
3.00	1,100	4.50	2,110	6.00	3,470	13.00	12,770
3.10	1,160	4.60	2,190	6.20	3,680	14.00	14,340
3.20	1,220	4.70	2,270	6.40	3,900	15.00	15,910
3.30	1,280	4.80	2,350	6.60	4,120	16.00	17,480
3.40	1,340	4.90	2,430	6.80	4,340	17.00	19,050
3.50	1,400	5.00	2,520	7.00	4,560	18.00	20,620
3.60	1,460	5.10	2,610	7.20	4,780	19.00	22,190
3.70	1,530	5.20	2,700	7.40	5,000	20.00	23,760
3.80	1,600	5.30	2,790	7.60	5,220	21.00	25,330
3.90	1,670	5.40	2,880	7.80	5,440	22.00	26,900
4.00	1,740	5.50	2,970	8.00	5,660		
4.10	1,810	5.60	3,070	9.00	6,900		

UNDER ICE COVER FOR 1906.[b]

3.60	1,210	4.60	1,740	5.60	2,400	6.60	3,140
3.80	1,300	4.80	1,860	5.80	2,540	6.80	3,300
4.00	1,400	5.00	1,990	6.00	2,680	7.00	3,460
4.20	1,500	5.20	2,120	6.20	2,830	8.00	4,290
4.40	1,620	5.40	2,260	6.40	2,980		

a This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1900-1906, and is well defined below gage height 12 feet. Above gage height 12 feet the rating curve is a tangent, the difference being 157 per tenth.

b This table is applicable only for ice-cover conditions. It is based upon fourteen discharge measurements made during 1904-1906, and is well defined between gage heights 4 feet and 5.5 feet. Gage heights are to bottom of ice. Above gage height 8 feet 75 per cent of the open-channel rating was used.

Monthly discharge of Connecticut River near Orford, N. H., for 1906.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile	Depth in inches.
January	21,600	2,055	6,360	1.93	2.22
February	7,170	2,055	3,030	.918	.96
March	6,800	1,255	2,240	.679	.78
April	26,300	4,300	11,800	3.58	3.99
May	24,400	7,290	13,700	4.15	4.78
June	14,200	3,270	6,540	1.98	2.21
July	4,010	1,670	2,630	.797	.92
August	4,010	1,050	1,790	.542	.62
September	3,570	950	1,600	.485	.54
October	5,000	1,000	2,760	.836	.96
November	4,670	1,530	2,670	.809	.90
December	3,070	1,500	1,960	.594	.68
The year	26,300	950	4,760	1.44	19.56

NOTE.—Values are rated as follows: January to March and December, fair; April, good; May to November, excellent.

CONNECTICUT RIVER AT SUNDERLAND, MASS.

This station was established March 31, 1904. It is located at a five-span steel highway bridge, with a total length of about 830 feet, at Sunderland. The nearest railway station is at South Deerfield. The gaging station is about 18 miles above the dam at Holyoke and about 5 miles below that at Turners Falls. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 118, where are given also references to publications that contain data for previous years. Length of chain changed to 42.84 feet on April 24, 1906.

Discharge measurements of Connecticut River at Sunderland, Mass., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 25	T. W. Norcross	776	10,700	14.54	40,400
August 9	G. M. Brett	692	2,830	4.04	5,320
October 6	F. E. Pressey	563	1,435	2.05	2,000

Daily gage height, in feet, of Connecticut River at Sunderland, Mass., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.2	7.4	8.75	10.45	9.35	13.15	6.0	5.3	4.1	2.45	4.2	5.0
2	7.9	7.1	7.7	9.4	9.35	10.9	8.0	5.25	3.55	2.0	4.1	4.75
3	7.05	8.0	7.25	8.5	10.5	9.4	7.75	4.9	3.3	2.3	3.95	4.2
4	6.75	6.9	10.0	8.5	11.8	9.0	7.3	5.0	3.0	2.5	3.8	4.8
5	7.2	7.25	11.45	9.8	11.4	8.7	7.0	5.0	2.9	2.35	3.6	4.75
6	7.5	7.4	9.85	11.4	10.6	8.2	6.7	4.55	3.2	2.2	3.65	4.7
7	7.25		8.7	11.8	10.35	8.1	6.1	4.3	3.4	1.6	3.45	4.7
8	7.05		7.95	10.7	10.25	8.6	5.5	4.35	3.3	2.55	3.4	4.85
9	6.85		7.75	10.0	9.8	9.9	5.1	4.05	3.2	2.45	3.3	
10	6.7		7.1	9.6	11.1	10.2	4.75	3.65	3.2	2.7	3.25	
11	6.5		5.8	9.4	12.1	10.0	4.8	3.35	3.0	2.75	3.1	
12	6.55		5.4	10.2	11.7	9.4	4.8	3.3	2.8	3.0	3.2	
13	7.15		4.9	11.5	10.9	8.6	4.85	3.2	2.9	2.9	3.5	
14	7.5		4.85	12.5	11.0	7.7	4.75	3.1	2.7	3.2	3.6	
15	7.25		5.0	16.2	12.1	7.0	4.4	3.1	2.65	3.8	3.6	4.6

Daily gage height, in feet, of Connecticut River at Sunderland, Mass., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	7.2	......	6.05	23.1	11.8	6.2	4.1	3.05	2.25	3.9	3.6	......
17	7.6	6.6	6.4	22.8	11.2	5.9	3.75	3.05	2.6	3.55	5.45	......
18	7.6	......	5.3	21.0	10.55	6.5	4.3	2.8	2.3	3.3	3.45	......
19	7.5	......	4.45	19.65	9.85	7.6	4.9	2.3	2.45	3.2	4.5	......
20	7.1	......	5.6	18.85	9.3	7.5	4.5	2.5	2.4	3.35	6.5	......
21	6.9	......	6.0	17.9	9.1	6.8	4.0	2.25	2.4	4.75	6.8	......
22	7.1	......	4.9	16.9	8.8	6.1	3.9	2.6	2.55	4.5	6.9	4.8
23	10.75	......	4.25	16.3	8.2	5.5	4.4	3.35	2.3	4.5	7.0	......
24	15.55	......	4.0	15.7	7.55	6.0	4.5	2.8	2.8	4.4	6.75	......
25	17.6	......	4.0	14.4	7.05	7.5	4.55	2.8	2.4	4.3	6.2	......
26	14.3	......	3.75	12.8	7.25	7.6	4.3	2.5	2.5	4.5	5.55	......
27	12.6	10.6	4.1	11.1	8.0	7.1	3.95	2.9	2.55	4.7	5.4	......
28	11.35	9.8	7.7	10.5	13.4	6.4	3.65	2.85	2.45	5.0	5.45	......
29	10.2	......	10.4	9.45	21.1	5.95	3.65	2.9	2.35	5.0	5.45	4.75
30	8.65	......	10.9	9.2	19.75	5.4	4.1	4.2	1.85	4.9	5.5	......
31	7.7	......	10.7	......	16.3	......	4.7	4.45	......	4.5	......	......

NOTE.—The river froze over February 7 and cleared of ice the afternoon of February 27. On March 24 the river was frozen over, beginning about 500 feet above the gage, but was open at and below the bridge; this ice went out March 28. River frozen December 4 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	Feet.	Feet.		Feet.	Feet.	Feet.
February 7	......	7.3	......	February 24	......	9.9	......
February 10	......	6.9	......	December 22	4.8	4.85	0.5
February 17	6.6	6.6	0.7	December 29	4.75	4.8	.6

Rating table for Connecticut River at Sunderland, Mass., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.60	1,630	3.00	3,350	4.40	6,200	6.60	12,100
1.70	1,710	3.10	3,520	4.50	6,430	6.80	12,710
1.80	1,800	3.20	3,700	4.60	6,670	7.00	13,340
1.90	1,900	3.30	3,880	4.70	6,910	7.20	13,980
2.00	2,000	3.40	4,070	4.80	7,150	7.40	14,630
2.10	2,110	3.50	4,270	4.90	7,400	7.60	15,290
2.20	2,220	3.60	4,470	5.00	7,650	7.80	15,970
2.30	2,340	3.70	4,670	5.20	8,170	8.00	16,650
2.40	2,470	3.80	4,880	5.40	8,690	9.00	20,200
2.50	2,600	3.90	5,090	5.60	9,230	10.00	23,850
2.60	2,740	4.00	5,300	5.80	9,780	11.00	27,550
2.70	2,880	4.10	5,520	6.00	10,340	12.00	31,250
2.80	3,070	4.20	5,740	6.20	10,920	13.00	34,950
2.90	3,190	4.30	5,970	6.40	11,500		

NOTE.—The above table is applicable only for open-channel conditions. It is based on three discharge measurements made during 1906, and the form of previous curves. It is well defined between gage heights 2 feet and 20 feet. Above gage height 9.5 feet the rating curve is a tangent, the difference being 370 per tenth.

Monthly discharge of Connecticut River at Sunderland, Mass., for 1906.

[Drainage area, 7,700 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	72,300	18,400	36,100	4.69	5.23
May	64,900	13,500	27,800	3.61	4.16
June	35,500	8,690	16,600	2.16	2.41
July	16,600	4,570	7,880	1.02	1.18
August	8,430	2,280	4,540	.590	.68
September	5,520	1,850	3,070	.399	.45
October	7,650	1,630	4,430	.575	.66
November	13,300	3,520	6,820	.886	.99

NOTE.—Values are rated as follows: April, good; May to November, excellent.

CONNECTICUT RIVER AT HARTFORD, CONN.

