Wm. A. Lamb.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 354

SURFACE WATER SUPPLY OF THE UNITED STATES

1913

PART IV. ST. LAWRENCE RIVER BASIN

N. C. GROVER, Chief Hydraulic Engineer

W. G. HOYT, A. H. HORTON, and C. C. COVERT, District Engineers

Prepared in cooperation with the States of Minnesota, New York, and Vermont

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CONTENTS.

ILLUSTRATIONS.

SURFACE WATER SUPPLY OF ST. LAWRENCE RIVER BASIN, 1913.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 12 reports presenting results of measurements of flow made on streams in the United States during 1913. Six of the reports for 1913 contain data for the year ending September 30, and the other six for the calendar year, as indicated in the table on page 6.

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

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

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

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

Annual appropriations for the fiscal years ending June 30, 1895–1914.

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911 to 1914, inclusive	150,000

In the execution of the work many private and State organizations have cooperated, either by furnishing data or by assisting financially in collecting the data. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected and of the second kind on page 15.

Measurements of stream flow have been made at about 3,000 points in the United States and also at many points in small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in

the Hawaiian Islands. On July 1, 1913, 1,388 gaging stations were being maintained by the Survey and the cooperating organizations in the United States, and during the year many miscellaneous discharge measurements were made at other points. In connection with this work, data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country, and will be made available in the regular water-supply papers from time to time.

PUBLICATIONS.

A report for each year has been prepared embodying the stream-flow data collected during that year. An index to the reports containing stream-flow measurements prior to 1904 has been published as Water-Supply Paper 119. Circulars are also available giving complete lists of the gaging stations maintained by the Survey to date, and a list of the reports relating to the water supply of the country.

Prior to 1901 gage heights and discharge measurements were published in water-supply papers or bulletins, and estimates of monthly discharge in annual reports; since 1901 both classes of data have been published in water-supply papers, and they are now being published in 12 parts, as shown in the following table:

Papers on surface water supply of the United States, 1913.

Part.	No.	Title.	Year used.
I	351	North Atlantic basins	Calendar year.
II	352	South Atlantic and eastern Gulf of Mexico basins.	Do.
III	353	Ohio River basin	Year ending Sept. 30.
IV	354	St. Lawrence River basin	Calendar year.
V	355	Upper Mississippi River and Hudson Bay basins.	Year ending Sept. 30.
VI	356	Missouri River basin	Calendar year.
VII	357	Lower Mississippi River basin	Do.
VIII	358	Western Gulf of Mexico basins	Year ending Sept. 30.
IX	359	Colorado River basin	Calendar year.
X	360	Great Basin	Year ending Sept. 30.
XI	361	Pacific basins in California	Do.
XII	362	North Pacific basins	Do.

A list of reports containing stream-flow data is presented in the following table:

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

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

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
WS 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
WS 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	do	1903.
WS 124 to 135	do	1904.
WS 165 to 178	do	1905.
WS 201 to 214	do	1906.
WS 241 to 252	do	1907–8.
WS 261 to 272	do	1909.
WS 281 to 292	do	1910.
WS 301 to 312	do	1911.
WS 321 to 332[a]	do	1912.
WS 351 to 362[a]	do	1913.

[a] In preparation.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The following table gives, by years and drainage basins, the numbers of the papers on surface water supply published from 1899 to 1913. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data for Machias River at Whitneyville, Me., 1903 to 1913, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, and 351, which contain records for the New England streams from 1903 to 1913. Results of miscellaneous measurements are published by drainage basins.

Numbers of water-supply papers containing results of stream measurements, 1899–1913.

	1899 [a]	1900 [b]	1901	1902	1903	1904	1905	1906	1907–8	1909	1910	1911	1912	1913
North Atlantic coast	35	47, [c] 48	65, 75	82	97	[d] 124, [e] 125 [f] 126	[d] 165, [e] 166 [f] 167	[d] 201, [e] 202 [f] 203	241	261	281	301	321	351
South Atlantic coast and eastern Gulf of Mexico	[g] 35, 36	48	65, 75	[g] 82, 83	[g] 97, 98	[f] 126, 127	[f] 167, 168	[f] 203, 204	242	262	282	302	322	352
Ohio River basin	36	48, [h] 49	65, 75	83	98	128	169	205	243	263	283	303	323	353
St. Lawrence River and Great Lakes	36	49	65, 75	[i] 82, 83	97	129	170	206	244	264	284	304	324	354
Hudson Bay and Upper Mississippi River	36	49	[j] 65, 66, 75	[j] 83, 85	[j] 98, 99, [k] 100	[j] 128, 130	171	207	245	265	285	305	325	355
Missouri River	[l] 36, 37	49, [m] 50	66, 75	84	99	130, [n] 131	172	208	246	266	286	306	326	356
Lower Mississippi River	37	50	[j] 65, 66, 75	[j] 83, 84	[j] 98, 99	[j] 128, 131	[j] 169, 173	[j] 205, 209	247	267	287	307	327	357
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288	308	328	358
Colorado River	[o] 37, 38	50	66, 75	85	100	133	175, [p] 177	211	249	269	289	309	329	359
Great Basin	38, [q] 39	51	66, 75	85	100	133, [r] 134	176, [r] 177	212, [r] 213	250, [r] 251	270, [r] 271	290, [r] 291	310	330	360
California	38, [s] 39	51	66, 75	85	100	134	177	213	251	271	291	311	331	361
North Pacific coast	38	51	66, 75	85	100	135	[t] 177, 178	214	252	272	292	312	[u] 332	[u] 362

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.

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

[c] Wissahickon and Schuylkill rivers to James River.

[d] New England rivers only.

[e] Hudson River to Delaware River, inclusive.

[f] Susquehana River to Yadkin River, inclusive.

[g] James River only.

[h] Scioto River.

[i] Lake Ontario and tributaries to St. Lawrence River proper.

[j] Tributaries of Mississippi from east.

[k] Hudson Bay only.

[l] Gallatin River.

[m] Loup and Platt rivers near Columbus, Nebr., and all tributaries below junction with Platte.

[n] Platte and Kansas rivers.

[o] Green and Gunnison rivers and Grand River above junction with Gunnison.

[p] Below junction with Gila.

[q] Mohavé River only.

[r] Great Basin in California, excepting Truckee and Carson drainage basins.

[s] Kings and Kern rivers only.

[t] Rogue, Umpqua, and Siletz rivers only.

[u] In three parts: *A*, Pacific drainage basins in Washington and Upper Columbia River; *B*, Snake River basin; *C*, Lower Columbia River and Rogue, Umpqua, and Siletz rivers.

Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
St. Paul, Minn., Old Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, Federal Building.
Boise, Idaho, 615 Idaho Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., Federal Building.
San Francisco, Cal., 505 Custom House.
Los Angeles, Cal., Federal Building.
Santa Fe, N. Mex., Capitol Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Geological Survey's publications will be sent on application to the Director of the United States Geological Survey, Washington, D. C.

DEFINITION OF TERMS.

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

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

fundamental unit from which others are computed by the use of the factors given in the tables of convenient equivalents (p. 11).

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

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

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

"Millions of cubic-feet" is a unit used to express quantities of water stored in reservoirs and is most frequently used in studies of flood control.

The following terms used in these reports are not in very common use and may be defined as follows:

"Control," "controlling section," and "point of control" are terms used to designate that cross section of the stream below the gage which controls or regulates the height of the water surface at the gage. It should be noted that the control may not be the same cross section at all stages.

"Discharge relation" is an abbreviation for the term "relation of gage height to discharge."

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

CONVENIENT EQUIVALENTS.

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

Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area.

Discharge in second-feet per square mile.	Run-off in depth in inches.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	0.03719	1.041	1.079	1.116	1.153
2	.07438	2.083	2.157	2.231	2.306
3	.11157	3.124	3.236	3.347	3.459
4	.14876	4.165	4.314	4.463	4.612
5	.18595	5.207	5.393	5.579	5.764
6	.22314	6.248	6.471	6.694	6.917
7	.26033	7.289	7.550	7.810	8.070
8	.29752	8.331	8.628	8.926	9.223
9	.33471	9.372	9.707	10.041	10.376

NOTE.—For part of a month multiply the values for one day by the number of days.

Table for converting discharge in second-feet into run-off in acre-feet.

Discharge in second-feet.	Run-off in acre-feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	1.983	55.54	57.52	59.50	61.49
2	3.967	111.1	115.0	119.0	123.0
3	5.950	166.6	172.6	178.5	184.5
4	7.934	222.1	230.1	238.0	246.0
5	9.917	277.7	287.6	297.5	307.4
6	11.90	333.2	345.1	357.0	368.9
7	13.88	388.8	402.6	416.5	430.4
8	15.87	444.3	460.2	476.0	491.9
9	17.85	499.8	517.7	535.5	553.4

NOTE.—For part of a month multiply values for one day by the number of days.

Table for converting discharge in second-feet into run-off in millions of cubic feet.

Discharge in second-feet.	Run-off in millions of cubic feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	0.0864	2.419	2.506	2.592	2.678
2	.1728	4.838	5.012	5.184	5.356
3	.2592	7.257	7.518	7.776	8.034
4	.3456	9.676	10.024	10.368	10.712
5	.4320	12.095	12.530	12.960	13.390
6	.5184	14.514	15.036	15.552	16.068
7	.6048	16.933	17.542	18.144	18.746
8	.6912	19.352	20.048	20.736	21.424
9	.7776	21.771	22.554	23.328	24.102

NOTE.—For part of a month multiply values for one day by the number of days.

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

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

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

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

1 second-foot 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 day equals 86,400 cubic feet.

1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.

1,000,000,000 cubic-feet equals 414 second-feet for one 28-day month.

1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.

1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.

1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.

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

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 for one day equal 5.17 acre-feet.

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

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 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.
1⅛ horsepower equals about 1 kilowatt.

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

EXPLANATION OF DATA.

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

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

The table of daily gage height shows the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day, usually in the morning and in the evening, though at many stations only one reading is made each day. At a comparatively few stations automatic gages are used, some of which give a continuous record of river stage in the form of an hydrograph, and others a record printed at regular intervals, from which the mean daily gage height can be computed. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating

table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

In the tables of daily gage height the use of zeros in the hundredths place indicates the limits of accuracy to which the gage was read and to which the mean daily gage height was computed. If a gage is read to tenths or half-tenths once a day or to tenths twice a day no zeros appear in the hundredths place for any stage. If the gage is read to half-tenths twice a day or to quarter-tenths or hundredths, regardless of the number of readings a day, the gage heights are published to hundredths, and zeros appear in the hundredths place, below a certain limiting stage. This limiting stage is so selected that the average error in the mean daily discharge, resulting from not using the mean daily gage height to hundredths above that stage, shall not be greater than 2 per cent. For automatic gages the allowable average error of the daily discharge has been taken as 1 per cent. The selection of the percentage is arbitrary, but it should be noted that the maximum error will in all cases be twice the average error. In like manner half tenths are used from the hundredths limit to another higher limit, above which only tenths are used. It is the aim to have the gage-height observations at each gaging station recorded to the degree of refinement required by the above-described method of use, but in practice it is found necessary, in order to avoid confusion in the gage observer's record, to have the observations for all stages recorded to the degree of refinement required for low stages, which usually necessitates readings to hundredths of a foot.

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

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

The table of daily discharge determined from the rating table gives the discharge in second-feet corresponding to the mean of the gage readings observed each day.

The base data for the tables of monthly discharge presented in this report, unless otherwise stated in the description of the station, have been collected by the methods commonly used at current-meter gaging stations and described in standard textbooks.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second-foot during the month. On this the computations for the remaining columns, which are defined on pages 9 and 10, are based.

Plate I shows typical gaging stations. Plate II shows current meters used in the work.