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

The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 121, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of Connecticut River at Hartford, Conn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.4	6.1	5.6	10.8	7.7	15.6	4.1	3.4	2.6	0.7	2.8	3.9
2	5.1	5.7	7.0	10.0	7.7	12.3	5.1	3.5	2.0	1.4	2.4	2.7
3	5.1	4.0	7.0	8.8	7.8	9.6	6.5	3.3	1.8	1.7	2.5	2.6
4	5.6	4.7	10.2	7.7	9.0	8.0	6.6	3.0	1.5	1.8	1.5	1.7
5	5.0	4.2	12.0	7.8	9.7	7.4	6.0	3.0	2.0	1.9	2.0	3.0
6	5.1	3.7	9.7	9.6	9.1	7.0	5.6	3.1	1.8	1.9	2.7	2.9
7	4.3	4.4	7.3	11.0	8.8	6.7	5.2	3.1	1.7	1.4	2.3	2.3
8	4.0	4.0	6.1	10.5	8.8	6.7	4.5	3.0	2.0	.8	2.2	3.3
9	4.9	4.0	5.5	9.6	8.5	7.0	4.2	3.1	1.8	1.6	2.4	3.2
10	5.5	4.1	5.1	10.6	8.4	7.9	3.9	3.0	1.9	2.2	3.0	3.2
11	5.5	2.9	4.3	11.4	9.6	8.3	3.7	3.0	2.0	2.5	2.9	4.3
12	5.1	3.6	4.5	11.6	10.0	8.0	3.6	2.0	2.6	1.9	3.5	3.7
13	5.0	4.2	4.4	11.5	9.5	7.3	3.4	2.2	2.8	2.3	3.5	3.9
14	5.5	4.2	4.0	11.5	8.9	6.5	3.3	2.9	2.8	1.9	3.5	3.9
15	6.1	4.4	4.0	12.0	9.2	5.7	3.1	2.7	2.2	2.6	3.5	3.7
16	6.3	4.0	3.7	17.6	9.7	5.2	3.1	2.6	2.8	3.6	3.3	2.8
17	6.6	3.9	3.5	20.0	9.4	4.8	3.1	2.4	1.7	3.2	2.3	2.8
18	6.4	3.6	3.9	20.1	8.9	4.8	2.8	1.8	1.6	2.7	1.6	3.9
19	6.2	3.7	3.8	19.1	8.3	5.5	2.8	1.2	1.5	2.9	2.2	3.7
20	5.7	4.0	4.0	18.0	7.4	6.2	3.1	.8	1.4	2.5	4.5	3.6
21	5.0	4.0	2.7	17.1	7.1	5.9	3.0	1.5	1.8	3.2	5.2	3.8
22	5.0	.5.2	3.8	16.1	7.0	5.2	2.1	2.0	1.7	4.2	5.5	3.8
23	5.4	7.2	3.2	15.2	6.6	4.6	2.3	1.9	1.7	3.9	5.2	3.2
24	9.0	7.4	2.5	14.5	6.0	4.0	2.9	1.7	1.2	3.8	5.0	3.0
25	14.4	6.7	1.8	13.7	5.5	4.5	2.8	1.7	2.2	4.7	4.7	2.8
26	14.1	6.9	2.5	12.5	5.2	5.5	2.9	1.8	2.4	4.3	4.4	2.7
27	12.0	7.0	3.2	11.1	5.3	5.5	2.9	2.1	2.8	4.5	4.3	3.3
28	10.4	6.2	4.7	9.5	7.3	5.1	2.9	2.4	2.4	4.1	4.1	3.2
29	9.2		9.6	8.4	15.9	4.6	2.4	2.8	2.8	3.3	3.5	3.3
30	8.0		10.8	7.8	19.0	4.3	2.9	3.0	1.8	3.5	4.0	2.6
31	6.8		10.8		18.2		3.2	3.0		3.1		2.8

ISRAEL RIVER (ABOVE SOUTH BRANCH) NEAR JEFFERSON HIGHLAND,
N. H.

This station was established September 2, 1903. It is located at a small wooden highway bridge in the town of Randolph, about half-way between the railway stations of Jefferson Highland and Bowman, 2½ miles from either place. The conditions and the bench marks are described in New Hampshire Forestry Reports for 1903–1906. and in Water-Supply Paper No. 165, page 123, where are given also references to publications that contain data for previous years. During 1906 gage was read by William Russell. Length of chain changed October 1, 1906, to 15.35 feet. Elevation of bench mark, 8.50 feet above datum of gage.

Discharge measurements of Israel River (above South Branch) near Jefferson Highland, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 1...........	T. W. Norcross.........................	25	33	1.83	48
August 22......	G. M. Brett.............................	9.2	5.0	1.03	4.2
August 22......	....do..................................	9.2	4.9	1.03	4.1
October 1 *a*.....	F. E. Pressey...........................	18	12.8	1.13	6.5

a By wading about 20 feet above bridge.

Daily gage height, in feet, of Israel River (above South Branch) near Jefferson Highland, N. H., for 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1...........	1.73	1.6	1.4	1.15	1.2	1.2	17...........	1.7	1.4	1.2	1.05	1.15	......
2...........	1.6	1.5	1.35	1.1	1.2	1.15	18...........	2.0	1.5	1.35	1.0	1.15	......
3...........	1.95	1.9	1.35	1.05	1.85	1.15	19...........	2.25	1.45	1.2	1.0	1.15	......
4...........	1.7	1.6	1.45	1.05	1.5	1.15	20...........	1.6	1.4	1.15	1.0	1.1	......
5...........	2.15	1.9	1.45	1.05	1.3	1.15	21...........	1.7	1.35	1.15	1.05	1.1	......
6...........	1.8	1.7	1.35	1.05	1.25	1.1	22...........	1.6	1.3	1.35	1.05	1.1	......
7...........	1.7	2.4	1.3	1.45	1.2	1.1	23...........	1.65	1.3	1.3	1.05	1.15	......
8...........	1.6	2.0	1.3	1.2	1.2	1.3	24...........	1.75	1.6	1.25	1.2	1.1	......
9...........	1.5	1.9	1.3	1.15	1.25	1.15	25...........	1.75	1.45	1.2	1.1	1.1	......
10...........	1.8	1.95	1.3	1.1	1.35	1.75	26...........	2.2	1.45	1.2	1.05	1.1	......
11...........	1.5	1.75	1.45	1.1	1.2	1.3	27...........	3.0	1.4	1.2	1.15	1.1	......
12...........	1.55	1.7	1.3	1.05	1.15	1.3	28...........	2.6	1.35	1.15	1.95	1.1	......
13...........	2.75	1.65	1.3	1.05	1.2	......	29...........	2.5	1.45	1.25	1.45	1.05	......
14...........	1.9	1.6	1.25	1.0	1.2	......	30...........	2.3	1.4	1.35	1.2	1.15	......
15...........	1.7	1.55	1.2	1.05	1.2	......	31...........	1.6	......	1.3	1.2	......	......
16...........	1.6	1.4	1.15	1.05	1.2	......							

Rating table for Israel River (above South Branch) near Jefferson Highland, N. H., for 1903–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	3.0	1.60	30	2.10	79	2.60	158
1.10	5.3	1.70	38	2.20	93	2.70	176
1.20	8.6	1.80	46	2.30	108	2.80	194
1.30	13	1.90	55	2.40	124	2.90	212
1.40	18	2.00	67	2.50	140	3.00	230
1.50	24						

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906 and is fairly well defined below gage heights 2.4 feet.

Monthly discharge of Israel River (above South Branch) near Jefferson Highlands, N. H., for 1906.

[Drainage area, 8.7 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
May	230	24	63.8	7.33	8.45
June	124	13	33.1	3.80	4.24
July	21	6.8	12.4	1.43	1.65
August	61	3.0	7.84	.901	1.04
September	50	4.0	9.59	1.10	1.23
October (1–12)	42	5.3	11.2	1.29	.58

NOTE.—Values are rated as approximate.

ISRAEL RIVER (BELOW SOUTH BRANCH) NEAR JEFFERSON HIGHLANDS, N. H.

This station was established September 2, 1903. It is located at a small wooden highway bridge about 2 miles from the railway station at Jefferson Highlands, in the town of Jefferson. The conditions and the bench marks are described in New Hampshire Forestry Reports for 1903–1906 and in Water-Supply Paper No. 165, page 125, where are given also references to publications that contain data for previous years. During 1906 the gage was read by William Russell.

Discharge measurements of Israel River (below South Branch) near Jefferson Highlands, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 1	T. W. Norcross	40	30	1.80	98
August 22[a]	G. M. Brett	15.6	13	1.07	11.8
October 1[a]	F. E. Pressey	16	13.9	1.20	14.0

[a] Measured by wading.

Daily gage height, in feet, of Israel River (below South Branch) near Jefferson Highlands, N. H., for 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	1.8	1.5	1.2	1.25	1.2	1.3	1.3
2	1.7	1.75	1.45	1.15	1.2	1.25	1.25	1.4
3	1.9	2.05	1.45	1.15	1.95	1.15	1.25	1.4
4	1.8	1.8	1.5	1.1	1.7	1.15	1.2	1.7
5	2.2	1.7	1.5	1.1	1.4	1.1	1.2	1.7
6	2.0	1.7	1.45	1.1	1.3	1.1	1.2	1.8
7	1.9	2.2	1.35	1.6	1.25	1.1	1.15	1.8
8	1.7	1.8	1.35	1.35	1.2	1.25	1.2	1.8
9	1.65	1.8	1.35	1.2	1.25	1.1	1.2	1.8
10	2.0	1.7	1.4	1.15	1.45	1.7	1.2	1.8
11	1.65	1.75	1.45	1.15	1.3	1.3	1.2	1.8
12	1.65	1.65	1.4	1.15	1.25	1.3	1.2	1.8
13	2.8	1.6	1.35	1.15	1.2	1.25	1.2	1.8
14	2.05	1.55	1.3	1.1	1.2	1.25	1.2	1.8
15	1.8	1.5	1.25	1.1	1.2	1.25	1.5	1.9

Daily gage height, in feet, of Israel River (below South Branch) near Jefferson Highlands,
N. H., for 1906—Continued.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	1.8	1.45	1.2	1.1	1.2	1.2	1.4	1.7
17	1.9	1.45	1.2	1.05	1.15	1.2	1.2	1.6
18	2.05	1.5	1.35	1.05	1.15	1.2	1.2	1.6
19	2.25	1.5	1.2	1.05	1.15	1.2	1.9	1.55
20	1.8	1.45	1.2	1.05	1.15	1.45	1.45	1.55
21	1.85	1.4	1.2	1.15	1.15	1.35	1.4	1.5
22	1.6	1.35	1.45	1.15	1.15	1.3	1.3	1.5
23	1.55	1.35	1.25	1.1	1.2	1.25	1.2	1.4
24	1.6	1.7	1.25	1.3	1.15	1.25	1.2	1.5
25	1.7	1.55	1.25	1.1	1.15	1.25	a 1.3	1.4
26	2.2	1.5	1.2	1.1	1.15	1.45	1.3	1.4
27	2.95	1.45	1.15	1.1	1.15	1.35	1.3	1.5
28	2.6	1.4	1.15	2.0	1.15	1.3	1.3	1.5
29	2.2	1.45	1.1	1.45	1.1	1.25	1.4	1.5
30	2.05	1.4	1.35	1.2	1.2	1.25	1.3	1.4
31	1.9	....	1.3	1.0	....	1.2	....	1.5

a Ice jam below gage, discharge corrected.

NOTE.—The river was frozen December 2 to 14 and 27 to 29. Records for November and December
are of doubtful value on account of anchor ice in the river and of jams of anchor ice and masses of
snow.

Rating table for Israel River (below South Branch) near Jefferson Highlands, N. H., for
1905–6.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	10	1.60	66	2.20	211	2.80	385
1.10	15	1.70	84	2.30	240	2.90	414
1.20	21	1.80	105	2.40	269	3.00	443
1.30	29	1.90	128	2.50	298		
1.40	39	2.00	154	2.60	327		
1.50	51	2.10	182	2.70	356		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge
measurements made during 1903–1906, and it is well defined between gage heights 0.9 foot and 2.6 feet.

Monthly discharge of Israel River (below South Branch) near Jefferson Highlands, N. H.,
for 1906.

[Drainage area, 21.2 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
May	428	58	149	7.03	8.10
June	211	34	73.1	3.45	3.85
July	51	15	32.1	1.51	1.74
August	154	10	24.0	1.13	1.30
September	141	15	28.3	1.33	1.48
October	84	15	26.5	1.25	1.44
November	128	21	28.3	1.33	1.48

NOTE.—Values are rated as fair.

AMMONOOSUC RIVER AT BRETTON WOODS, N. H.

This station was established August 28, 1903. It is located at the steel highway bridge near Mount Pleasant House, at Bretton Woods. The conditions and the bench marks are described in New Hampshire Forestry Reports for 1903–1906, and in Water-Supply Paper No. 165, page 128, where are given also references to publications that contain data for previous years.

Discharge measurements of Ammonoosuc River near Bretton Woods, N. H., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 4.........	T. W. Norcross................................	40	157	3.61	534
July 5.........	Murphy and Barrows.........................	38	83	1.80	54
August 1*a*.....	T. W. Norcross................................	40	106	2.40	129
August 4.....	.....do...	39	89	1.93	62
August 24*b*....	.....do...	30	27.6	1.58	31.6
October 27*c*....	.....do...	24	28.5	1.57	30.4
1906.					
May 2.........	T. W. Norcross................................	40	117	2.50	159
August 21......	G. M. Brett....................................	27.5	22	1.51	21
October 1.......	F. E. Pressey..................................	31	34	1.65	25

a Meter in poor condition.
b By wading, 150 above gage; meter fastened to a rod.
c From upstream side of highway bridge.

Daily gage height, in feet, of Ammonoosuc River at Bretton Woods, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1...............	1.55	1.75	....	1.80	2.84	2.58	2.58	1.68	1.62	1.68	1.85	1.90
2...............	1.55	1.75	....	1.54	2.58	2.55	2.38	1.62	1.60	1.62	1.85	1.90
3...............	1.55	1.75	....	1.52	3.05	2.80	1.95	1.52	1.92	1.60	1.82	......
4...............	1.58	1.75	....	1.54	2.85	2.58	2.68	1.50	2.10	1.52	1.80	......
5...............	1.60	1.75	....	1.70	3.15	2.40	2.30	1.50	1.80	1.50	1.80	......
6...............	1.60	....	....	1.70	2.82	2.75	2.08	1.65	1.68	1.55	1.80	1.80
7...............	1.60	....	1.60	1.54	2.72	3.10	1.95	1.72	1.62	1.80	1.80	......
8...............	1.60	....	1.50	1.52	2.55	2.72	1.88	1.62	1.60	1.70	1.80	1.70
9...............	1.55	1.70	1.50	1.52	2.68	2.52	1.85	1.55	1.60	1.75	1.78	......
10...............	1.55	1.60	1.50	1.52	2.95	2.35	1.90	1.50	2.10	2.15	1.75	1.70
11...............	1.50	....	1.50	1.47	2.60	2.28	1.88	1.50	1.75	1.98	1.72	......
12...............	1.50	....	....	1.47	2.52	2.22	1.82	1.50	1.62	1.88	1.70	1.70
13...............	1.50	....	....	1.60	3.80	2.10	1.78	1.50	1.60	1.85	1.70	......
14.s...............	1.50	....	....	1.77	2.98	2.02	1.72	1.50	1.60	1.85	1.70	......
15...............	1.52	1.50	1.50	3.37	1.98	1.75	1.75	1.48	1.60	1.80	1.75	1.75
16...............	1.62	....	....	3.20	2.78	1.92	1.75	1.45	1.60	1.78	1.80	......
17...............	1.58	1.50	....	2.87	2.70	2.05	1.72	1.42	1.60	1.75	1.78	1.68
18...............	1.55	....	....	2.77	2.60	2.18	1.72	1.40	1.58	1.75	1.75	1.65
19...............	1.55	....	....	2.80	2.58	2.02	1.62	1.50	1.52	1.75	2.52	1.65
20...............	1.55	1.50	....	2.92	2.52	1.95	1.60	1.42	1.50	2.85	2.30	1.65
21...............	1.55	1.58	1.35	3.27	2.48	1.85	1.88	1.50	1.50	2.15	2.00	1.65
22...............	2.45	1.80	1.35	2.94	2.42	1.85	1.88	1.48	1.52	2.02	1.98	1.65
23...............	3.68	1.70	1.38	2.62	2.30	1.88	1.80	1.68	1.60	1.98	1.95	1.62
24...............	3.75	1.58	1.40	2.42	2.35	2.25	1.75	1.82	1.50	1.92	1.90	1.60
25...............	2.50	1.58	1.40	2.10	3.08	2.05	1.62	1.62	1.45	2.53	1.88	1.60

Daily gage height, in feet, of Ammonoosuc River at Bretton Woods, N. H., for 1906—
Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26...............	2.25	1.70	1.40	2.07	2.78	1.98	1.58	1.58	1.45	2.28	1.85	1.58
27...............	2.15	1.62	1.58	2.07	4.65	1.88	1.52	2.20	1.60	2.10	2.02	1.55
28...............	2.05	....	2.08	2.02	4.20	1.75	1.50·	2.70	1.62	2.08	2.12	1.55
29...............	1.85	....	1.70	2.17	3.55	2.48	1.50	1 95	1.52	2.02	1.98	1.55
30...............	1.80	....	1.70	2.82	2.80	2.58	1.95	1.75	1.90	1.98	1.92	1.55
31...............	1.80	....	1.68	....	2.70	....	1.95	1.70	....	1.95	....	1.55

NOTE.—The following ice conditions prevailed during 1906: River open January 1 to February 5; frozen most of the time from February 5 to March 21, except in narrow strips just above and below gage. Ice went out about March 21. Anchor ice reported on April 1 and 5 and on December 2. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
February 9................	1.7	2.1	0.4	December 8, 10, 12.......	1.7	....	0.6
February 10.............	1.6	2.1	.4	December 15.............	1.75	....	.45
February 15.............	1.5	1.75	.35	December 17.............	1.68	....	.45
February 17.............	1.5	1.95	.4	December 18–20..........	1.65	....	.4
March 15.................	1.5	1.75	.35	December 21.............	1.65	....	.35
December 6...............	1.8	....	.45				

Rating table for Ammonoosuc River at Bretton Woods, N. H.

JANUARY 1 TO DECEMBER 31, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	20	2.00	75	2.60	185	3.20	388
1.50	26	2.10	88	2.70	213	3.30	428
1.60	33	2.20	103	2.80	243	3.40	469
1.70	42	2.30	120	2.90	275	3.50	510
1.80	52	2.40	139	3.00	310	3.60	552
1.90	63	2.50	160	3.10	348		

JANUARY 1 TO DECEMBER 31, 1906.[b]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1.40	15	2.30	118	3.20	388	4.00	726
1.50	20	2.40	138	3.30	428	4.10	770
1.60	27	2.50	160	3.40	469	4.20	815
1.70	36	2.60	185	3.50	510	4.30	860
1.80	46	2.70	213	3.60	552	4.40	905
1.90	57	2.80	243	3.70	595	4.50	950
2.00	70	2.90	275	3.80	638	4.60	995
2.10	84	3.00	310	3.90	682	4.70	1,040
2.20	100	3.10	348				

[a] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1905 and is fairly well defined.

[b] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1906 and is not well defined.

Monthly discharge of Ammonoosuc River at Bretton Woods, N. H., for 1905–6.

[Drainage area, 34 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
March (21–31)	544	26	256	7.53	3.08
April	282	32	147	4.32	4.82
May	531	75	192	5.65	6.51
June	228	35	86.7	2.55	2.84
July	329	20	47.6	1.40	1.61
August	228	33	69.1	2.03	2.34
September	213	47	86.7	2.55	2.84
October	111	29	41.0	1.21	1.40
November	88	17	29.1	.856	.955
December (1–15)	199	26	58.0	1.71	.954
1906.					
March (21–31)	81	13	27.1	.797	.326
April	457	18	132	3.88	4.33
May	1,020	118	290	8.53	9.83
June	348	41	122	3.59	4.00
July	207	20	59.6	1.75	2.02
August	213	15	34.6	1.02	1.18
September	84	17	32.5	.956	1.07
October	259	20	64.8	1.91	2.20
November	165	36	57.3	1.69	1.89

NOTE.—Values for 1905 are rated as follows: March to September and December, fair; October and November, approximate. Values for 1906 are rated as follows: March and September to November, approximate; April to August, good.

ZEALAND RIVER NEAR TWIN MOUNTAIN, N. H.

This station was established August 29, 1903. It is located about 800 feet above the mouth of the river, which empties into the Ammonoosuc at a point midway between Fabyans and Twin Mountain, about 2½ miles from either place. The conditions at the station and the bench marks are described in New Hampshire Forestry Reports for 1903–6, and in Water-Supply Paper No. 165, page 30, where are given also references to publications that contain data for previous years. Length of chain changed to 12.99 feet, May 2, 1906, and to 12.38 feet, October 3, 1906, on account of settling of one of the trees to which the gage is fastened.

Discharge measurements of Zealand River near Twin Mountain, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 2	T. W. Norcross	46	37	2.85	96
August 21 [a]	G. M. Brett	19.5	12	2.01	6.8
August 21 [a]	....do	12.2	6.2	2.01	7.6
October 3 [a]	F. E. Pressey	25	13.5	2.02	6.4

[a] Measured by wading.