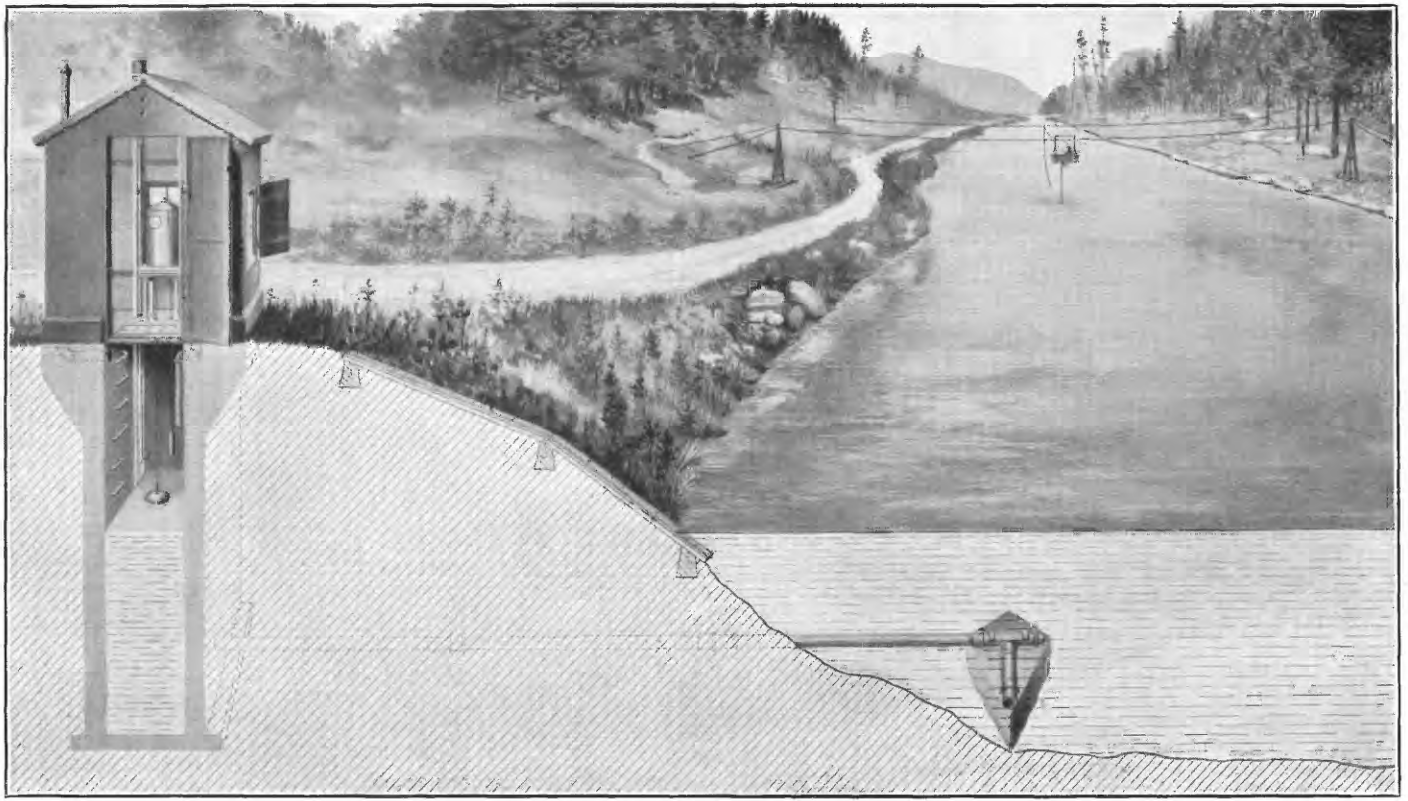
ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends on the permanence of the relation between discharge and stage and on the accuracy of observation of stage, measurements of discharge, and interpretation of data.

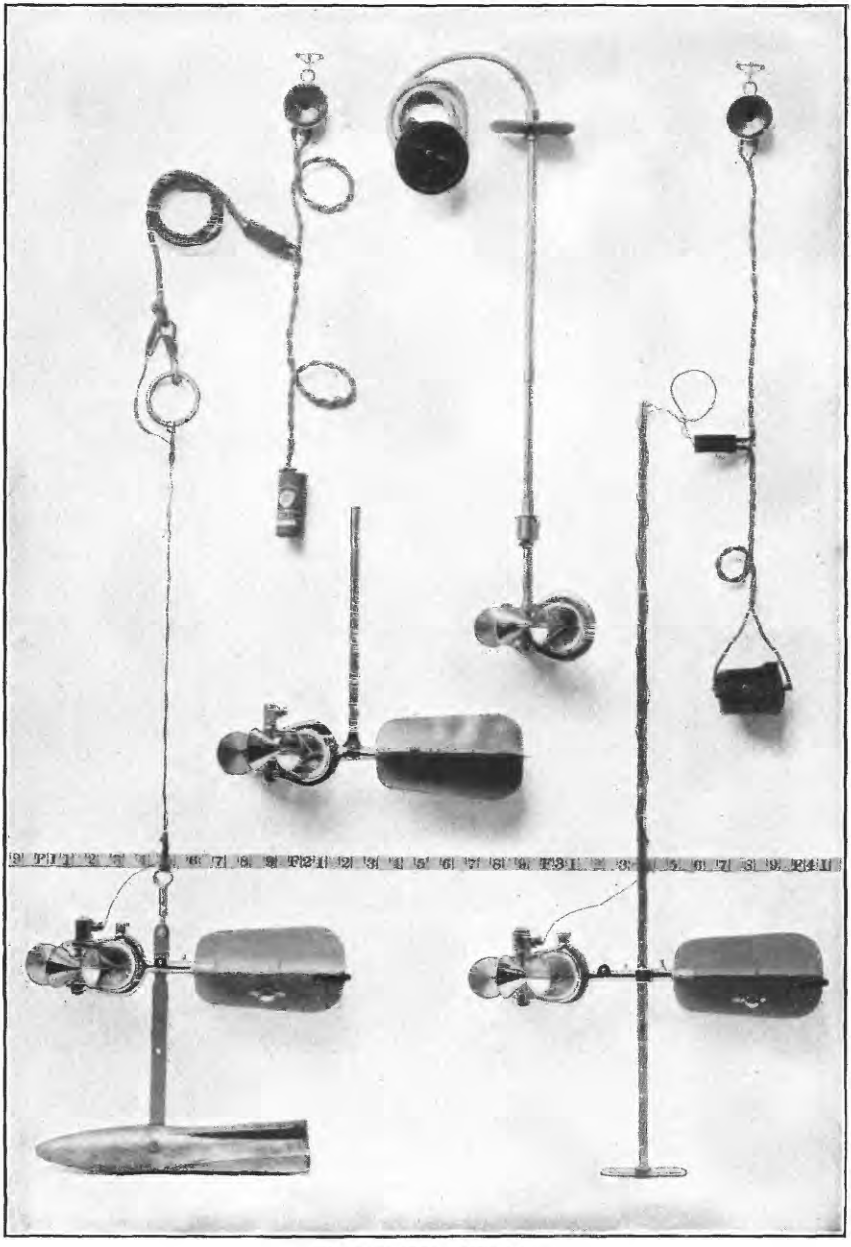
In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily discharge tables, stating the probable accuracy of the rating curves used, and an accuracy column is inserted in the monthly discharge table. For the rating curves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

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

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors which result from including in the measured drainage area large noncontributing districts or omitting estimates of water diverted for irrigation or other use. On this account the computations of "second-feet per square mile" and "run-off, depth in inches" have not been made for stations draining areas having an annual rainfall of less than 20 inches, nor for those



TYPICAL GAGING STATIONS.



PRICE CURRENT METERS.

stations draining areas of over 20 inches of rainfall for which it is believed that the computations would be uncertain and misleading because of the presence of large noncontributing districts in the measured drainage area, of omitting estimates of water diverted for irrigation or other use, or of artificial control or unusual natural control of the flow of the river above the gaging station. All values of "second-feet per square mile" and "run-off, depth in inches" previously published by the Survey should be used with extreme caution, and such values in this report should be used with care because of possible inherent sources of error not known to the Survey.

In general the base data collected each year by the Survey engineers are published, not only to comply with the law, but also to afford any engineer the means of examining and adjusting to his own needs the results of the computations. The table of monthly discharge is so arranged as to give only a general idea of the flow at the station and should not be used for other than preliminary estimates. The determinations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in these papers should verify all ratings and make such adjustments for earlier years as may seem necessary.

COOPERATION.

The work in Minnesota during 1913 has been carried on in cooperation with the State drainage commission, George A. Ralph, chief engineer, under the terms of an act of the legislature of 1909 as embodied in joint resolution 19, which reads as follows:

> Whereas the water supplies, water powers, navigation of our rivers, drainage of our lands, and the sanitary condition of our streams and their watersheds generally form one great asset and present one great problem: Therefore be it
>
> *Resolved by the house of representatives, the senate concurring*, That the State drainage commission be, and is hereby, directed to investigate progress in other States toward the solution of said problem in such States, to investigate and determine the nature of soil problem in this State.

Assistance has been rendered by the Oliver Iron Mining Co., which paid the salary of the observer on Menominee River near Iron Mountain.

The gaging stations on Wolf River in the Menominee Indian Reservation were maintained in cooperation with the Office of Indian Affairs, under an allotment made available January 1, 1913.

The gaging station on Escanaba River near Escanaba, Mich., has been maintained in cooperation with the Geological Survey of the State of Michigan.

Work in the State of New York has been conducted under cooperative agreements with John A. Bensel, State engineer and surveyor, and since July 1, 1911, with the division of inland waters of the State conservation commission.

The work in Vermont during 1913 has been done in cooperation with the State of Vermont, Allen M. Fletcher, governor.

DIVISION OF WORK.

The field data in the Lake Superior and part of Lake Michigan drainage basins were collected under the direction of W. G. Hoyt, district engineer, by S. B. Soulé and B. J. Peterson.

The field data in the Lake Michigan, Lake Huron, and Lake Erie drainage basins were collected under the direction of A. H. Horton.

The field data in the St. Lawrence drainage basin in New York and Vermont were collected under the direction of C. C. Covert, by O. W. Hartwell, G. H. Canfield, C. S. De Golyer, Frank Weber, J. G. Mathers, R. S. Barnes, G. J. Lyon, and W. S. Easterly.

The ratings, special estimates, and studies of the completed data for stations outside of New York and Vermont were made by B. J. Peterson under the direction of H. J. Jackson, and by W. G. Hoyt.

The computations were made under the direction of B. J. Peterson by M. I. Walters, J. H. Morgan, and E. D. Burchard.

The ratings, special estimates, and studies of the completed data for stations in New York and Vermont were made by C. C. Covert and O. W. Hartwell. The computations were made under the direction of O. W. Hartwell, by C. S. De Golyer, Frank Weber, R. S. Barnes, and W. S. Easterly.

The report was edited by Mrs. B. D. Wood.

GAGING-STATION RECORDS.

STREAMS TRIBUTARY TO LAKE SUPERIOR.

POPLAR RIVER AT LUTSEN, MINN.

Location.—In sec. 34, T. 60 N., R. 3 W., about 800 feet above mouth of river.

Records available.—May 6 to November 4, 1911; August 22, 1912, to December 31, 1913.

Drainage area.—144 square miles.

Gage.—Staff gage bolted to rock wall on right bank, in a pool between two distinct falls; installed August 26, 1912. Gage used May 6 to November 4, 1911, was a staff about 400 feet above mouth of river.

Control.—Crest of falls below gage. Channel solid rock.

Discharge measurements.—Made by wading.

Point of zero flow.—Approximately at gage height 0.35 foot.

Winter flow.—Discharge relation affected slightly by ice. Measurements and frequent gage observations to determine the winter flow.