Daily gage height, in feet, of Zealand River near Twin Mountain, N. H., for 1906.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.45	2.6	2.6	2.35	2.3	2.25	2.5	2.75
2		3.0	2.6	2.45	2.3	2.15	2.25	2.45	....
3		3.3	2.8	2.25	2.25	2.2	2.8	2.4	....
4		3.2	2.6	2.65	2.25	2.1	2.6	2.4	....
5		3.3	2.55	2.55	2.25	2.05	2.3	2.4	....
6		2.9	3.2	2.45	2.25	2.0	2.3	2.35	....
7		3.0	3.0	2.35	2.25	2.0	2.5	2.35	....
8	2.55	2.7	2.9	2.3	2.35	2.0	2.4	2.25	....
9	2.55	2.9	2.8	2.35	2.3	2.3	2.6	2.25	....
10	2.55	3.0	2.7	2.4	2.2	2.0	2.8	2.25	....
11	2.45	2.9	2.7	2.35	2.25	2.0	3.2	2.3	....
12	2.35	2.8	2.6	2.3	2.25	1.95	3.1	2.35	....
13	2.25	3.7	2.55	2.25	2.2	1.9	2.9	2.35	....
14	2.55	3.05	2.5	2.15	2.15	1.9	2.6	2.4	....
15	4.05	2.9	2.45	2.25	2.2	1.85	2.55	2.5	....
16	3.55	2.95	2.3	2.5	2.2	2.05	2.5	2.4	....
17	3.45	2.95	2.5	2.3	2.15	2.05	2.5	2.4	....
18	3.55	2.9	2.45	2.35	2.1	2.15	2.5	2.5	....
19	3.35	2.7	2.4	2.3	2.05	2.1	2.45	2.6	....
20	3.85	2.7	2.3	2.3	2.05	2.05	2.8	2.9	....
21	4.0	2.5	2.3	2.8	2.15	2.0	2.4	2.8	....
22	3.15	2.45	2.35	2.5	2.15	2.0	2.8	2.8	....
23	2.85	2.45	2.4	2.55	2.25	2.25	2.7	2.6	....
24	2.75	2.5	2.7	2.4	2.2	2.35	2.6	2.5	....
25	2.75	3.2	2.6	2.35	2.15	2.25	2.9	2.5	....
26	2.75	2.7	2.45	2.25	2.15	2.25	3.0	2.7	....
27	2.75	4.0	2.55	2.2	3.05	2.15	2.85	2.8	....
28	2.65	3.8	2.35	2.15	2.65	2.15	2.65	2.9	....
29	2.70	3.25	2.75	2.2	2.45	2.15	2.6	2.8	....
30	3.75	2.85	2.7	2.6	2.35	2.35	2.65	2.8	....
31	....	2.75	....	2.5	2.35	....	2.5	....	....

Rating table for Zealand River near Twin Mountain, N. H., for 1906.

Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.85	3	2.30	24	2.90	127	3.50	330
1.90	4	2.40	34	3.00	156	3.60	368
1.95	5	2.50	45	3.10	188	3.70	406
2.00	6	2.60	60	3.20	222	3.80	445
2.10	11	2.70	78	3.30	257	3.90	485
2.20	17	2.80	100	3.40	293	4.00	526

NOTE.—The above table is applicable only for open-channel conditions. It is based upon four discharge measurements made during 1906, and is merged with the 1905 table at gage height 2.6 feet. It is fairly well defined.

Monthly discharge of Zealand River near Twin Mountain, N. H., for 1906.

[Drainage area, 14 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (8–30)	546	20	190	13.57	11.61
May	526	39	169	12.07	13.91
June	222	24	64.8	4.63	5.17
July	100	14	34.2	2.44	2.81
August	172	8	25.8	1.84	2.12
September	29	3	12.2	.871	.97
October	222	24	74.9	5.35	6.17
November	127	20	54.0	3.86	4.31

NOTE.—Values are rated as approximate, owing to settling of gage and erroneous gage heights.

DEERFIELD RIVER AT DEERFIELD, MASS.

This station was established March 29, 1904, at the suspension highway bridge, about one-fourth mile from the West Deerfield railway station and about 6 or 7 miles above the mouth of the river. It was discontinued December 31, 1905. The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 134, where are given also references to publications that contain data for previous years.

Discharge measurements of Deerfield River at Deerfield, Mass., in 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 30.......	N. C. Grover......................	....	2,180	3.61	2,390
April 11........	S. K. Clapp......................	....	2,500	4.68	5,810
April 25........	.....do..........................	....	2,480	4.58	5,010
May 18.........	.....do..........................	....	2,270	3.75	3,420
June 1.........	.....do..........................	....	1,920	2.81	590
June 20 [a].....	.....do..........................	....	449	2.70	850
July 28 [a]......	.....do..........................	....	259	2.60	513
August 17 [a]....	.....do..........................	....	168	2.45	275
September 17 ..	T. W. Norcross..................	....	2,020	3.21	1,260
October 27.....	.....do..........................	....	2,010	2.90	981
November 30 [ab]	.....do..........................	....	288	2.60	531
1905.					
April 4.........	T. W. Norcross..................	319	2,270	3.97	3,710
August 16......	.....do..........................	315	2,040	3.29	1,680
August 16....	.....do..........................	318	2,120	3.56	2,290
August 16....	.....do..........................	318	2,140	3.69	2,520
August 17.....	.....do..........................	318	2,130	3.68	2,380
August 17.....	.....do..........................	318	2,110	3.51	2,000
August 17.....	.....do..........................	318	2,100	3.42	1,840
August 31.....	.....do..........................	314	2,020	3.12	1,310
1906.					
September 21[a].	F. E. Pressey....................	180	110	1.58	85

[a] By wading at different sections.
[b] River frozen at gage 0.1 foot thick. Gage height to bottom of ice.

Rating table for Deerfield River at Deerfield, Mass., for 1904–5.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.20	180	3.20	1,450	4.20	3,900	5.40	8,250
2.30	220	3.30	1,650	4.30	4,200	5.60	9,120
2.40	280	3.40	1,860	4.40	4,510	5.80	10,030
2.50	370	3.50	2,080	4.50	4,830	6.00	10,980
2.60	490	3.60	2,310	4.60	5,170	6.20	11,970
2.70	620	3.70	2,550	4.70	5,520	6.40	12,980
2.80	760	3.80	2,800	4.80	5,880	6.60	14,030
2.90	910	3.90	3,060	4.90	6,250	6.80	15,100
3.00	1,080	4.00	3,330	5.00	6,630	7.00	16,200
3.10	1,260	4.10	3,610	5.20	7,420	7.20	17,300

NOTE.—The above table is applicable only for open-channel conditions. It is based on twenty discharge measurements made during 1904–1906 and is fairly well defined between gage heights 2.5 feet and 5 feet. The rating below gage height 2.5 feet is very uncertain.

Monthly discharge of Deerfield River at Deerfield, Mass., for 1904–5.

[Drainage area, 550 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
April	10,700	1,550	4,050	7.36	8.21
May	5,340	620	2,270	4.13	4.76
June	11,200	250	1,200	2.18	2.43
July	910	280	411	.747	.86
August	3,200	220	476	.865	1.00
September	9,120	180	915	1.66	1.85
October	5,880	325	983	1.79	2.06
November	760	220	336	.611	.68
1905.					
January 7–13	17,300	1,760	5,000	9.09	2.37
March 27–31	14,000	8,460	10,900	19.80	3.68
April	9,340	1,260	3,380	6.15	6.86
May	1,450	325	716	1.30	1.50
June	4,200	220	682	1.24	1.38
July	2,080	180	421	.765	.88
August	2,310	180	588	1.07	1.23
September	8,680	490	2,110	3.84	4.28
October	1,860	325	630	1.15	1.33
November	5,520	280	696	1.27	1.42
December 1–15	12,000	760	2,240	4.07	2.27

NOTE.—Values for 1904 are rated as follows: April to June, September and October, good; remainder of year, approximate. Values for 1905 are rated as follows: January, April, September, and December, good; March, May, June, August, October, and November, fair; July, approximate.

DEERFIELD RIVER AT HOOSAC TUNNEL, MASS.

A measurement was made October 29, 1906, from the downstream side of the highway bridge at this point. The bench mark is the top of guard rail 25 feet from the downstream side of the left abutment, the distance to water surface being 23.63 feet.

Width, 125 feet; area, 130 square feet; discharge, 66 second-feet.

WARE RIVER NEAR WARE, MASS.

This station was established September 15, 1904, at the steel highway bridge about 2 miles above the village of Ware, Mass. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 136, where are given also references to publications that contain data for previous years.

Discharge measurements of Ware River near Ware, Mass., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 21 a	T. W. Norcross	83	159	3.40	301
April 7	do	83	230	4.17	741
October 18	F. E. Pressey	80	113	3.05	237

a Probably an ice jam below bridge.

Daily gage height, in feet, of Ware River near Ware, Mass., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.05	2.9	3.6	4.6	3.5	4.35	3.5	3.05	2.2	3.2	3.15	3.4
2	2.95	2.9	3.4	4.2	3.25	4.0	3.8	3.0	2.3	2.8	3.1	2.35
3	2.95	2.85	3.1	3.8	3.3	3.9	3.9	3.0	3.0	2.8	3.0	3.3
4	3.15	2.8	6.05	3.7	3.3	3.5	4.1	3.05	3.4	2.8	2.7	e 4.1
5	3.5	2.75	5.65	3.7	3.35	3.3	4.2	3.0	2.45	2.7	2.8	e 4.65
6	3.2	a 4.1	4.1	4.15	2.9	3.55	3.4	3.05	2.8	2.3	2.9	2.75
7	3.1	a 4.65	3.55	4.3	3.45	3.15	3.4	3.0	2.85	2.35	3.1	3.3
8	3.25	a 3.75	3.75	4.0	3.45	3.15	3.2			2.15	2.8	e 3.7
9	3.15	b 5.0	3.7	3.8	3.5	3.1	2.9	2.8		2.9	2.8	e 4.65
10	a 3.5	b 5.0	3.4	4.15	3.3	3.0	2.9			3.2	2.6	e 5.2
11	a 3.9	(c)	3.2	4.9	3.2	3.3	2.7	2.8		3.2	2.4	e 5.0
12	a 3.8	(c)	3.35	4.9	3.1	3.2	2.5	2.65	2.75	3.15	3.05	e 4.9
13	3.1	(c)	3.05	4.75	3.1	3.2	2.95	2.6	2.35	2.6	3.4	e 4.8
14	3.1	d 3.5	3.1	4.4	3.1	3 1	2.8	2.6	3.0	2.25	2.9	
15	2.95	3.7	3.05	4.3	3.0	3.1	2.65	2.7	2.7	2.5	3.0	
16	3.1	3.8	3.75	5.25	3.0	3.45	2.75	2.7	2.15	2.7	3.2	
17	3.85	a 3.55	3.65	4.8	2.9	3.9	2.75	2.7	2.2	2.8	3.1	3.3
18	3.55	d 2.9	2.75	4.25	3.1	4.1	2.6	2.35	2.6	3.0	2.5	2.7
19	3.0	3.05	3.45	4.0	3.0	4.3	2.7	1.7	2.7	3.3	3.8	3.85
20	3.0	3.95	3.0	3.85	2.8	3.95	2.5	2.7	2.7	2.9	3.75	3.9
21	2.9	e 2.8	3.1	3.75	2.6	3.75	3.05	2.9	3.0	3.85	3.8	3.1
22	3.4	4.4	2.95	3.5	2.6	3.55	2.6	2.9	2.6	2.6	3.7	3.05
23	3.6	4.4	2.8	3.45	2.7	3.2	2.7	3.05	2.4	2.75	3.75	3.3
24	4.1	3.7	3.1	3.5	2.6	3.3	2.6	3.2	3.15	3.2	3.0	a 4.4
25	3.7	3.4	2.7	3.4	2.6	3.25	2.55	2.75	2.45	3.4	2.9	a 5.4
26	3.5	3.9	2.65	3.2	2.9	3.1	2.25	2.3	2.8	4.0	3.25	a 5.2
27	3.1	3.8	2.9	3.2	2.8	3.05	2.2	2.6	2.65	3.7	3.0	4.25
28	3.3	3.5	5.1	3.05	5.6	3.05	2.25	4.4	2.5	2.8	3.1	d 3.65
29	3.2		5.05	2.8	6.9	2.85	2.85	4.05	1.85	3.25	2.9	2.8
30	3.2		4.7	3.3	6.3	2.7	3.8	3.3	2.25	3.3	3.15	f 2.5
31	3.05		4.6		4.45		3.4	3.25		3.15		2.35

a Backwater due to ice jam.
b Water flowing over ice.   Anchor ice jam below gage.
c River full of anchor ice.
d Ice going out.
e Ice jam about 30 feet below gage.
f River clear of ice.

NOTE.—River does not usually freeze at gaging section, but frequent difficulty is experienced from backwater due to a jam of anchor ice about 500 feet below.

Rating table for Ware River near Ware, Mass., for 1904–1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.70	20	2.80	235	3.90	624	5.00	1,212
1.80	30	2.90	264	4.00	670	5.20	1,332
1.90	42	3.00	294	4.10	718	5.40	1,460
2.00	55	3.10	325	4.20	768	5.60	1,590
2.10	71	3.20	357	4.30	820	5.80	1,725
2.20	89	3.30	390	4.40	873	6.00	1,865
2.30	109	3.40	424	4.50	927	6.20	2,005
2.40	131	3.50	460	4.60	982	6.40	2,155
2.50	155	3.60	498	4.70	1,038	6.60	2,305
2.60	180	3.70	538	4.80	1,095	6.80	2,460
2.70	207	3.80	580	4.90	1,153	7.00	2,620

NOTE.—The above table is applicable only for open-channel conditions.   It is based on discharge measurements made during 1904–1906 and is well defined between gage heights 1.9 feet and 7 feet.

Monthly discharge of Ware River near Ware, Mass., for 1906.

[Drainage area, 162 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	1,360	235	685	4.23	4.72
May	2,540	180	503	3.10	3.57
June	846	207	445	2.75	3.07
July	768	89	307	1.90	2.19
August	873	20	278	1.72	1.98
September	424	36	197	1.22	1.36
October	670	80	292	1.80	2.08
November	580	131	329	2.03	2.26

NOTE.—Values are rated as good.

WARE RIVER AT BARRE PLAINS, MASS.

A measurement was made October 18, 1906, from the downstream side of the wooden highway bridge at Barre Plains. The bench mark is top of top chord of bridge, 20 feet from downstream side of left abutment. The distance to water surface was 15.33 feet.

Width, 53 feet; area, 132 square feet; discharge, 104 second-feet.

QUABOAG RIVER AT WEST WARREN, MASS.

A station for securing a record of flow of Quaboag River has been maintained by the United States Geological Survey at West Warren, at the dam of J. T. F. MacDonnell, of Holyoke, since October 22, 1904. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 139, where are given also references to publications that contain data for previous years.

A measurement was made October 19, 1906, by wading, 150 feet below the tail race, with the following results:

Width, 125 feet; area, 120 square feet; gage height, 50.60 feet; discharge, 173 second-feet.

Daily gage height, in feet, of Quaboag River at West Warren, Mass., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	50.45	50.7	50.85	51.4	51.0	51.35	50.7	50.6	50.45	50.3	50.8	50.55
2	50.45	50.65	50.8	51.4	51.0	51.3	50.75	50.6	50.5	50.3	50.75	50.55
3	50.4	50.6	50.85	51.4	51.0	51.15	51.05	50.55	50.5	50.25	50.7	50.55
4	50.45	50.55	51.65	51.35	51.0	51.15	51.1	50.6	50.45	50.3	50.7	50.5
5	50.5	50.55	51.60	51.35	50.9	51.15	51.0	50.6	50.45	50.3	50.65	50.5
6	50.45	50.5	51.55	51.3	50.9	51.1	51.0	50.6	50.5	50.3	50.65	50.5
7	50.45	50.5	51.5	51.3	50.9	51.1	50.95	50.7	50.45	50.4	50.6	50.5
8	50.45	50.55	51.45	51.25	51.0	51.0	50.9	50.65	50.45	50.4	50.55	50.45
9	50.45	50.5	51.4	51.25	50.9	51.0	50.9	50.65	50.45	50.35	50.5	50.5
10	50.45	50.5	51.35	51.35	50.85	50.9	50.85	50.6	50.4	50.55	50.5	50.5
11	50.5	50.5	51.2	51.4	50.85	50.9	50.8	50.6	50.4	50.6	50.45	50.55
12	50.55	50.5	51.2	51.45	50.85	50.85	50.8	50.6	50.4	50.6	50.75	50.5
13	50.55	50.5	51.15	51.45	50.8	50.85	50.75	50.6	50.35	50.55	50.7	50.45
14	50.6	50.45	51.1	51.45	50.8	50.8	50.7	50.6	50.4	50.55	50.7	50.5
15	50.6	50.45	51.0	51.5	50.8	50.8	50.6	50.55	50.35	50.55	50.65	50.5
16	50.6	50.5	51.05	51.5	50.75	50.8	50.6	50.5	50.35	50.5	50.7	50.55
17	50.8	50.5	51.2	51.5	50.7	50.9	50.65	50.6	50.35	50.5	50.7	50.55
18	50.85	50.55	50.8	51.45	50.7	50.9	50.65	50.6	50.3	50.45	50.75	50.55
19	50.9	50.55	50.8	51.4	50.65	50.9	50.65	50.6	50.3	50.45	50.75	50.5
20	50.9	50.6	50.8	51.4	50.6	50.85	50.7	50.6	50.35	50.45	50.7	50.5

Daily gage height, in feet, of Quaboag River at West Warren, Mass., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21..............	50.95	50.65	50.75	51.35	50.6	50.85	50.75	50.55	50.3	51.1	50.6	50.5
22..............	51.0	51.25	50.75	51.3	50.6	50.8	50.8	50.6	50.3	51.1	50.7	50.55
23..............	51.0	51.2	50.75	51.3	50.55	50.75	50.8	50.55	50.45	51.05	50.7	50.55
24..............	51.1	51.0	50.7	51.3	50.55	50.7	50.85	50.55	50.45	51.0	50.65	50.55
25..............	51.0	50.95	50.7	51.25	50.5	50.65	50.8	50.5	50.4	50.95	50.65	50.5
26..............	50.95	50.95	50.75	51.2	50.5	50.65	50.75	50.5	50.4	50.9	50.65	50.5
27..............	50.9	50.9	50.75	51.2	50.5	50.6	50.7	50.5	50.35	50.9	50.6	50.5
28..............	50.85	50.9	51.4	51.1	51.0	50.6	50.65	50.55	50.3	50.85	50.6	50.5
29..............	50.85	....	51.45	51.1	51.5	50.6	50.6	50.55	50.3	50.85	50.6	50.5
30..............	50.8	....	51.45	51.1	51.5	50.6	50.6	50.5	50.25	50.8	50.6	50.5
31..............	50.75	....	51.4	51.0	51.4	....	50.65	50.5	....	50.8	....	51.2

NOTE.—The gage was read once a day, about 6.15 a. m. (before the mill upstream starts up) on week days and about 4 p. m. on Sundays.
The discharge is not affected by ice conditions.

Monthly discharge of Quaboag River at West Warren, Mass., for 1906.

[Drainage area, 144 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January...........................	416	89	213	1.48	1.71
February..........................	507	106	198	1.38	1.44
March............................	783	205	432	3.00	3.46
April.............................	675	416	562	3.90	4.35
May..............................	675	123	285	1.98	2.28
June.............................	571	161	303	2.10	2.34
July.............................	416	161	245	1.70	1.96
August...........................	205	123	152	1.06	1.22
September.........................	123	41	85.1	.591	.66
October...........................	416	41	181	1.26	1.45
November.........................	254	106	186	1.29	1.44
December.........................	476	106	139	.965	1.11
The year.........................	783	41	248	1.72	23.41

QUABOAG RIVER AT PALMER, MASS.

A measurement was made October 19, 1906, from the downstream side of the highway bridge near Palmer railroad station. The bench mark is top of floor beam, 72 feet from the right abutment, downstream side of bridge. Distance to water surface, 14.25 feet.

Width, 77 feet; area, 170 square feet; discharge, 110 second-feet.

WESTFIELD LITTLE RIVER NEAR BLANDFORD, MASS.

This station was established July 13, 1905, at Cobble Mountain, near Blandford, Mass., a short distance below Borden Brook. It is maintained in cooperation with the water board of the city of Springfield, through their engineer, E. E. Lochridge. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 142, where are given also references to publications that contain data for previous years.

On August 10, 1906, a sharp-crested weir, with length of crest 29.98 feet, capable of carrying a depth of flow of 1.5 feet, was installed

a short distance downstream from the current-meter station. Estimates of flow over the weir are given, based upon the coefficients given on page 36, Water-Supply Paper 150. The weir gage was read at approximately the same times as the current-meter gage.