Regulation.—Flow controlled to some extent by two dams above the station, the nearest being that of National Paper & Pulp Co., 2½ miles above mouth of river.

Accuracy.—Gage so situated that, except for periods during which ice exists at control and temporary drift is lodged on rapids below, records should be reliable.

Discharge measurements of Poplar River at Lutsen, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 11	S. B. Soulé	0.84	12.0
12	do	.78	10.5
June 12[a]	do	1.97	148
12[a]	do	1.94	136

[a] Measurement made by wading.

Daily gage height, in feet, of Poplar River at Lutsen, Minn., for 1913.

[C. A. A. Nelson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.85	0.85	0.85	2.1	1.94	1.70	1.48	1.15	1.14	1.54	1.69
2	.....	.....	.....	.85	2.0	1.99	1.58	1.38	1.12	1.15	1.51	1.68
3	.....	.....	.....	.85	2.0	2.0	1.49	1.32	1.10	1.12	1.49	1.64
4	0.8	.....	.....	.85	2.05	2.0	1.44	1.29	1.12	1.21	1.46	1.50
5	.....	.....	.....	.85	2.0	2.0	1.90	1.22	1.29	2.55	1.45	1.46
6	.....	.....	.....	.85	1.95	2.45	2.15	1.16	1.26	2.8	1.48	1.45
7	.....	.....	.....	.85	1.82	2.5	2.0	1.12	1.19	2.7	1.48	1.42
8	.....	.8	.88	.86	1.78	2.35	1.96	1.19	1.14	2.6	1.45	1.40
9	.....	.....	.....	.86	1.70	2.25	1.91	1.24	1.11	2.5	1.45	1.40
10	.....	.....	.....	.86	1.62	2.2	1.84	1.16	1.11	2.4	1.45	1.38
11	.85	.....	.....	.91	1.56	2.0	1.70	1.15	1.22	2.65	1.42	1.38
12	.78	.....	.....	.92	1.62	1.95	2.1	1.15	1.21	2.55	1.40	1.35
13	.....	.....	.....	.99	1.68	1.92	2.25	1.15	1.15	2.3	1.40	1.32
14	.....	.....	.....	1.10	1.69	1.94	2.1	1.15	1.06	2.1	1.38	1.32
15	.....	.8	.88	1.38	1.84	1.90	1.94	1.12	1.02	2.0	1.36	1.31
16	.....	.....	.....	1.88	2.2	1.86	1.82	1.11	1.02	1.92	1.32	1.30
17	.....	.....	.....	2.40	2.25	1.85	1.75	1.09	1.00	1.81	1.30	1.29
18	.95	.....	.....	2.55	2.2	1.81	1.65	1.08	.98	1.74	1.30	1.28
19	.....	.....	.....	2.5	2.1	1.90	1.56	1.05	.95	1.69	1.31	1.24
20	.....	.....	.....	2.4	1.96	2.0	1.56	1.06	1.04	1.69	1.36	1.22
21	.....	.....	.....	2.35	2.2	1.92	1.51	1.52	1.08	1.59	1.41	1.21
22	.....	.82	.88	2.4	2.6	1.84	1.45	1.54	1.06	1.56	1.49	1.51
23	.....	.....	.....	2.6	2.55	1.78	1.39	1.40	1.06	1.54	1.56	1.18
24	.....	.....	.....	2.9	2.4	1.69	1.34	1.35	1.11	1.50	1.32	1.12
25	.92	.....	.....	3.0	2.2	1.62	1.32	1.22	1.36	1.54	1.49	1.05
26	.....	.....	.....	2.8	2.1	1.56	1.32	1.14	1.51	1.71	1.42	1.11
27	.....	.....	.....	2.55	2.05	1.75	1.32	1.09	1.42	1.78	1.36	1.15
28	.....	.....	.....	2.3	2.0	2.05	1.29	1.12	1.31	1.69	1.31	1.15
29	.....	.....	.85	2.2	2.0	1.98	1.25	1.26	1.19	1.62	1.50	1.19
30	.....	.....	.....	2.15	2.0	1.84	1.21	1.21	.....	1.58	1.62	1.19
31	.....	.....	.....	.....	1.99	.....	1.34	1.16	.....	1.56	.....	1.16

NOTE.—Discharge relation affected by ice about Jan. 1 to Mar. 31. Gage height Dec. 22 apparently too high.

Daily discharge, in second-feet, of Poplar River at Lutsen, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	19	168	139	100	70	34	33	78	99
2	19	150	148	83	58	32	34	73	97
3	19	150	150	71	50	30	32	71	92
4	19	159	150	65	47	32	39	67	72
5	19	150	150	132	40	47	280	66	67
6	19	141	252	179	35	44	360	70	66
7	19	119	265	150	32	37	325	70	62
8	19	113	228	143	37	33	295	66	60
9	19	100	202	134	42	31	265	66	60
10	19	89	190	122	35	31	240	66	58
11	20	80	150	100	34	40	310	62	58
12	21	89	141	168	34	39	280	60	54
13	24	97	136	202	34	34	215	60	50
14	30	99	139	168	34	28	168	58	50
15	58	122	132	139	32	25	150	55	49
16	129	190	126	119	31	25	136	50	48
17	240	202	124	108	29	24	118	48	47
18	280	190	118	93	29	23	106	48	46
19	265	168	132	80	27	22	99	49	42
20	240	143	150	80	28	26	99	55	40
21	228	190	136	73	75	29	85	61	39
22	240	295	122	66	78	28	80	71	a 38
23	295	280	113	59	60	28	78	80	36
24	395	240	99	53	54	31	72	50	32
25	430	190	89	50	40	55	78	71	27
26	360	168	80	50	33	73	102	62	31
27	280	159	108	50	29	62	113	55	34
28	215	150	159	47	32	49	99	49	34
29	190	150	146	43	44	37	89	72	37
30	179	150	122	39	39	a 35	83	89	37
31	.....	148	.....	53	35	.....	80	.....	35

a Interpolated.

NOTE.—Discharge computed from a fairly well defined rating curve.

Discharge estimated, because of ice, from gage heights, two discharge measurements, observer's notes, and climatologic records, as follows:

Jan. 1 to 31, 10 second-feet; Feb. 1 to 28, 9 second-feet; Mar. 1 to 31, 8 second-feet.

Monthly discharge of Poplar River at Lutsen, Minn., for 1913.

[Drainage area, 144 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	10	0.069	0.08	C.
February	.....	.....	9	.062	.06	C.
March	.....	.....	8	.056	.06	C.
April	430	19	144	1.00	1.12	B.
May	295	80	156	1.08	1.24	A.
June	265	80	147	1.02	1.14	A.
July	202	39	97.4	.676	.78	A.
August	78	27	41.2	.286	.33	B.
September	73	22	35.5	.247	.28	A.
October	360	32	147	1.02	1.18	B.
November	89	48	63.3	.440	.49	B.
December	99	27	51.5	.358	.41	B.
The year	430	.....	76.0	.528	7.17	

NOTE.—See footnote to table of daily discharge.

BEAVER BAY RIVER AT BEAVER BAY, MINN.

Location.—At bridge at Beaver Bay, a few hundred yards above mouth of river.

Records available.—July 26, 1911, to December 31, 1913.

Drainage area.—120 square miles.

Gage.—Chain gage on steel highway bridge, April 22, 1912, at same section and datum as staff gage used July 26, 1911, to April 9, 1912. Gage read once daily to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0 feet.

Control.—Permanent; solid rock.

Winter flow.—Affected by ice. Measurements made to determine winter discharge.

Regulation.—None.

Accuracy.—At times of exceptionally high sea on Lake Superior a bar is formed which causes backwater at the gage, lasting as long as the high sea is running. When the lake becomes normal the water washes through the bar and the regular rating curve applies. The discharge rating curve used for 1913 differs above 87 second-feet (gage height 2.0 feet) from that used for 1912. The rating curve for 1913 applies to 1912, and estimates of discharge for that year as published in Water-Supply Paper 324 should be revised to new rating curve, which gives the smaller discharge. The maximum difference between the two curves is about 10 per cent and occurs at gage height 2.6 feet.

Discharge measurements of Beaver Bay River at Beaver Bay, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 14[a]	S. B. Soulé	0.47	2.1
June 11[b]	do	2.66	189
11[c]	do	2.65	188

[a] Complete ice cover at gage bridged across the stream, not touching the water surface.
[b] Measurement made from a boat at a section about 700 feet below gage.
[c] Measurement made from a boat at a section about 200 feet below gage.

Daily gage height, in feet, of Beaver Bay River at Beaver Bay, Minn., for 1913.

[Louis Lorntson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					2.8	2.95	1.75	1.98	0.92	1.42	1.97	2.35
2	2.0				2.9	3.0	1.50	1.73	.82	1.44	1.77	2.3
3				2.8	3.0	2.8	1.35	1.43	.90	1.47	1.72	2.2
4				2.9	2.9	2.6	1.50	1.33	1.50	3.2	1.67	2.0
5				3.1	2.8	4.0	2.65	1.03	1.77	4.6	1.87	1.9
6		−0.30	−0.18	2.3	2.7	4.7	2.8	1.01	1.72	4.2	1.77	1.87
7				2.5	2.5	4.8	2.4	1.03	1.97	4.0	1.72	1.82
8				1.92	2.4	4.0	2.5	1.03	1.77	3.9	1.92	2.7
9	.68			1.50	2.3	3.7	2.6	.98	1.42	3.7	1.72	2.45
10				1.15	2.2	2.9		1.08	2.25	5.4	1.92	1.67
11				2.0	2.0	2.6		1.13	2.7	4.9	2.25	1.62
12				3.0	2.2	2.4		1.38	2.45	4.3	1.7	1.52
13		−.50	.15	3.5	2.25	2.2		1.43	2.1	3.9	1.57	1.37
14	.47			4.1	2.25	2.2		1.33	2.1	3.5	1.42	1.32
15				5.5	3.2	2.2	2.65	1.23	1.72	3.3	1.32	1.27
16	.58			6.7	3.5	1.98	2.8	1.13	1.52	2.9	1.32	1.22
17				7.0	3.3	1.90	2.9	.98	1.30	2.5	1.37	1.17
18				7.0	2.9	1.70	2.7	1.13	1.12	2.2	1.42	1.12
19				5.9	2.65	2.3	2.3	1.13	.92	1.95	1.47	1.17
20		−.10	.15	5.2	2.7	2.6	2.2	1.53	1.12	2.0	1.62	1.42
21				5.0	4.6	2.3	1.98	1.55	1.72	2.05	1.82	1.92
22				4.9	4.7	2.2	2.1	2.2	1.62	1.95	1.92	1.82
23	.10			4.9	4.2	1.90	1.88	2.35	1.32	1.9	2.05	1.42
24				5.2	3.5	1.82	1.65	1.73	1.42	1.9	1.97	1.22
25				5.0	3.2	1.65	1.48	1.33	1.97	1.9	2.0	.97
26				3.8	2.8	1.80	1.48	1.08	2.25	2.5	1.92	1.67
27		−.60	.38	3.5	2.6	2.05	1.48	1.03	2.1	2.3	1.87	1.57
28				3.2	2.55	2.4	1.73	1.13	2.05	1.95	1.77	
29				2.95	2.4	2.25	1.38	1.05	1.95	2.15	1.82	1.67
30	.02			2.8	2.5	1.98	1.28	1.05	1.62	2.0	1.97	
31					3.0		2.15	1.03		1.75		1.17

NOTE.—Discharge relation affected by ice Jan. 1 to about Apr. 5, and about Dec. 26–31.