Discharge measurements of Westfield Little River near Blandford, Mass., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
July 14 *a*	Barrows and Norcross	34	44	2.32	32.4
August 10 *a*	Norcross and Lochridge	32	51	2.30	23.8
September 8 *a*	.....do	46	73	2.98	82
September 27 *a*	T. W. Norcross	39	54	2.40	26.5
September 28 *a*	.....do	39	53	2.39	25.7
October 13	.....do	44	77	2.94	85
October 14	.....do	42	71	2.76	59
November 9	Norcross and Lochridge	39	59	2.57	40.1
1906.					
March 23 *b*	T. W. Norcross	40	46	2.61	38
April 5	.....do	65	144	4.21	449
April 6	.....do	69	172	4.64	594
April 6	.....do	69	166	4.53	587
April 6	.....do	68	164	4.50	565
April 6	.....do	69	159	4.44	555
April 23	.....do	50	93	3.31	162
April 24	.....do	50	88	3.21	135
June 22	F. E. Pressey	35	53	2.48	26.5
August 9	.....do	38	64	2.58	45.2
August 10	.....do	32	47	2.34	23.4
August 10	.....do	32	47	2.32	26.0
August 10	.....do	32	46	2.34	22.8
August 10	G. M. Brett	33	46	2.34	21.4
August 10	F. E. Pressey	32	46	2.34	22.4
August 10	G. M. Brett	33	46	2.33	24.2
August 10	Barrows and Pressey	32	44	2.33	22.3
September 18 *c*	F. E. Pressey	7.0	4.2	1.68	3.4
September 18 *c*	.....do	6.0	2.7	1.68	3.2
September 19 *c*	.....do	5.5	3.5	1.68	3.3
September 19 *c*	.....do	5.5	3.5	1.68	3.1
September 19 *c*	.....do	5.5	3.5	1.68	3.1
September 19 *c*	.....do	5.5	3.5	1.68	3.1
September 19 *c*	.....do	5.5	3.6	1.68	2.8
September 19 *c*	.....do	5.5	3.6	1.68	3.2
September 19 *c*	.....do	5.5	3.6	1.68	2.9
September 19 *c*	.....do	5.5	3.6	1.68	3.3
September 24 *d*	.....do	10	7.6	2.09	11.8
September 25 *d*	.....do	10	7.2	2.04	10.6
September 25 *d*	.....do	8	6.4	2.02	11.2
September 25 *d*	.....do	8	6.4	2.02	10.6
October 21	.....do	49	86	3.28	154
October 22	.....do	43	76	3.00	96
October 22	.....do	43	74	3.00	94
October 22	.....do	43	72	2.99	89
October 22	.....do	48	76	2.99	87.
October 22	.....do	43	72	2.98	88
October 22	.....do	43	70	2.93	81
October 22	.....do	43	71	2.92	77
October 23	.....do	42	66	2.76	63
October 23	.....do	42	67	2.75	61
October 23	.....do	41	66	2.72	56
October 23	.....do	41	66	2.71	56
October 23	.....do	40	66	2.72	59
October 24	.....do	38	60	2.60	43.6
October 24	.....do	38	57	2.59	41.3
October 24	.....do	38	58	2.58	40.4
October 24	.....do	38	57	2.56	39.8
October 24	.....do	38	56	2.56	39.3
October 24	.....do	38	57	2.58	40.8
October 25	.....do	48	89	3.28	150
October 25	.....do	48	86	3.28	138
October 25	.....do	48	88	3.26	140
November 23	Lee and James	45	81	3.02	93
November 24	.....do	43	72	2.84	72

a By wading; meter on a rod.   *c* Measured 300 feet below gage.
b River frozen over.   *d* Measured 300 feet below weir.

Daily gage height, in feet, of Westfield Little River near Blandford, Mass., for 1905-6.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.									
1					3.50	2.47	2.32	2.38	3.28
2					3.05	2.50	2.32	2.38	a 3.30
3					2.84	4.08	2.58	2.35	4.18
4					2.68	5.25	2.46	2.75	3.88
5					2.46	4.35	2.39	2.58	a 3.40
6					2.32	3.60	2.34	2.68	3.30
7					2.46	3.25	2.30	2.78	3.15
8					2.41	3.00	2.28	2.68	3.00
9					2.40	2.84	2.28	2.59	2.95
10					2.30	2.68	2.25	2.55	3.00
11					2.38	2.60	2.24	2.48	a 3.10
12					2.36	3.66	3.45	2.46	a 3.10
13				2.58	2.24	3.65	2.98	2.44	a 3.10
14				2.37	2.14	3.30	2.76	2.44	a 3.00
15				2.25	2.44	2.95	2.60	a 2.52	a 2.90
16				2.06	2.95	2.82	2.51	a 2.49	a 2.90
17				1.98	2.80	2.80	2.50	2.47	a 2.90
18				1.92	2.53	3.00	2.48	2.45	a 3.00
19				2.25	2.34	3.01	2.46	2.40	a 3.00
20				2.26	2.26	2.90	3.20	a 2.50	a 3.00
21				2.13	2.19	2.98	2.95	a 2.60	b 4.00
22				2.00	2.16	2.84	2.73	a 2.60	3.40
23				1.94	2.10	2.68	2.59	a 2.60	3.35
24				1.90	2.08	2.58	2.60	2.50	3.10
25				1.93	2.80	2.52	2.60	2.50	3.08
26				1.88	2.58	2.44	2.53	2.48	3.00
27				1.86	2.42	2.44	2.46	2.48	2.90
28				1.84	2.37	2.42	2.43	3.32	2.90
29				1.90	2.49	2.36	2.40	3.52	3.85
30				7.75	2.68	2.36	2.40	3.38	3.45
31				4.30	2.57	....	2.37	....	3.08
1906.									
1	3.84	2.89	2.95	3.00	2.42	1.85	2.26	2.35	2.63
2	3.45	2.84	2.77	2.66	2.32	1.80	2.18	2.31	2.42
3	3.27	2.99	2.67	2.52	2.20	1.95	2.09	2.29	2.40
4	3.27	2.91	2.57	3.01	2.39	1.98	2.04	2.21	2.46
5	3.84	2.85	2.59	2.64	2.28	1.92	1.96	2.20	2.48
6	4.48	2.83	2.97	2.45	2.20	1.85	1.92	2.18	2.73
7	3.65	2.91	2.87	2.36	2.16	1.80	1.99	2.16	2.79
8	3.38	2.84	2.75	2.28	2.84	1.78	1.95	2.12	2.90
9	3.43	3.03	2.64	2.22	2.60	1.76	2.02	2.12	3.00
10	4.41	3.16	2.74	2.24	2.36	1.75	2.82	2.08	2.78
11	5.00	3.00	2.75	2.24	2.34	1.73	2.58	2.28	2.58
12	4.43	2.89	2.53	2.19	2.24	1.79	2.46	2.50	2.52
13	3.91	2.77	2.41	2.11	2.18	1.82	2.28	2.52	2.50
14	3.73	2.66	2.30	2.06	2.08	1.78	2.12	2.47	2.54
15	5.91	2.44	2.21	2.02	2.05	1.74	2.06	2.39	2.62
16	4.89	2.28	2.49	1.98	2.02	1.70	2.04	2.37	3.30
17	3.79	2.23	2.94	2.22	1.95	1.70	2.00	2.34	3.34
18	3.57	2.17	3.08	2.38	1.96	1.68	2.08	2.70	2.88
19	3.39	2.13	3.01	2.22	1.90	1.68	2.07	3.92	2.72
20	3.33	2.15	2.81	2.15	1.86	1.79	3.72	3.54	2.82
21	3.22	2.13	2.67	2.15	2.46	2.34	3.34	3.24	c 3.35
22	3.13	2.10	2.55	2.10	2.20	2.42	2.96	3.24	2.88
23	3.25	2.07	2.43	2.14	2.06	2.55	2.73	3.01	2.52
24	3.25	2.10	2.55	2.18	2.15	2.14	2.60	2.86	2.65
25	3.14	2.26	2.44	2.12	2.02	2.04	2.93	2.67	2.56
26	3.06	2.21	2.36	2.00	1.98	1.98	2.92	2.64	2.50
27	2.97	2.55	2.27	2.00	1.95	2.04	2.71	2.64	2.46
28	2.89	3.47	2.20	2.30	2.26	1.99	2.62	2.64	2.42
29	2.82	4.09	2.13	2.48	2.09	2.02	2.54	2.56	2.46
30	2.97	3.48	2.12	2.95	1.99	2.38	2 44	2.60	2.51
31	....	3.17	....	2.56	1.94	....	2.42	....	3.55

a Anchor ice in river.   b River clear of ice.   c River filled with anchor ice.

NOTE.—Gage heights during freshet of July 30, 1905, estimated. Crest of flood was at gage height 8.0 feet at 8.30 a. m. Relation of gage heights to discharge changed by this flood.

Daily gage height, in feet, on weir of Westfield Little River near Blandford, Mass., for 1906.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1..............	......	0.14	0.33	a 0.58	0.60	17.............	0.18	0.09	0.22	0.41	1.12
2..............	......	.13	.30	a. 56	.44	18.............	.18	.08	.24	.69	.86
3..............	......	.18	.26	a. 54	.42	19.............	.16	.08	.24	d 1.90	.66
4..............	......	.18	.24	a. 50	.46	20.............	.14	.12	d 1.58	1.56	.70
5..............	......	.16	.20	a. 48	.47	21.............	.41	.40	1.33	1.19	1.04
6..............	......	.14	.18	a. 48	.70	22.............	.31	.46	.90	1.15	1.02
7..............	......	.13	.22	a. 47	c. 76	23.............	.23	.50	.72	.92	1.00
8..............	......	.12	.20	....	.90	24.............	.26	.28	.59	.76	1.12
9..............	......	.11	.22	b. 51	.98	25.............	.22	.23	.92	.64	1.05
10.............	0.36	.10	.69	b. 47	.88	26.............	.18	.20	.85	.60	.99
11.............	.34	.09	.48	b. 67	.94	27.............	.17	.26	.66	.59	.92
12.............	.32	.12	.40	b. 92	1.06	28.............	.33	.20	.56	.60	.89
13.............	.25	.14	.34	b. 96	1.00	29.............	.24	.22	.50	.54	.89
14.............	.24	.11	.31	b. 84	.84	30.............	.20	.40	.46	.56	.94
15.............	.22	.10	.24	b. 78	.80	31.............	.16	......	.44	......	1.40
16.............	.20	.09	.24	.44	1.12						

a Length of weir shortened to 14.8 feet.
b Length of weir changed to 12.5 feet.
c Anchor ice in river.
d Gage reading probably in error as flow over weir is much smaller than that for the same day by the current meter method.

Rating table for Westfield Little River near Blandford, Mass., for 1905–6.

Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.	Gage height.	Dis- charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.65	2.4	2.45	29.9	3.25	141	4.40	535
1.70	3.1	2.50	33.8	3.30	155	4.50	570
1.75	3.9	2.55	38.1	3.35	170	4.60	605
1.80	4.8	2.60	42.8	3.40	186	4.70	640
1.85	5.8	2.65	47.8	3.45	203	4.80	675
1.90	6.9	2.70	53.1	3.50	220	4.90	710
1.95	8.0	2.75	58.7	3.55	238	5.00	745
2.00	9.2	2.80	64.7	3.60	255	5.10	780
2.05	10.6	2.85	71.1	3.65	272	5.20	815
2.10	12.2	2.90	77.9	3.70	290	5.30	850
2.15	14.0	2.95	85.0	3.80	325	5.40	885
2.20	16.0	3.00	92.4	3.90	360	5.50	920
2.25	18.2	3.05	100	4.00	395	5.60	955
2.30	20.6	3.10	109	4.10	430	5.70	990
2.35	23.3	3.15	119	4.20	465	5.80	1,025
2.40	26.4	3.20	129	4.30	500	5.90	1,060

NOTE.—The above table is applicable only for open-channel conditions. It is based on sixty-three discharge measurements made during 1905–6 and is well defined between gage heights 1.65 feet and 4.6 feet. Above gage height 3.5 feet the rating curve is a tangent, the difference being 35 per tenth.

Daily discharge, in second-feet, of Westfield Little River near Blandford, Mass., for 1905–6.