Daily discharge, in second-feet, of Beaver Bay River at Beaver Bay, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	230	270	63	85	19	39	84	132
2	.....	255	285	44	61	16	40	65	124
3	.....	285	230	36	40	18	42	61	110
4	.....	255	180	44	34	44	350	57	87
5	.....	230	675	192	22	65	945	74	77
6	124	205	990	230	21	61	765	65	74
7	160	160	1,040	140	22	84	675	61	69
8	79	140	675	160	22	65	630	79	205
9	44	124	545	180	20	39	545	61	150
10	27	110	255	180	24	117	1,300	79	75
11	87	87	180	180	26	205	1,080	117	53
12	285	110	140	190	37	150	810	59	45
13	465	117	110	190	40	98	630	49	36
14	720	117	110	190	34	98	465	39	34
15	1,350	350	110	192	30	61	385	34	32
16	1,890	465	85	230	26	45	255	34	30
17	2,020	385	77	255	20	33	160	36	28
18	2,020	255	59	205	26	26	110	39	26
19	1,530	192	124	124	26	19	82	42	28
20	1,220	205	180	110	46	26	87	53	39
21	1,120	945	124	85	48	61	92	69	79
22	1,080	990	110	98	110	53	82	79	69
23	1,080	765	77	75	132	34	77	92	39
24	1,220	465	69	55	61	39	77	84	30
25	1,120	350	55	43	34	84	77	87	20
26	585	230	67	43	24	117	160	79	20
27	465	180	92	43	22	98	124	74	20
28	350	170	140	61	26	92	82	65	20
29	270	140	117	37	23	82	104	69	20
30	230	160	85	32	23	53	87	84	20
31	.....	285	.....	104	22	.....	63	.....	20

NOTE.—Discharge computed from a rating curve well defined below 285 second-feet (gage height 3.0 feet) and poorly defined above that point. Discharge July 10–14 estimated. Discharge estimated, because of ice, from gage heights, one discharge measurement, observer's notes, climatologic records, and discharge of adjacent areas, as follows: Jan. 1–31, 3 second-feet; Feb. 1–28, 1 second-foot; Mar. 1–31, 2 second-feet, varying from about 1 to 4 second-feet; Apr. 1–5, 50 second-feet; Dec. 26–31, 20 second-feet. See "Accuracy" in station description.

Monthly discharge of Beaver Bay River at Beaver Bay, Minn., for 1913.

[Drainage area, 120 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	*a* 3	0.025	0.03	C.
February	.....	.....	*a* 1	.0083	.009	C.
March	.....	.....	*a* 2	.017	.02	C.
April	2,020	27	660	5.50	6.14	C.
May	990	87	289	2.41	2.78	B.
June	1,040	55	242	2.02	2.25	B.
July	255	32	123	1.02	1.18	B.
August	132	20	38.3	.319	.37	A.
September	205	16	66.7	.556	.62	A.
October	1,300	39	336	2.80	3.23	B.
November	117	34	65.7	.548	.61	A.
December	205	.....	57.8	.482	.56	B.
The year	2,020	.....	157	1.31	17.80	

a Estimated.

NOTE.—See footnote to table of daily discharge.

ST. LOUIS RIVER NEAR THOMSON, MINN.

Location.—In sec. 11, T. 48 N., R. 16 W., just below tailrace of the Great Northern power house, 3 miles east of Thomson.

Records available.—October 5, 1909, to December 31, 1913.

Drainage area.—3,420 square miles.

Gage.—Chain gage read four times each day (except Sunday), at 8 and 11 a. m., 2 and 5 p. m.; average of four readings taken as the mean for the day. Limits of use: Hundredths below 0.0, half-tenths from 0.0 to 1.5, and tenths above 1.5 feet.

Control.—Practically permanent at low stages; at high stages may shift slightly.

Discharge measurements.—Made from cable 1,500 feet below gage.

Winter flow.—During January, February, and March ice renders the gage heights useless as indication of discharge. Flow for these months estimated from amount of water passing through turbines of Great Northern Power Co.

Regulation.—The flow at the station is to a certain extent regulated by reservoirs above. The dam at Thomson is designed to hold 24 hours' supply of water for the power plant, and logging dams control the discharge from a large part of the entire area above the station. Gage heights show considerable fluctuations caused by operation of turbine gates at power plant, which is operated on a 24-hour schedule though with varying load.

Accuracy.—Open-water estimates subject to errors due to fluctuation in stage caused by operation of power plant. Daily range in stage is not great, however, and it is believed that errors will compensate for a month, so that the monthly averages should be accurate within 10 per cent. Accuracy of records furnished by the power company not known.

Cooperation.—Gage heights throughout the year and records of flow when ice affects discharge relation furnished through courtesy of Great Northern Power Co., Duluth.

Discharge measurements of St. Louis River near Thomson, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 16	S. B. Soulé	3.32	4,130
Sept. 9	B. J. Peterson	2.18	2,350

Daily gage height, in feet, of St. Louis River near Thomson, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.4	4.7	4.2	3.5	2.6	.....	1.7	1.8	1.7
2	.55	4.3	3.4	3.0	2.7	.....	1.5	1.9	1.7
3	.7	4.1	3.5	3.1	2.3	.....	1.6	2.1	1.8
4	.75	4.6	4.0	2.9	2.3	.....	1.5	2.2	1.7
5	1.2	3.9	3.7	3.6	2.0	.....	2.7	2.1	1.8
6	1.5	3.9	4.4	4.2	2.0	.....	.....	2.0	1.6
7	1.8	3.3	5.5	4.4	1.6	.....	4.0	1.9	1.6
8	2.0	.....	5.0	3.5	1.7	2.3	4.2	2.0	1.1
9	2.2	3.2	5.5	3.3	1.8	2.6	4.7	1.8	.....
10	2.2	3.6	4.6	3.0	1.7	2.5	4.7	1.7	1.1
11	2.1	3.5	4.6	2.8	1.7	2.7	4.9	1.8	1.35
12	2.2	2.8	4.4	3.2	1.8	2.5	4.7	1.6	1.25
13	2.4	2.5	4.1	3.8	1.5	2.6	4.4	1.5	1.25
14	2.8	2.7	3.8	4.7	1.5	2.5	4.5	1.45	1.15
15	3.0	3.3	3.8	4.3	1.4	2.5	4.1	1.8	1.1
16	3.2	3.1	3.3	4.0	.....	2.1	3.9	1.5	1.1
17	3.6	4.1	2.9	5.1	.....	1.9	3.9	1.5	.95
18	3.5	5.3	2.6	5.9	1.68	1.8	3.4	1.35	.8
19	3.5	4.5	2.6	5.9	1.3	1.8	3.2	1.6	.75
20	3.4	4.5	2.8	5.6	1.3	1.5	2.8	1.4	.6
21	3.4	5.4	2.9	5.0	1.3	1.4	2.7	1.45	.4
22	3.5	5.7	2.8	4.7	1.2	.....	2.4	1.4	.6
23	3.9	5.9	3.3	4.2	1.2	1.2	2.2	1.8	.65
24	3.9	5.1	2.5	3.8	1.2	1.2	2.4	1.8	.6
25	5.5	5.5	2.8	3.5	1.3	1.2	2.3	1.8	.4
26	5.6	4.6	2.8	3.1	1.5	1.6	2.4	1.6	.4
27	5.4	4.7	2.9	3.3	.....	1.6	2.4	1.8	.35
28	5.4	3.9	3.8	3.4	.....	1.7	2.4	1.6	.....
29	5.8	5.2	3.7	3.0	.....	1.7	2.3	1.7	.5
30	5.2	3.8	3.1	3.1	.....	1.8	2.3	1.7	.6
31	.....	4.1	.....	2.7	.....	.....	1.8	.....	.6

Daily discharge, in second-feet, of St. Louis River near Thomson, Minn., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	335	350	370	530	7,080	5,910	4,440	2,910	.....	1,720	1,830	1,720
2	323	346	366	635	6,140	4,250	3,540	3,060	.....	1,500	1,950	1,720
3	367	317	354	740	5,690	4,440	3,710	2,480	.....	1,610	2,200	1,830
4	373	325	366	780	6,840	5,470	3,380	2,480	.....	1,500	2,340	1,720
5	356	318	337	1,180	5,260	4,840	4,640	2,070	.....	3,060	2,200	1,830
6	344	311	373	1,500	5,260	6,370	5,910	2,070	.....	[1]4,260	2,070	1,610
7	324	340	375	1,830	4,060	9,150	6,370	1,610	.....	5,470	1,950	1,610
8	328	323	377	2,070	a3,970	7,850	4,440	1,720	2,480	5,910	2,070	1,090
9	290	360	374	2,340	3,880	9,150	4,060	1,830	2,910	7,080	1,830	a1,090
10	310	330	345	2,340	4,640	6,840	3,540	1,720	2,760	7,080	1,720	1,090
11	315	346	353	2,200	4,440	6,840	3,220	1,720	3,060	7,590	1,830	1,340
12	218	358	317	2,340	3,220	6,370	3,880	1,830	2,760	7,080	1,610	1,230
13	327	354	351	2,620	2,760	5,690	5,050	1,500	2,910	6,370	1,500	1,230
14	326	366	332	3,220	3,060	5,050	7,080	1,500	2,760	6,600	1,440	1,140
15	328	388	355	3,540	4,060	5,050	6,140	1,390	2,760	5,690	1,830	1,090
16	336	403	392	3,880	3,710	4,060	5,470	a1,490	2,200	5,260	1,500	1,090
17	332	402	321	4,640	5,690	3,380	8,110	a1,600	1,950	5,260	1,500	955
18	348	411	339	4,440	8,630	2,910	10,200	1,700	1,830	4,250	1,340	820
19	345	425	338	4,440	6,600	2,910	10,200	1,280	1,830	3,880	1,610	780
20	336	449	340	4,250	6,600	3,220	9,410	1,280	1,500	3,220	1,390	670
21	362	488	338	4,250	8,890	3,380	7,850	1,280	1,390	3,060	1,440	530
22	332	461	301	4,440	9,670	3,220	7,080	1,180	1,280	2,620	1,390	670
23	304	449	351	5,260	10,200	4,060	5,910	1,180	1,180	2,340	1,830	705
24	315	439	342	5,260	8,110	2,760	5,050	1,180	1,180	2,620	1,830	670
25	304	409	303	9,150	9,150	3,220	4,440	1,280	1,180	2,480	1,830	530
26	324	371	332	9,410	6,840	3,220	3,710	1,500	1,610	2,620	1,610	530
27	335	342	313	8,890	7,080	3,380	4,060	.....	1,610	2,620	1,830	500
28	347	378	316	8,890	5,260	5,050	4,250	.....	1,720	2,620	1,610	a550
29	338	.....	327	9,930	8,370	4,840	3,540	.....	1,720	2,480	1,720	600
30	347	.....	393	8,370	5,050	3,710	3,710	.....	1,830	2,480	1,720	670
31	338	.....	389	.....	5,690	.....	3,060	.....	.....	1,830	.....	670

a Discharge interpolated.

NOTE.—Daily discharge computed from a rating curve well defined between 530 and 10,400 second-feet (gage heights 0.4 and 6.0 feet). Discharge Jan. 1 to Mar. 31, furnished by the Great Northern Power Co. Discharge Aug. 27 to Sept. 7, estimated by comparison with rainfall records as follows: Aug. 27-31, 1,500 second-feet; Sept. 1-7, 1,800 second-feet.

Monthly discharge of St. Louis River near Thomson, Minn., for 1913.

[Drainage area, 3,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	373	218	329	0.096	0.11	
February	488	311	377	.110	.11	
March	393	301	348	.102	.12	
April	9,930	530	4,050	1.18	1.32	B.
May	10,200	2,760	6,000	1.75	2.02	B.
June	9,150	2,760	4,890	1.43	1.60	B.
July	10,200	3,060	5,340	1.56	1.80	B.
August	3,060	1,180	1,690	.494	.57	B.
September	3,060	1,180	1,970	.576	.64	B.
October	7,590	1,500	3,940	1.15	1.33	A.
November	2,340	1,340	1,750	.512	.57	A.
December	1,830	500	1,040	.304	.35	B.
The year	10,200	218	2,660	.778	10.54	

NOTE.—See footnote to table of daily discharge.