Day.	1905.				1906.				
	Aug.	Sept.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.
1..............................	220	31.5	21.7	25.1	339	76.5	85.0	92.4	27.8
2..............................	100	33.8	21.7	25.1	203	69.8	61.1	48.9	21.7
3..............................	69.8	423	40.9	23.3	147	90.9	49.9	35.5	16.0
4..............................	51.0	832	30.7	58.7	147	79.3	40.0	93.9	25.8
5..............................	30.7	518	25.8	40.9	339	71.1	41.9	46.8	19.6
6..............................	21.7	255	22.8	51.0	563	68.5	88.0	29.9	16.0
7..............................	30.7	141	20.6	62.3	272	79.3	73.8	23.9	14.4
8..............................	27.1	92.4	19.6	51.0	180	69.8	58.7	19.6	69.8
9..............................	26.4	69.8	19.6	41.9	196	97.0	46.8	16.9	42.8
10..............................	20.6	51.0	18.2	38.1	538	121	57.6	17.8	....
11..............................	25.1	42.8	17.8	32.2	745	92.4	58.7	17.8	....
12..............................	23.9	276	203	30.7	545	76.5	36.4	15.6	....
13..............................	17.8	272	89.4	29.2	364	61.1	27.1	12.6	....
14..............................	13.6	155	59.9	29.2	300	48.9	20.6	10.9	....
15..............................	29.2	85.0	42.8	a 35.5	1,060	29.2	16.4	9.8	....

a Anchor ice in river.

Daily discharge, in second-feet, of Westfield Little River near Blandford, Mass., for 1905–6—
Continued.

Day.	1905.				1906.				
	Aug.	Sept.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.
16	85.0	67.3	34.7	a 33.	706	19.6	33.0	8.7	....
17	64.7	64.7	33.8	31.5	322	17.3	83.6	16.9	....
18	36.4	92.4	32.2	29.9	244	14.8	105	25.1	....
19	22.8	93.9	30.7	26.4	183	13.3	93.9	16.9	....
20	18.7	77.9	129	a 33.8	164	14.0	66.0	14.0	....
21	15.6	89.4	85.0	a 42.8	134	13.3	49.9	14.0	....
22	14.4	69.8	56.5	a 42.8	115	12.2	38.1	12.2	....
23	12.2	51.0	41.9	a 42.8	141	11.2	28.5	13.6	....
24	11.6	40.9	42.8	33.8	141	12.2	38.1	15.2	....
25	64.7	35.5	42.8	33.8	117	18.7	29.2	12.9	....
26	40.9	29.2	36.4	32.2	102	16.4	23.9	9.2	....
27	27.8	29.2	30.7	32.2	88.0	38.1	19.2	9.2	....
28	24.5	27.8	28.5	161	76.5	210	16.0	20.6	....
29	33.0	23.9	26.4	227	67.2	426	13.3	32.2	....
30	51.0	23.9	26.4	180	88.0	213	12.9	85.0	....
31	39.9	....	24.5	....	....	123	....	39.0	....

a Anchor ice in river.

Daily discharge, in second-feet, of Westfield Little River near Blandford, Mass., 1906, as determined by weir and by current-meter ratings.

Day.	Aug.			Sept.			Oct.			Nov.			Dec.
	Weir.	Current meter.	Per cent difference.	Weir.	Current meter.	Per cent difference.	Weir.	Current meter.	Per cent difference.	Weir.	Current meter.	Per cent difference.	Weir.
1	.....	.....	.....	5.42	5.8	+ 7	18.9	18.7	− 1	21.5	23.3	+ 8	46.0
2	.....	.....	.....	4.86	4.8	− 1	16.5	15.2	− 8	20.5	21.1	+ 3	29.0
3	.....	.....	.....	7.81	8.0	+ 2	13.3	11.9	−12	19.4	20.1	+ 3	27.0
4	.....	.....	.....	7.81	8.7	+11	11.9	10.3	−16	17.2	16.4	− 5	31.0
5	.....	.....	.....	6.58	7.3	+11	9.11	8.2	−11	16.3	15.6	− 4	32.0
6	.....	.....	.....	5.42	5.8	+ 7	7.81	7.3	− 7	16.3	15.2	− 7	57.8
7	.....	.....	.....	4.86	4.8	− 1	10.5	9.0	−17	15.8	14.4	−10	65.4
8	.....	.....	.....	4.33	4.4	+ 2	9.11	8.0	−14	16.1	12.9	−25	84.0
9	.....	.....	.....	3.82	4.1	+ 7	10.5	9.8	− 7	15.0	12.9	−16	95.4
10	21.5	23.9	+11	3.32	3.9	+17	56.6	67.3	+ 9	13.3	11.6	−15	81.5
11	19.8	22.8	+15	2.85	3.6	+26	33.0	40.9	+24	22.6	19.6	−15	89.6
12	18.1	17.8	− 2	4.33	4.6	+ 6	25.2	30.7	+22	36.1	33.8	− 7	107
13	12.6	15.2	+20	5.42	5.2	− 4	19.8	19.6	− 1	38.5	35.5	− 8	98.3
14	11.9	11.6	− 3	3.82	4.4	+15	17.3	12.9	−34	31.6	31.5	0	76.0
15	10.5	10.6	+ 1	3.32	3.7	+11	11.9	10.9	− 9	28.3	25.8	−10	70.5
16	9.11	9.8	+ 7	2.85	3.1	+ 8	11.9	10.3	−15	29.0	24.5	−18	116
17	7.81	8.0	+ 2	2.85	3.1	+ 8	10.5	9.2	−14	26.1	22.8	−14	116
18	7.81	8.2	+ 5	2.40	2.8	+17	11.9	11.6	− 3	56.6	53.1	− 6	78.7
19	6.58	6.9	+ 5	2.40	2.8	+17	11.9	11.2	− 6	a367	367	0	53.1
20	5.42	6.0	+11	4.33	4.6	+ 6	a297	297	0	193	234	+21	57.8
21	26.1	30.7	+17	25.2	22.8	−10	150	167	+11	128	139	+ 8	104
22	17.3	16.0	− 8	31.0	27.8	−11	84.0	86.5	+ 3	122	139	+14	101
23	11.2	10.9	− 3	35.0	38.1	+ 9	60.3	56.5	− 7	86.8	93.9	+ 8	98.3
24	13.3	14.0	+ 5	14.9	13.6	−10	44.8	42.8	− 5	65.4	72.5	+10	116
25	10.5	9.8	− 7	11.2	10.3	− 9	86.8	82.2	− 5	50.7	49.9	− 2	106
26	7.81	8.7	+11	9.11	8.7	− 5	77.4	80.7	+ 4	46.0	46.8	+ 2	96.8
27	7.20	8.0	+11	13.3	10.3	−29	53.1	54.2	+ 2	44.8	46.8	+ 4	86.8
28	18.9	18.7	− 1	9.11	9.0	− 1	41.5	44.8	+ 8	46.0	46.8	+ 2	82.8
29	11.9	11.9	0	10.5	9.8	− 7	35.0	37.3	+ 6	39.3	39.0	− 1	82.8
30	9.11	9.0	− 1	25.2	25.1	0	31.0	29.2	− 6	41.5	42.8	+ 3	89.6
31	6.58	7.8	+18	.....	.....	.....	29.0	27.8	− 4	.....	.....	.....	162
Mean	12.3	13.0	+ 5	9.1	9.0	− 1	42.2	42.9	+ 2	55.7	57.6	+ 3	.....

a Discharge over weir made same as current meter station discharge. Original maximum values for weir 198 and 290 for October and November, respectively. See gage-height table footnote.

Monthly discharge of Westfield Little River near Blandford, Mass., for 1905–6.

[Drainage area, 43 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
August	220	11.6	41.0	0.953	1.10
September	832	23.9	136	3.16	3.53
October	203	17.8	43.8	1.02	1.18
November	227	23.3	51.9	1.21	1.35
1906.					
April	1,060	67.2	288	6.70	7.48
May	426	11.2	74.3	1.73	1.99
June	105	12.9	47.1	1.10	1.23
July	93.9	8.7	27.0	.628	.72
August	69.8	6.0	17.4	.405	.47
September	38.1	2.8	9.0	.209	.23
October	297	7.3	42.9	.998	1.15
November	367	11.6	57.6	1.34	1.50

Monthly discharge (by weir) of Westfield Little River near Blandford, Mass., for 1906.

[Drainage area, 43 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
August (10–31)	26.1	5.42	12.3	0.286	0.23
September	35.0	2.40	9.1	.212	.24
October	297	7.81	42.2	.981	1.13
November	367	13.3	55.7	1.30	1.45
December	162	27.0	81.9	1.90	2.19

SALMON RIVER AT LEESVILLE, CONN.

This station was established March 28, 1905, at the plant of the East Haddam Electric Light Company at Leesville, a short distance above the bridge on the highway leading from Leesville to Easthampton. It is maintained through the cooperation of Messrs. Ransom & Hoadley, of Providence, R. I., who expect to build at this point a dam about 72 feet in height for developing light and power, which will probably be used in Hartford. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 144, where are given also references to publications that contain data for previous years.

Discharge measurements of Salmon River at Leesville, Conn., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 28 [a]	Barrows and Norcross	120	112	1.34	166
May 16 [a]	T. W. Norcross	122	121	1.38	177
May 26 [a]	....do	98	82	.70	73
December 5 [b] [c]	....do	102	400	1.97	330
1906.					
March 9 [b]	T. W. Norcross	103	408	2.25	437

[a] By wading; meter on a rod.
[b] From downstream side of highway bridge.
[c] About one-eighth of discharge estimated.

Daily gage height, in feet, of Salmon River at Leesville, Conn., for 1905–6.

Day.	1905.		1906.			Day.	1905.		1906.		
	Apr.	May.	Jan.	Feb.	Mar.		Apr.	May.	Jan.	Feb.	Mar.
1	......	1.25	1.85	1.8	2.4	17	1.65	1.25	2.3	1.75	......
2	......	1.15	1.6	1.7	1.65	18	1.62	1.15	2.2	1.7	......
3	......	1.14	1.65	1.7	4.8	19	1.62	1.05	1.9	1.7	......
4	......	1.10	3.3	1.6	4.4	20	1.55	.95	2.0	1.75	......
5	......	1.08	2.35	1.6	3.0	21	1.52	......	2.2	4.4	......
6	......	1.08	2.0	1.6	2.5	22	1.70	......	2.1	3.3	......
7	......	1.04	1.95	1.7	2.35	23	1.95	......	2.2	2.4	......
8	......	1.00	1.65	1.65	2.35	24	1.52	......	2.3	2.1	......
9	......	.90	1.5	1.6	......	25	1.50	......	2.3	2.0	......
10	......	.90	1.65	1.7	......	26	1.40	......	2.0	2.0	......
11	......	.95	1.55	1.65	......	27	1.40	......	1.95	1.95	......
12	......	1.10	1.75	1.65	......	28	1.35	......	2.0	2.0	......
13	......	1.28	1.75	1.65	......	29	1.29	......	1.85	......	......
14	......	1.35	1.75	1.65	......	30	1.25	......	1.85	......	......
15	......	1.65	1.75	1.75	......	31	......	......	1.8	......	......
16	......	1.38	3.00	1.7	......						