WHITEFACE RIVER BELOW MEADOWLANDS, MINN.

Location.—About 2½ miles below gaging station on Whiteface River at Meadowlands, half a mile below the beginning of decided rapids, and about 10 miles above confluence of Whiteface and St. Louis rivers.

Records available.—April 28, 1912, to December 31, 1913.

Drainage area.—446 square miles.

Gage.—Chain gage attached to two trees on left bank read daily, morning and evening, to quarter-tenths. Limits of use: Half-tenths below 3.5 and tenths above 3.5 feet.

Control.—Heavy gravel and rocks; probably permanent.

Discharge measurements.—Made by wading or from the highway bridge in sec. 14, T. 53 N., R. 19 W., near the gage of the abandoned station on Whiteface River at Meadowlands.

Winter flow.—Affected by ice; observations discontinued.

Regulation.—The flow is controlled to a large extent by logging dams above. The operation of gates at these dams causes fluctuations in gage heights amounting to several feet at the gage section. Few logs lodge below the station, so that backwater from logs is seldom present.

Accuracy.—Estimates good except as affected by ice.

Discharge measurements of Whiteface River below Meadowlands, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 4	W. G. Hoyt	4.42	825
Sept. 11	B. J. Peterson	4.19	694

Daily gage height, in feet, of Whiteface River below Meadowlands, Minn., for 1913.

[A. A. Jochim, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.7	4.2	3.8	3.3	2.4	3.15	3.7	3.0
2	.....	4.0	4.0	3.6	3.25	2.45	3.15	3.35	3.0
3	.....	4.0	4.4	3.4	3.2	2.35	3.15	3.3	3.05
4	.....	4.0	4.2	3.35	3.1	3.8	3.6	3.2	3.05
5	.....	4.0	4.2	4.0	3.0	4.6	4.4	3.15	3.0
6	.....	3.3	5.9	4.6	2.9	4.5	4.9	3.2	2.95
7	.....	3.8	6.2	4.7	2.85	4.4	5.1	3.2	2.9
8	.....	3.9	6.1	4.7	2.85	4.2	5.2	3.15	3.2
9	.....	4.0	6.1	4.4	2.8	4.0	5.1	3.0	.....
10	.....	2.45	6.5	4.2	2.8	3.8	5.2	3.2	.....
11	Ice.	2.4	6.1	4.1	2.8	4.2	5.5	3.5	.....
12	.....	3.1	5.9	4.3	2.75	4.0	5.3	3.3	.....
13	2.5	3.6	4.9	4.5	2.8	3.9	5.1	3.15	.....
14	2.5	3.0	4.4	4.5	2.8	3.8	5.0	3.1	.....
15	2.4	2.7	4.4	4.4	2.75	3.6	4.8	3.05	.....
16	2.7	4.1	4.2	4.9	2.75	3.5	4.5	2.8	.....
17	3.2	4.9	4.0	5.3	2.8	3.35	4.3	2.8	.....
18	3.7	4.8	3.8	5.2	2.8	3.25	4.1	2.8	.....
19	4.0	5.0	3.7	5.0	2.75	3.15	3.9	2.9	.....
20	4.1	5.0	3.8	4.8	2.75	3.1	3.8	3.2	.....
21	4.1	5.0	3.7	4.6	2.7	3.05	3.6	2.95	.....
22	3.9	5.7	3.6	4.4	2.7	2.9	3.5	3.1	.....
23	3.8	5.2	3.5	4.2	2.8	2.85	3.5	2.95	.....
24	4.0	5.2	3.35	4.0	2.8	2.9	3.4	2.8	.....
25	4.5	4.8	3.3	3.8	2.8	3.0	3.35	2.95	.....
26	4.5	4.8	3.3	3.8	2.75	3.25	3.45	3.1	.....
27	4.8	4.6	3.7	3.7	2.7	3.25	3.6	3.0	.....
28	5.2	3.3	3.8	3.6	2.6	3.25	3.5	2.9	.....
29	4.4	3.3	3.8	3.5	2.6	3.2	3.4	2.95	.....
30	4.0	3.5	3.8	3.4	2.55	3.15	3.45	3.0	.....
31	.....	4.0	.....	3.35	2.6	.....	3.6	.....	.....

Daily discharge, in second-feet, of Whiteface River below Meadowlands, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	474	712	519	316	97	266	474	220
2	.....	613	613	431	299	104	266	334	220
3	.....	613	816	352	282	92	266	316	235
4	.....	613	712	334	250	519	431	282	235
5	.....	613	712	613	220	932	816	266	220
6	.....	316	1,820	932	192	872	1,120	282	206
7	.....	519	2,050	992	180	816	1,250	282	192
8	.....	565	1,980	992	180	712	1,320	266	.....
9	.....	613	1,980	816	167	613	1,250	220	.....
10	.....	104	2,280	712	167	519	1,320	282	.....
11	.....	97	1,980	662	167	712	1,530	390	.....
12	.....	250	1,820	763	156	613	1,390	316	.....
13	110	431	1,120	872	167	565	1,250	266	.....
14	110	220	816	872	167	519	1,180	250	.....
15	97	145	816	816	156	431	1,050	235	.....
16	145	662	712	1,120	156	390	872	167	.....
17	282	1,120	613	1,390	167	334	763	167	.....
18	474	1,050	519	1,320	167	299	662	167	.....
19	613	1,180	474	1,180	156	266	565	192	.....
20	662	1,180	519	1,050	156	250	519	282	.....
21	662	1,180	474	932	145	235	431	206	.....
22	565	1,680	431	816	145	192	390	250	.....
23	519	1,320	390	712	167	180	390	206	.....
24	613	1,320	334	613	167	192	352	167	.....
25	872	1,050	316	519	167	220	334	206	.....
26	872	1,050	316	519	156	299	371	250	.....
27	1,050	932	474	474	145	299	431	220	.....
28	1,320	316	519	431	126	299	390	192	.....
29	816	316	519	390	126	282	352	206	.....
30	613	390	519	352	118	266	371	220	.....
31	.....	613	.....	334	126	.....	431	.....	.....

NOTE.—Discharge computed from a well-defined rating curve. Discharge Dec. 8 to 31 estimated, because of ice, from gage heights, observer's notes, climatologic records and discharge of adjacent drainage areas, as 200 second-feet, varying from about 150 to 250 second-feet.

Monthly discharge of Whiteface River below Meadowlands, Minn., for 1913.

[Drainage area, 446 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
April (13-30)	1,320	97	578	1.30	0.87	B.
May	1,680	97	695	1.56	1.80	B.
June	2,280	316	912	2.04	2.28	B.
July	1,390	334	736	1.65	1.90	B.
August	316	118	176	.395	.46	B.
September	932	92	404	.906	1.01	B.
October	1,530	266	720	1.61	1.86	B.
November	474	167	252	.565	.63	B.
December	.....	.....	204	.457	.53	D.

CLOQUET RIVER AT INDEPENDENCE, MINN.

Location.—In sec. 26, T. 52 N., R. 17 W., at highway bridge at Independence post office, just below a small tributary entering from the north.

Records available.—June 28, 1909, to December 31, 1913.

Drainage area.—698 square miles.

Gage.—Vertical staff, read daily, morning, noon, and evening to quarter-tenths. Limits of use: Hundredths below 4.0, half-tenths from 4.0 to 6.0, and tenths above 6.0 feet.

Control.—Practically permanent except when obstructed by log jams.

Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice. From January 1 to April 19 the monthly mean has been based on the discharge at the outlet of Fish Lake reservoir on Cloquet River, in sec. 15, T. 52 N., R. 15 W., and from Island Lake reservoir on Beaver River, in sec. 29, T. 52 N., R. 15 W., plus 10 second-feet.

Regulation.—Cloquet River is used extensively for log driving, and the run-off from by far the greater part of the drainage area above Independence is controlled by logging dams. This control causes violent fluctuations in the gage height during the day, amounting at times to several feet, and consequently the mean daily gage height, which is the mean of the three readings per day, can only be considered approximate. The chief purpose of the records is to show the approximate mean monthly discharge and total discharge.

Accuracy.—Discharge relation at the gage section affected by backwater from a log jam just below the highway bridge, April 20 to June 30, 1913. Winter records good. For open-water accuracy see note under "Regulation."

Cooperation.—Records of flow from logging reservoirs January 1 to March 31, 1913, furnished by Great Northern Power Co., of Duluth.

Discharge measurements of Cloquet River at Independence, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 4	W. G. Hoyt	6.58	849
Sept. 10	B. J. Peterson	6.00	896

Daily gage height, in feet, of Cloquet River at Independence, Minn., for 1913.

[Herbert Haakensen, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7.3	5.2	7.5	6.5	4.6	4.5	5.2	4.95
2	.....	5.45	5.0	6.6	5.35	4.6	4.55	5.4	4.65
3	.....	7.7	7.6	6.6	5.3	4.55	4.6	5.5	4.4
4	.....	6.1	6.6	7.0	5.0	4.5	4.75	5.5	5.1
5	.....	7.9	7.6	6.2	5.0	4.75	5.0	5.3	5.0
6	.....	5.9	7.4	5.65	5.25	4.9	5.4	5.2	4.9
7	.....	7.3	7.1	5.45	5.5	4.6	6.7	5.05	4.9
8	.....	5.85	6.9	5.3	5.65	4.6	6.0	5.35	4.85
9	.....	7.5	6.4	4.8	5.55	5.9	7.3	6.2	5.15
10	.....	7.7	7.6	4.6	5.3	5.9	7.3	6.5	5.4
11	.....	5.7	7.4	5.1	5.25	5.9	7.2	5.15	5.2
12	.....	5.35	6.6	5.1	5.3	5.8	7.2	4.5	5.4
13	.....	6.2	7.5	5.5	5.05	5.95	7.2	4.5	5.6
14	.....	7.7	7.5	6.6	5.3	6.0	7.1	4.5	5.4
15	.....	5.25	7.8	6.0	6.6	5.9	6.8	4.5	5.4
16	.....	5.2	6.9	5.6	6.2	5.9	6.9	4.6	5.3
17	.....	7.8	5.6	6.3	5.6	5.8	6.8	4.6	5.2
18	.....	6.5	4.8	6.2	4.9	5.8	6.9	4.6	5.0
19	.....	5.6	6.3	6.2	4.85	5.75	5.8	4.65	5.0
20	4.1	6.6	7.7	6.3	4.7	5.7	5.75	4.7	4.95
21	4.3	7.9	7.3	6.2	4.5	5.65	5.6	4.9	5.1
22	5.05	8.2	7.6	5.9	4.4	5.4	5.6	4.9	5.35
23	5.05	7.8	6.4	6.1	4.35	5.0	5.6	5.0	5.45
24	6.8	6.2	7.3	5.8	4.8	4.8	5.7	5.0	5.45
25	7.2	6.1	8.4	5.35	5.3	4.75	5.8	5.0	5.6
26	6.8	7.5	7.9	6.2	5.1	4.6	5.85	4.8	5.7
27	6.2	6.4	8.0	6.6	5.4	4.55	5.9	4.7	5.8
28	8.3	7.3	7.8	6.3	5.5	4.5	5.7	4.7	.....
29	8.4	6.3	5.0	6.1	4.85	4.5	5.5	4.9	.....
30	7.9	6.5	7.5	5.1	4.55	4.5	5.2	4.9	.....
31	.....	8.3	.....	5.35	4.5	.....	5.2	.....	.....

NOTE.—Discharge relation affected by backwater from log jam about Apr. 20 to June 30, and by ice about Dec. 21–31.

Daily discharge, in second-feet, of Cloquet River at Independence, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,380	262	2,670	1,370	193	165	410	311
2	.....	337	208	1,480	480	193	179	505	208
3	.....	1,680	1,600	1,480	455	179	193	560	140
4	.....	580	865	1,980	330	165	240	560	370
5	.....	1,840	1,600	1,080	330	240	330	455	330
6	.....	495	1,450	652	432	292	505	410	292
7	.....	1,380	1,220	532	560	193	1,600	350	292
8	.....	475	1,080	455	652	193	900	480	274
9	.....	1,520	740	257	590	825	2,390	1,080	390
10	.....	1,680	1,600	193	455	825	2,390	1,370	505
11	.....	420	1,450	370	432	825	2,250	390	410
12	.....	307	865	370	455	755	2,250	165	505
13	.....	630	1,520	560	350	862	2,250	165	620
14	.....	1,680	1,520	1,480	455	900	2,110	165	505
15	.....	277	1,760	900	1,480	825	1,720	165	505
16	.....	262	1,080	620	1,080	825	1,850	193	455
17	.....	1,760	385	1,170	620	755	1,720	193	410
18	.....	800	162	1,080	292	755	1,850	193	330
19	.....	385	685	1,080	274	720	755	208	330
20	64	865	1,680	1,170	224	685	720	224	311
21	82	1,840	1,380	1,080	165	652	620	292	.....
22	248	2,080	1,600	825	140	505	620	292	.....
23	221	1,760	740	985	129	330	620	330	.....
24	1,000	630	1,380	755	257	257	685	330	.....
25	1,300	580	2,240	480	455	240	755	330	.....
26	1,000	1,520	1,840	1,080	370	193	790	257	.....
27	630	740	1,920	1,480	505	179	825	224	.....
28	2,160	1,380	1,760	1,170	560	165	685	224	.....
29	2,240	685	208	985	274	165	560	292	.....
30	1,840	800	1,520	370	179	165	410	292	.....
31	.....	2,160	.....	480	165	.....	410	.....	.....

NOTE.—Discharge Dec. 21–31 estimated, because of ice, from gage heights, observer's notes, climatologic records and discharge of adjacent drainage areas, at 300 second-feet. See "Winter flow" and "Accuracy" in station description.

Monthly discharge of Cloquet River at Independence, Minn., for 1913.

[Drainage area, 698 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	[a] 156	0.223	0.26	
February	.....	.....	[a] 205	.294	.31	
March	.....	.....	[a] 119	.170	.20	
April	2,240	.....	398	.570	.64	D.
May	2,160	262	1,060	1.52	1.75	C.
June	2,240	162	1,210	1.73	1.93	B.
July	2,670	193	944	1.35	1.56	B.
August	1,480	129	468	.670	.77	A.
September	900	165	469	.672	.75	A.
October	2,390	165	1,080	1.55	1.79	A.
November	1,370	165	370	.530	.59	A.
December	.....	140	348	.499	.58	B.
The year	2,670	.....	571	.818	11.13	

[a] Estimated.

NOTE.—See footnote to table of daily discharge.

STREAMS TRIBUTARY TO LAKE MICHIGAN.

ESCANABA RIVER NEAR ESCANABA, MICH.

Location.—At highway bridge between Escanaba and Gladstone, Mich., about 9 miles north of Escanaba and 4 miles above mouth of River, T. 40 N., R. 23 W., at quarter-section corner between secs. 24 and 25.

Records available.—August 25, 1903, to March 31, 1909; June 1, 1909, to December 31, 1913. Discharge measurements only April, May, and July, 1903.

Drainage area.—800 square miles.

Gage.—Standard chain attached to bridge; new gage installed November 15, 1910. Gage read once daily in the morning to tenths.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Affected by ice, which exists some years for nearly four months.

Accuracy.—Discharge relation during the logging season affected by backwater from log jams. All gage readings for 1913 are correct if the new chain (installed Nov. 15, 1910) has not stretched and if the structure to which the gage is attached has not changed since July 16, 1908.

No discharge measurements were made at this station during 1913.

Daily gage height, in feet, of Escanaba River near Escanaba, Mich., for 1913.

[Olive Beauchamp, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	4.8	5.2	3.3	3.3	2.4	2.1	2.8	3.0	3.0
2	4.1	.....	.....	4.9	4.8	3.2	2.9	2.5	2.1	2.7	2.9	3.1
3	.....	.....	.....	5.0	4.3	3.2	2.8	2.5	2.2	2.9	2.9	3.1
4	.....	.....	.....	5.2	4.2	3.2	2.8	2.4	2.5	3.0	2.8	2.9
5	.....	.....	.....	5.2	4.4	3.3	3.0	2.4	2.5	3.1	2.8	2.9
6	.....	3.6	3.6	5.2	4.6	3.7	3.0	2.3	2.4	3.1	2.7	2.9
7	.....	.....	.....	5.3	4.4	3.5	3.0	2.3	2.4	3.1	2.7	2.8
8	.....	.....	.....	5.3	4.4	3.5	2.9	2.4	2.4	3.1	2.7	2.7
9	3.7	.....	.....	5.3	4.1	3.4	2.8	2.5	2.4	3.2	2.7	2.7
10	.....	.....	.....	5.2	3.9	3.4	2.8	2.5	2.2	3.2	2.8	2.7
11	.....	.....	.....	5.2	3.6	3.2	2.5	2.4	2.2	3.3	3.0	2.9
12	.....	.....	.....	5.2	3.6	3.1	3.3	2.4	2.1	3.3	3.0	2.9
13	.....	3.6	3.6	5.2	3.6	2.9	3.3	2.3	2.1	3.5	2.9	2.4
14	.....	.....	.....	5.4	3.6	2.9	3.2	2.2	2.1	3.6	2.8	2.4
15	.....	.....	.....	5.4	3.4	2.9	3.0	2.2	2.1	3.3	2.8	2.3
16	3.7	.....	.....	5.4	3.4	2.8	2.9	2.1	2.1	3.3	2.7	2.3
17	.....	.....	.....	5.5	3.5	2.8	2.8	2.1	2.0	2.9	2.7	2.4
18	.....	.....	.....	5.6	3.5	2.8	2.7	2.1	2.0	2.9	2.8	2.4
19	.....	.....	.....	6.0	3.7	3.7	2.5	2.1	2.0	2.8	2.8	2.4
20	.....	3.6	4.4	6.1	3.7	3.3	2.5	2.1	2.0	2.7	3.0	2.4
21	.....	.....	.....	6.2	3.7	3.7	2.5	2.1	2.5	2.7	3.2	2.5
22	.....	.....	.....	6.2	3.9	3.7	2.3	2.1	3.3	2.7	3.4	2.6
23	3.8	.....	.....	5.8	3.9	3.5	2.4	2.1	3.5	2.7	3.5	2.7
24	.....	.....	.....	6.4	3.9	3.3	2.4	2.1	3.5	2.6	3.7	2.5
25	.....	.....	.....	6.8	3.7	2.9	2.4	2.0	3.4	2.6	3.7	2.6
26	.....	.....	.....	6.6	3.7	2.9	2.3	2.0	3.3	2.6	3.5	2.7
27	.....	3.6	4.4	6.4	3.5	3.1	2.3	2.0	3.3	2.9	3.4	2.7
28	.....	.....	.....	6.2	3.3	3.5	2.2	2.0	3.3	3.0	3.1	2.7
29	.....	.....	.....	5.8	3.2	3.5	2.2	2.0	3.3	3.3	3.0	2.7
30	3.8	.....	.....	5.6	3.2	3.4	2.2	2.1	3.0	3.2	3.0	2.7
31	.....	.....	.....	.....	3.2	.....	2.2	2.1	.....	3.0	.....	2.5

NOTE.—Discharge relation affected by ice about Jan. 1 to Mar. 31.

MENOMINEE RIVER NEAR IRON MOUNTAIN, MICH.

Location.—At the homestead highway bridge, 3½ miles south of Iron Mountain, Mich.

Records available.—September 4, 1902, to March 31, 1909; June 5, 1909, to December 31, 1913.

Drainage area.—2,420 square miles.

Gage.—Standard chain gage attached to the bridge; read once daily to tenths. From September 4, 1902, to May 18, 1904, a staff gage was read.

Control.—Permanent.

Winter flow.—Prior to 1914 few discharge measurements had been made at Iron Mountain when ice was present. Information obtained from persons familiar with conditions in the vicinity of the gage led to the assumption that discharge relation was not affected by ice, but measurements made during 1914 show that this assumption was unwarranted.

Regulation.—Practically no reservoirs above gaging station. Fluctuations at the gage are, however, caused by operation of Peninsular Power Co.'s plant above station. Plant is run continuously, but load varies somewhat throughout the day, causing slight fluctuations in stage at the gage.

Accuracy.—As discharge relation may be affected by ice and possibly also by backwater from logs during certain periods, winter records previous to December 1, 1913, should be used with caution.

Cooperation.—Gage readings furnished by courtesy of Oliver Iron Mining Co.

Discharge measurements of Menominee River near Iron Mountain, Mich., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 2	S. B. Soulé	3.17	2,200
3	do	2.76	1,960

Daily gage height, in feet, of Menominee River near Iron Mountain, Mich., for 1913.

[A. J. St. Arnauld, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	1.8	2.1	3.1	8.8	4.3	2.0	2.4	2.2	2.4	4.0	3.6
2	2.0	1.8	2.1	2.8	8.0	6.7	1.0	2.4	2.2	2.8	4.0	3.8
3	2.0	1.8	2.0	2.8	7.8	3.2	1.8	2.6	2.0	3.0	3.4	3.2
4	1.8	1.8	1.9	2.8	7.6	4.8	2.8	2.6	2.0	2.8	2.8	3.0
5	2.0	1.8	1.9	2.8	7.5	4.8	4.8	2.4	2.0	3.5	1.6	2.9
6	2.1	2.0	1.7	3.1	9.5	5.0	4.8	0.9	2.0	3.5	1.9	2.4
7	2.1	2.2	1.7	3.1	5.5	7.6	4.6	2.0	2.1	4.2	2.0	3.0
8	2.2	2.2	1.7	3.4	6.1	7.6	4.6	2.7	2.1	1.6	2.0	2.4
9	2.5	2.0	1.7	4.1	5.5	7.4	4.2	2.8	2.1	1.9	2.0	1.9
10	2.5	2.0	1.7	5.5	5.6	5.5	4.0	2.8	2.0	3.6	2.0	3.0
11	2.7	2.0	1.7	5.0	5.0	5.5	3.4	2.8	2.1	3.6	1.8	3.0
12	2.7	2.0	1.6	4.8	4.4	5.4	3.7	2.8	2.0	4.0	2.0	3.0
13	2.5	1.9	1.6	5.1	4.0	5.4	3.9	2.6	2.0	4.0	2.3	3.0
14	1.7	1.2	1.4	5.5	4.2	5.0	3.9	2.6	2.8	4.0	2.5	2.8
15	2.3	1.6	1.3	6.1	5.1	5.0	3.4	2.4	2.8	4.0	2.5	2.8
16	2.3	1.9	1.3	7.3	4.2	3.6	3.2	2.4	2.8	3.8	2.5	3.0
17	2.3	1.9	1.3	9.2	6.5	3.6	4.0	2.2	2.8	2.2	2.6	3.0
18	2.2	1.9	1.5	10.6	9.0	3.3	3.8	2.2	2.8	2.4	2.6	3.0
19	2.1	1.9	1.7	12.0	7.9	4.0	3.6	2.2	3.0	2.4	2.9	3.0
20	2.1	1.9	2.0	11.0	9.3	5.5	3.4	2.0	3.0	2.8	2.9	3.0
21	2.1	1.9	2.0	10.6	9.3	5.5	3.0	1.7	4.4	2.8	2.9	3.0
22	2.1	1.4	2.3	10.6	6.7	5.0	3.0	1.7	4.6	2.6	2.9	2.4
23	2.0	1.4	2.0	10.6	6.0	5.0	2.8	1.7	4.8	2.6	3.0	2.4
24	2.0	1.4	2.0	12.3	6.0	5.0	2.8	1.7	4.8	2.8	3.0	2.4
25	2.0	1.6	1.8	10.8	6.2	4.8	2.8	1.7	4.8	2.8	4.8	2.4
26	2.0	1.9	1.8	11.9	6.0	3.7	2.8	1.8	5.0	4.8	4.8	2.4
27	1.9	1.9	1.8	11.6	5.3	3.2	2.6	1.7	5.1	4.8	4.8	2.4
28	2.1	2.1	2.0	11.2	6.0	1.1	2.5	1.7	3.0	4.6	4.6	2.4
29	2.0	.....	2.0	10.6	3.6	1.9	2.4	1.7	2.4	4.6	4.6	2.4
30	1.9	.....	2.6	9.0	4.0	2.9	2.4	1.7	2.4	4.6	4.6	2.4
31	1.9	.....	3.0	.....	4.3	.....	2.4	2.0	.....	4.6	.....	2.4

NOTE.—Apparently no backwater from ice during 1913.