NOTE.—River did not freeze over during periods of observation, 1905 and 1906.
Gage heights for April and May, 1905, are the mean of two readings, morning and evening.
During January to March, 1906, the gage was read once a day, at midnight.

Rating table for Salmon River at Leesville, Conn., for 1905–6.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	98	1.70	250	2.50	510	3.60	940
1.00	112	1.80	280	2.60	545	3.80	1,020
1.10	128	1.90	310	2.70	580	4.00	1,100
1.20	144	2.00	340	2.80	620	4.20	1,180
1.30	161	2.10	370	2.90	660	4.40	1,260
1.40	180	2.20	405	3.00	700	4.60	1,340
1.50	200	2.30	440	3.20	780	4.80	1,420
1.60	225	2.40	475	3.40	860		

NOTE.—The above table is applicable only for open-channel conditions. It is based on five discharge measurements made during 1905-6, and is well defined below gage height 2.2 feet. Above gage height 3 feet the rating curve is a tangent, the difference being 40 per tenth.

Monthly discharge of Salmon River at Leesville, Conn., for 1905–6.

[Drainage area, 115 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
April (17-30)	325	152	210	1.83	0.95
May (1-20)	237	98	136	1.18	.88
August (3-31)	111	72	82.9	.721	.78
September	712	85	181	1.57	1.75
October	282	64	124	1.08	1.24
November	430	97	130	1.13	1.26
December	640	149	292	2.54	2.93
1906.					
January	820	200	348	3.03	3.49
February	1,200	225	328	2.85	2.97
March (1-8)	1,420	237	690	6.00	1.79

NOTE.—Values for 1905 and 1906 are approximate. Daily discharges, August to December, 1905, are based on the averages of three gage readings per day.

ASHUELOT RIVER AT HINSDALE, N. H.

A measurement was made October 31, 1906, from the highway bridge at this point. At this time the distance from water surface to reference point was 20.66 feet, this being the top of guard railing at 50 feet from the downstream side of the left abutment.

Width, 120 feet; area, 185 square feet; discharge, 230 second-feet.

FARMINGTON RIVER AT FARMINGTON, CONN.

A measurement was made October 27, 1906, from the highway bridge, which is a short distance above the electric railway bridge near Farmington, Conn. The bench mark is the top of guard railing of bridge, 20 feet from the end of the inclined end post on the left bank, downstream side of bridge, the distance to water surface being 24.36 feet.

Width, 115 feet; area, 474 square feet; discharge, 902 second-feet.

HOUSATONIC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Housatonic River has its source in Berkshire County, Mass. It flows southward across Massachusetts and the west end of Connecticut, entering Long Island Sound. Its course is nearly parallel to the eastern boundary of New York State, and it receives the drainage from Tenmile River in New York.

Tenmile River drains an area of diversified topography, including broad flats and marshes in the basin of Swamp River and extensive areas under cultivation and sparsely timbered hills in the region of the Chestnut Range. The drainage area lies chiefly in New York State, the stream crossing the line into Connecticut one-half mile above the junction with the Housatonic.

HOUSATONIC RIVER AT GAYLORDSVILLE, CONN.

This station was established October 24, 1900. It is located at the covered wooden highway bridge at Gaylordsville, 2 miles below the mouth of Tenmile River. The conditions are described in Water-Supply Paper No. 165, page 145, where are given also references to publications that contain data for previous years. The bench mark is a large spike in a notch on the river and highway side of a large cottonwood tree, about 150 feet from right hand end of bridge, along road to New Milford; elevation, 28.97 feet. The reference point is the top of three nails at the 1-foot mark on the gage board; elevation, 29.66 feet. Elevations refer to gage datum.

A measurement was made October 17, 1906, by C. C. Covert, with the following results:

Width, 170 feet; area, 373 square feet; gage height, 3.55 feet; discharge, 654 second-feet.

Daily gage height, in feet, of Housatonic River at Gaylordsville, Conn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.70	4.60	4.50	6.40	5.24	5.19	3.99	4.44	3.78	3.78	4.00	4.10
2	4.45	4.55	4.55	6.00	5.19	5.19	4.19	4.14	3.73	3.73	3.80	4.05
3	4.45	4.15	4.70	5.80	4.89	4.89	5.04	3.99	3.58	3.63	3.85	3.90
4	4.65	4.15	8.45	5.55	4.94	4.84	4.84	4.29	3.48	3.33	3.90	3.70
5	5.10	4.15	7.10	5.70	4.99	4.54	4.74	4.14	3.63	3.28	3.70	3.90
6	5.05	4.05	6.55	6.10	4.94	4.99	4.54	3.64	3.18	3.43	3.55	3.95
7	4.70	4.15	6.45	6.25	5.04	5.09	4.34	3.39	3.18	4.08	3.50	4.35
8	4.35	4.20	5.75	6.00	4.84	4.74	4.44	3.89	3.23	3.78	3.60	4.00
9	4.35	4.15	5.45	5.95	4.94	4.59	4.34	4.24	3.08	3.18	3.60	4.15
10	4.05	4.15	5.25	6.95	5.39	5.19	3.99	4.19	3.63	2.98	3.55	4.05
11	4.30	4.20	5.20	7.55	5.34	5.19	4.04	4.14	3.03	3.60	3.75	4.10
12	4.25	4.15	5.05	6.95	5.24	5.04	4.34	4.44	3.33	3.70	4.25	3.85
13	4.35	4.05	5.00	6.50	4.74	4.74	4.09	4.24	3.38	3.70	4.15	4.15
14	4.90	4.15	4.95	6.65	4.89	4.49	3.64	3.84	3.43	3.65	4.10	4.10
15	4.80	4.15	4.85	6.70	4.94	4.24	3.74	3.79	3.23	3.55	4.00	4.10
16	4.85	4.15	4.50	8.05	4.99	4.29	3.69	3.59	3.03	3.40	4.00	4.55
17	5.10	4.25	4.65	7.85	4.74	5.09	3.64	3.74	3.23	3.35	4.00	4.50
18	4.95	4.25	4.45	7.85	4.64	5.04	3.24	3.44	3.23	3.20	4.10	4.10
19	4.90	4.05	4.35	7.20	4.44	4.74	3.24	3.09	2.98	3.15	4.40	3.95
20	4.75	3.85	4.45	6.80	4.44	4.54	3.49	3.34	3.23	4.30	4.50	4.00
21	4.65	4.20	4.45	6.40	4.49	4.59	3.94	3.59	3.48	5.10	4.95	4.25
22	4.95	6.35	4.60	6.05	4.29	4.59	3.74	3.34	3.88	4.80	4.80	4.20
23	5.35	6.30	4.55	6.00	4.39	4.54	3.89	3.79	3.98	4.70	4.55	4.05
24	5.50	5.95	4.55	6.15	4.44	4.44	3.84	3.94	3.68	4.50	4.20	3.80
25	5.65	5.50	4.25	6.05	4.34	4.19	3.94	3.94	3.68	4.50	4.40	3.95
26	5.35	5.80	4.35	5.85	4.29	4.24	3.74	3.34	3.68	4.45	4.30	3.85
27	5.25	5.15	5.00	5.65	4.21	4.14	3.64	3.34	3.63	4.30	4.25	3.70
28	5.00	4.80	7.00	5.45	5.84	4.04	4.04	3.89	3.88	4.25	4.05	4.00
29	4.75	....	7.00	5.25	6.54	4.14	3.79	4.04	3.73	4.00	4.00	4.00
30	4.40	....	6.75	5.45	6.34	4.04	4.44	4.19	3.78	3.85	4.15	4.05
31	4.50	....	6.75	....	5.74	....	4.44	3.99	....	4.05	....	4.35

NOTE.—The following ice conditions prevailed during 1906: January 8, ice along banks; February 3, ice in eddy; February 6, ice in river—anchor ice running; February 22, ice went out 9.30 a. m.; February 28, ice in eddy; March 15, ice in eddy above gorge; March 26, ice went out; December 4, ice in river.

The river seldom freezes over at gage, but jams of needle ice form on rifts below and cause backwater at times. Discharges have been computed as if open-channel conditions existed. It is believed that this will introduce little serious error.

The chain length was last checked in July, 1904, hence all gage heights may be subject to some constant error.

Rating table for Housatonic River at Gaylordsville, Conn., for 1900–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.90	266	4.10	986	5.30	2,548	7.00	6,180
3.00	303	4.20	1,082	5.40	2,714	7.20	6,700
3.10	352	4.30	1,178	5.50	2,880	7.40	7,220
3.20	402	4.40	1,274	5.60	3,076	7.60	7,744
3.30	451	4.50	1,370	5.70	3,272	7.80	8,272
3.40	501	4.60	1,506	5.80	3,468	8.00	8,800
3.50	550	4.70	1,642	5.90	3,664	8.20	9,340
3.60	618	4.80	1,778	6.00	3,860	8.40	9,880
3.70	686	4.90	1,914	6.20	4,300	8.60	10,430
3.80	754	5.00	2,050	6.40	4,740		
3.90	822	5.10	2,216	6.60	5,204		
4.00	890	5.20	2,382	6.80	5,692		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1900–1906 and is well defined between gage heights 3 feet and 5 feet.

Monthly discharge of Housatonic River at Gaylordsville, Conn., for 1906.

[Drainage area, 1,020 square miles.]

Month.	Discharge in second-feet			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq mile.	Depth in inches.
January	3,170	938	1,800	1.76	2.03
February	4,630	788	1,630	1.60	1.67
March	10,000	1,130	2,910	2.85	3.29
April	8,930	2,460	4,780	4.69	5.23
May	5,060	1,090	2,110	2.07	2.39
June	2,370	928	1,630	1.60	1.78
July	2,120	421	984	.965	1.11
August	1,310	347	818	.802	.92
September	876	296	554	.543	.61
October	2,220	296	861	.844	.97
November	1,980	550	992	.973	1.09
December	1,440	686	958	.939	1.08
The year	10,000	296	1,670	1.64	22.17

NOTE.—Values for 1906 are rated as good.

INDEX.

CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

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 can be had on application.

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

1. A limited number are delivered to the Director of the Survey, from whom they can 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 can 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 can 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 (* means out of stock). 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*.

I

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.
1906. East of Mississippi River, Water-Supply Papers Nos. 201, 202, 203, 204, 205, 206, and 207.
     West of Mississippi River, Water-Supply Papers Nos. 207, 208, 209, 210, 211, 212, 213, and 214.

Correspondence should be addressed to

THE DIRECTOR,

UNITED STATES GEOLOGICAL SURVEY,

WASHINGTON, D. C.

JULY, 1907.

O