Daily discharge, in second-feet, of Menominee River near Iron Mountain, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,560	1,440	1,620	2,290	7,560	3,180	1,560	1,820	1,680	1,820	2,960	2,660
2	1,560	1,440	1,620	2,080	6,740	5,360	1,030	1,820	1,680	2,080	2,960	2,810
3	1,560	1,440	1,560	2,080	6,520	2,360	1,440	1,940	1,560	2,220	2,510	2,360
4	1,440	1,440	1,500	2,080	6,300	3,580	2,080	1,940	1,560	2,080	2,080	2,220
5	1,560	1,440	1,500	2,080	6,180	3,580	3,580	1,820	1,560	2,580	1,340	2,150
6	1,620	1,560	1,390	2,290	8,470	3,750	3,580	985	1,560	2,580	1,500	1,820
7	1,620	1,680	1,390	2,290	4,200	6,300	3,420	1,560	1,620	3,110	1,560	2,220
8	1,680	1,680	1,390	2,510	4,780	6,300	3,420	2,010	1,620	1,340	1,560	1,820
9	1,880	1,560	1,390	3,040	4,200	6,080	3,110	2,080	1,620	1,500	1,560	1,500
10	1,880	1,560	1,390	4,200	4,300	4,200	2,960	2,080	1,560	2,660	1,560	2,220
11	2,010	1,560	1,390	3,750	3,750	4,200	2,510	2,080	1,620	2,660	1,440	2,220
12	2,010	1,560	1,340	3,580	3,260	4,110	2,740	2,080	1,560	2,960	1,560	2,220
13	1,880	1,500	1,340	3,840	2,960	4,110	2,880	1,940	1,560	2,960	1,750	2,220
14	1,390	1,120	1,220	4,200	3,110	3,750	2,880	1,940	2,080	2,960	1,880	2,080
15	1,750	1,340	1,180	4,780	3,840	3,750	2,510	1,820	2,080	2,960	1,880	2,080
16	1,750	1,500	1,180	5,970	3,110	2,660	2,360	1,820	2,080	2,810	1,880	2,220
17	1,750	1,500	1,180	8,120	5,160	2,660	2,960	1,680	2,080	1,680	1,940	2,220
18	1,680	1,500	1,280	9,800	7,890	2,440	2,810	1,680	2,080	1,820	1,940	2,220
19	1,620	1,500	1,390	11,500	6,640	2,960	2,660	1,680	2,220	1,820	2,150	2,220
20	1,620	1,500	1,560	10,300	8,240	4,200	2,510	1,560	2,220	2,080	2,150	2,220
21	1,620	1,500	1,560	9,800	8,240	4,200	2,220	1,390	3,260	2,080	2,150	2,220
22	1,620	1,220	1,750	9,800	5,360	3,750	2,220	1,390	3,420	1,940	2,150	1,820
23	1,560	1,220	1,560	9,800	4,680	3,750	2,080	1,390	3,580	1,940	2,220	1,820
24	1,560	1,220	1,560	11,900	4,680	3,750	2,080	1,390	3,580	2,080	2,220	1,820
25	1,560	1,340	1,440	10,100	4,870	3,580	2,080	1,390	3,580	2,080	3,580	1,820
26	1,560	1,500	1,440	11,400	4,680	2,740	2,080	1,440	3,750	3,580	3,580	1,820
27	1,500	1,500	1,440	11,000	4,020	2,360	1,940	1,390	3,840	3,580	3,580	1,820
28	1,620	1,620	1,560	10,500	4,680	1,080	1,880	1,390	2,220	3,420	3,420	1,820
29	1,560	.....	1,560	9,800	2,660	1,500	1,820	1,390	1,820	3,420	3,420	1,820
30	1,500	.....	1,940	7,890	2,960	2,150	1,820	1,390	1,820	3,420	3,420	1,820
31	1,500	.....	2,220	.....	3,180	.....	1,820	1,560	.....	3,420	.....	1,820

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

Monthly discharge of Menominee River near Iron Mountain, Mich., for 1913.

[Drainage area, 2,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,010	1,390	1,640	0.678	0.78	C.
February	1,680	1,120	1,460	.603	.63	C.
March	2,220	1,180	1,480	.612	.71	C.
April	11,900	2,080	6,430	2.66	2.97	C.
May	8,470	2,660	5,070	2.10	2.42	B.
June	6,300	1,080	3,610	1.49	1.66	B.
July	3,580	1,030	2,420	1.00	1.15	B.
August	2,080	985	1,670	.690	.80	B.
September	3,840	1,560	2,220	.917	1.02	B.
October	3,580	1,340	2,500	1.03	1.19	B.
November	3,580	1,340	2,260	.934	1.04	B.
December	2,810	1,500	2,070	.855	.99	B.
The year	11,900	985	2,740	1.13	15.36	

WOLF RIVER AT KESHENA, WIS.

Location.—At highway bridge at Keshena, 3 miles below outlet of West Branch of Wolf River (coming in from the right).

Records available.—May 9, 1907, to March 31, 1909; February 10, 1911, to December 31, 1913.

Drainage area.—797 square miles.

Gage.—Vertical staff, read twice daily up to October 1, 1911; since that date read morning, noon, and evening; mean of three readings taken as mean for day. Limits of use: Hundredths below 0.5, half tenths from 0.5 to 1.5, and tenths above 1.5 feet.

Control.—Gravel; smooth and permanent.

Discharge measurements.—Made from the bridge.

Winter flow.—Solid ice cover forms in the vicinity of gage and causes 1 to 3 feet of backwater. At times during the winter slush ice and frazil collect under this ice cover, making discharge measurements impossible. The ice forms at the falls above Keshena and floats in the river as backwater from the dam at Shawano.

Regulation.—River and main tributaries above Keshena controlled to some extent by logging dams.

Accuracy.—Conditions favorable; open-water rating curve excellent between gage heights 1 and 4 feet. Accuracy of open-water records depends on accuracy with which mean gage height is determined.

Cooperation.—Station maintained in cooperation with United States Indian Office and Wisconsin Railroad Commission.

Discharge measurements of Wolf River at Keshena, Wis., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 28	W. G. Hoyt	4.4	[a] 537
Mar. 11	S. B. Soulé	3.70	[b] 537
June 18	....do	2.72	1,120
Sept. 29	....do	2.20	837

[a] Measurement made under complete ice cover about 4 miles below gage.
[b] Complete ice cover at gage.

Daily gage height, in feet, of Wolf River at Keshena, Wis., for 1913.

[Ray Gauthier, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	3.9	4.0	3.4	3.5	2.6	2.8	.....	2.3	2.2	1.8
2	.....	4.4	4.0	4.0	3.4	3.6	2.6	2.6	1.8	2.2	2.3	2.1
3	.....	.....	.....	4.4	3.4	3.5	2.5	2.5	2.5	2.3	2.4	2.0
4	.....	4.2	.....	4.5	3.4	3.4	2.6	2.4	2.5	2.2	2.2	1.7
5	4.8	.....	3.8	4.6	3.3	3.1	2.7	2.2	2.3	2.2	2.1	1.5
6	.....	4.0	.....	4.6	3.5	3.0	2.6	2.2	2.0	2.1	2.2	1.5
7	5.0	.....	.....	4.5	3.8	3.0	2.7	2.2	2.0	2.2	2.2	1.3
8	.....	4.0	3.7	4.2	4.0	2.9	2.7	2.3	2.1	2.5	2.2	1.3
9	5.0	4.0	3.8	3.9	4.4	2.7	2.8	2.4	2.1	2.7	2.6	1.4
10	.....	.....	.....	3.7	3.9	2.6	2.9	2.4	1.9	2.9	2.8	1.3
11	5.0	3.9	3.7	3.7	3.6	2.6	2.8	2.3	1.8	3.3	2.6	1.2
12	5.3	.....	3.7	3.6	3.2	2.6	2.9	2.2	1.8	3.0	2.7	1.5
13	.....	.....	.....	3.6	3.2	2.6	3.0	2.2	1.7	2.8	2.6	1.8
14	5.4	.....	.....	3.6	3.2	2.6	3.0	2.1	1.7	2.6	2.4	1.7
15	.....	3.8	3.7	3.6	3.1	2.7	2.7	2.0	1.7	2.5	2.4	1.6
16	5.2	.....	.....	3.8	3.0	2.7	2.6	2.0	1.7	2.4	2.3	1.7
17	.....	3.8	4.4	3.9	2.9	2.7	2.7	2.0	1.8	2.2	2.2	1.4
18	5.3	.....	.....	4.1	2.8	2.8	2.7	2.1	1.9	2.2	2.2	1.6
19	5.2	3.8	4.3	4.4	2.7	2.9	2.5	2.1	1.9	2.2	2.1	1.8
20	.....	.....	.....	4.4	2.6	3.1	2.5	2.0	2.2	2.2	1.9	1.8
21	4.8	.....	.....	4.5	2.6	3.0	2.6	2.0	3.1	2.3	2.0	1.9
22	.....	.....	.....	4.1	2.7	2.9	2.3	2.0	3.0	2.4	2.0	2.0
23	4.9	3.8	.....	4.1	2.8	2.8	2.3	2.0	2.8	2.2	1.8	2.1
24	.....	3.8	4.0	4.1	2.7	2.7	2.3	1.8	2.6	2.1	1.9	2.6
25	4.8	.....	.....	4.1	2.6	2.8	2.2	1.7	2.9	2.2	2.0	2.7
26	4.8	.....	4.0	4.3	2.6	2.9	2.3	1.7	2.9	2.3	1.7	2.8
27	.....	3.8	.....	4.2	2.7	2.8	2.2	1.6	2.8	2.6	1.6	2.9
28	4.5	.....	.....	3.9	2.8	2.7	2.3	.....	2.6	2.7	1.4	2.9
29	.....	.....	3.9	3.7	3.2	2.6	2.9	.....	2.4	2.6	1.4	3.0
30	4.5	.....	.....	3.7	3.6	2.7	3.0	.....	2.3	2.4	1.2	3.2
31	.....	.....	.....	.....	3.6	.....	3.0	.....	.....	2.3	.....	3.4

NOTE.—Discharge relation affected by ice about Jan. 1 to Mar. 31, Nov. 9–18, and Dec. 18–31.

Daily discharge, in second-feet, of Wolf River at Keshena, Wis., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,920	1,530	1,590	1,060	1,170	680	915	869	695
2	1,920	1,530	1,660	1,060	1,060	695	869	915	824
3	2,190	1,530	1,590	1,010	1,010	1,010	915	962	780
4	2,260	1,530	1,530	1,060	962	1,010	869	869	654
5	2,330	1,460	1,340	1,110	869	915	869	824	575
6	2,330	1,590	1,280	1,060	869	780	824	869	575
7	2,260	1,790	1,280	1,110	869	780	869	869	497
8	2,060	1,920	1,220	1,110	915	824	1,010	869	497
9	1,850	2,190	1,110	1,170	962	824	1,110	.....	536
10	1,720	1,850	1,060	1,220	962	737	1,220	.....	497
11	1,720	1,660	1,060	1,170	915	695	1,460	.....	459
12	1,660	1,400	1,060	1,220	869	695	1,280	.....	575
13	1,660	1,400	1,060	1,280	869	654	1,170	.....	695
14	1,660	1,400	1,060	1,280	824	654	1,060	.....	654
15	1,660	1,340	1,110	1,110	780	654	1,010	.....	614
16	1,790	1,280	1,110	1,060	780	654	962	.....	654
17	1,850	1,220	1,110	1,110	780	695	869	.....	536
18	1,990	1,170	1,170	1,110	824	737	869	.....	.....
19	2,190	1,110	1,220	1,010	824	737	869	824	.....
20	2,190	1,060	1,340	1,010	780	869	869	737	.....
21	2,260	1,060	1,280	1,060	780	1,340	915	780	.....
22	1,990	1,110	1,220	915	780	1,280	962	780	.....
23	1,990	1,170	1,170	915	780	1,170	869	695	.....
24	1,990	1,110	1,110	915	695	1,060	824	737	.....
25	1,990	1,060	1,170	869	654	1,220	869	780	.....
26	2,120	1,060	1,220	915	654	1,220	915	654	.....
27	2,060	1,110	1,170	869	614	1,170	1,060	614	.....
28	1,850	1,170	1,110	915	630	1,060	1,110	536	.....
29	1,720	1,400	1,060	1,220	640	962	1,060	536	.....
30	1,720	1,660	1,110	1,280	660	915	962	459	.....
31	.....	1,660	.....	1,280	670	.....	915	.....	.....

NOTE.—Discharge computed from a rating curve well defined between 383 and 1,920 second-feet (gage heights, 1.0 and 4.0 feet). Discharge estimated, because of ice, from gage heights, two discharge measurements, observer's notes, climatologic records, and flow of West Branch of Wolf River at Neopit, as follows: Jan. 1–31, 630 second-feet; Feb. 1–28, 560 second-feet; Mar. 1–31, 720 second-feet; Nov. 9–18, 850 second-feet; and Dec. 18–31, 480 second-feet.

Monthly discharge of Wolf River at Keshena, Wis., for 1913.

[Drainage area, 797 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	630	0.790	0.91	C.
February	.....	.....	560	.703	.73	C.
March	.....	.....	720	.903	1.04	C.
April	2,380	1,660	1,960	2.46	2.74	A.
May	2,190	1,060	1,400	1.76	2.03	A.
June	1,660	1,060	1,220	1.53	1.71	A.
July	1,280	869	1,080	1.36	1.57	A.
August	1,170	614	821	1.03	1.19	A.
September	1,340	654	890	1.12	1.25	A.
October	1,460	824	979	1.23	1.42	A.
November	.....	459	789	.990	1.10	B.
December	.....	.....	550	.690	.80	C.
The year	2,330	.....	968	1.21	16.49	

NOTE.—See footnote to table of daily discharge.

WEST BRANCH OF WOLF RIVER AT NEOPIT, WIS.

Location.—At the dam and power plant at Neopit, a station of the Wisconsin & Northern Railroad, 20 miles north of Shawano.

Records available.—January 25, 1911, to December 31, 1913.

Drainage area.—108 square miles.

Gages.—Vertical staff gages on headrace and tailrace.

Determination of flow.—An attempt in 1911 to measure the flow by current meter a short distance below the dam proved unsatisfactory, and it was decided to rate the turbine and spillway. The power is developed by means of a timber dam about 14 feet high, which backs the water upstream for a considerable distance and forms a service reservoir. The spillway is a rectangular opening about 13 feet wide, which is closed by means of stop planks. Little water leaks through the dam, but considerable passes between the planks when all are in place. The power house is at the dam and is equipped with a 35-inch Leffel-Samson turbine, belted to a 60-kilowatt generator, which is used chiefly for lighting. The turbine takes water from the service reservoir through a rectangular flume, which is 9 feet wide by 6 feet deep and is lined with smooth planks. The turbine was rated by means of current-meter measurements in the flume. The spillway and leakage through the boards were rated by measurements in the sluiceway. Gages were placed in the pond and below the dam to show the head on the turbine. Readings of both gages, voltage, amperage, and number of planks removed from the spillway were recorded seven times each day, at 6, 7, and 10 a. m., 12 m., 3, 6, and 10 p. m. These readings were then weighted in accordance with the elapsed interval.

Accuracy.—Seven current-meter measurements made during 1913 indicate careful observations and results well within 10 per cent. When the station was visited September 30 and October 1, 1913, it was found that an obstruction under the fourth stop plank of spillway caused a leakage of about 41 second-feet. This obstruction occurred either July 27 or September 3, 1913; 41 second-feet have been added to the computed discharge from September 3 to October 1, but as it is possible that the obstruction may have occurred on July 27, estimates of daily discharge may be 41 second-feet too low from that date to September 2.

Cooperation.—Station established at request of United States Indian Office, as Neopit is on Menominee Indian Reservation.

Daily discharge, in second-feet, of West Branch of Wolf River at Neopit, Wis., for 1918.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	159	111	107	228	163	178	170	147	127	83	179	131
2	113	126	112	209	151	210	139	138	122	136	63	205
3	136	120	122	217	81	197	187	117	286	135	82	152
4	125	106	105	245	246	179	171	133	130	102	135	86
5	96	107	117	229	189	161	180	136	115	216	148	72
6	120	106	108	191	224	221	177	131	120	133	265	66
7	117	103	116	155	113	144	184	130	168	98	120	52
8	109	102	114	172	252	116	153	130	178	79	161	64
9	109	89	133	188	229	104	191	142	119	180	141	78
10	139	109	109	151	146	167	128	147	107	208	39	78
11	129	107	129	176	210	201	126	103	106	171	74	186
12	128	108	115	158	117	124	259	85	112	186	164	110
13	113	107	128	190	194	125	201	136	158	143	99	110
14	112	108	207	179	141	303	135	135	159	199	142	117
15	128	107	184	205	260	349	139	209	163	87	111	119
16	120	116	195	197	298	378	141	159	159	121	149	130
17	130	116	136	204	259	180	172	174	157	137	81	171
18	114	106	160	235	160	156	163	145	157	134	105	83
19	143	107	148	199	200	275	154	159	155	127	177	62
20	119	104	162	150	145	255	127	139	158	140	125	69
21	112	103	156	121	165	196	135	138	.....	139	209	72
22	139	95	141	165	220	173	137	134	.....	136	188	77
23	108	101	177	140	142	127	137	127	.....	130	73	81
24	*1* 120	110	149	154	170	165	134	137	.....	135	248	106
25	*1* 120	107	135	149	166	197	132	122	.....	136	80	132
26	126	114	137	209	101	202	134	111	.....	188	109	130
27	104	104	131	64	260	204	223	117	.....	199	142	130
28	104	132	136	256	191	165	267	120	228	138	128	109
29	114	.....	142	78	242	178	191	123	138	188	133	102
30	115	.....	193	85	243	170	147	135	178	140	101	70
31	115	.....	184	.....	211	.....	117	110	.....	168	.....	72

Monthly discharge of West Branch of Wolf River at Neopit, Wis., for 1918.

[Drainage area, 108 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	159	96	121	1.12	1.29	B.
February	132	89	108	1.00	1.04	B.
March	207	105	142	1.31	1.51	B.
April	256	64	177	1.64	1.83	B.
May	298	81	190	1.76	2.03	B.
June	378	104	193	1.79	2.00	B.
July	267	117	163	1.51	1.74	C.
August	209	85	134	1.24	1.43	(*b*)
September	286	106	152	1.41	1.57	C.
October	216	79	146	1.35	1.56	B.
November	265	39	132	1.22	1.36	B.
December	205	52	104	.963	1.11	B.
The year	378	39	147	1.36	18.47	

b See "Accuracy."

GRAND RIVER AT GRAND RAPIDS, MICH.

Location.—At Fulton Street Bridge, Grand Rapids, Mich.

Records available.—March 12, 1901, to December 31, 1913.

Drainage area.—4,900 square miles.

Gage.—Staff, attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 0.5 and tenths above 0.5 feet.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Somewhat affected by ice.

Regulation.—Operation of power plants above station may modify low-water flow.

Accuracy.—The two or three measurements made at this station since 1905 indicate that the 1905 discharge curve is not applicable after that year.

Cooperation.—Records furnished by city engineer of Grand Rapids.

No discharge measurements were made at this station during 1913.

Daily gage height, in feet, of Grand River at Grand Rapids, Mich., for 1913.

[A. J. Seys and Charles Darling, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	6.3	2.8	8.7	1.4	.....	−1.70	−1.80	.....	−1.68	−1.45	−0.3
2	0.0	.....	.....	8.4	1.2	−0.3	−1.70	−1.80	−1.45	−1.30	.....	.0
3	.2	8.2	3.0	8.6	1.0	− .3	−1.80	.....	−1.80	−1.25	−1.62	− .3
4	−.2	8.4	2.6	9.2	.....	− .4	.....	−1.80	−1.95	−1.28	−1.48	− .5
5	.....	8.4	2.4	9.6	.2	− .55	−1.80	−1.80	−2.00	.....	−1.45	− .2
6	−.70	8.4	2.4	.....	.6	− .80	.....	−1.85	−2.00	−1.42	−1.55	− .2
7	−.75	8.1	2.2	11.7	.3	− .80	−1.80	−1.90	.....	−1.30	−1.62	.....
8	−.4	7.8	2.2	11.7	.0	.....	−1.80	−2.00	−2.00	−1.40	−1.50	− .3
9	−.1	.....	.....	10.8	− .2	− .90	−1.80	−2.00	−2.20	−1.45	.....	.0
10	.1	7.2	3.6	10.0	− .5	− .95	−1.80	.....	−2.20	−1.45	−1.52	− .3
11	.4	6.5	5.3	9.0	.....	−1.05	−1.90	−1.95	−2.20	−1.48	−1.55	− .60
12	.....	6.0	7.0	8.2	− .80	−1.20	−1.90	−1.65	−2.20	.....	−1.48	− .70
13	.8	6.0	9.7	.....	− .60	−1.30	.....	−1.40	−2.20	−1.52	−1.40	− .82
14	.6	5.6	9.8	7.2	− .5	−1.35	−1.90	−1.45	.....	−1.48	−1.45	.....
15	.6	4.6	10.6	6.7	− .60	.....	−1.90	−1.55	−2.10	−1.55	−1.40	−1.15
16	1.0	.....	.....	5.7	− .5	−1.50	−1.90	−1.40	−2.20	−1.52	.....	−1.05
17	2.0	4.0	11.2	5.1	.2	−1.50	−1.50	.....	−2.20	−1.55	−1.45	−1.05
18	4.2	3.8	10.7	4.5	.....	−1.50	−1.20	−1.00	−2.00	−1.48	− .90	− .98
19	.....	3.3	9.7	3.9	.6	−1.60	− .90	− .2	−1.90	.....	− .58	−1.10
20	5.6	3.5	8.7	.....	.7	−1.55	.....	− .2	−1.80	−1.55	.2	−1.05
21	5.8	4.0	8.2	2.8	.9	−1.50	−1.00	− .55	.....	−1.50	.2	.....
22	5.5	.....	8.0	2.4	.6	.....	−1.20	− .9	−1.70	−1.32	.3	−1.15
23	5.8	.....	.....	2.2	.2	−1.50	−1.00	−1.15	−1.70	−1.35	.....	−1.00
24	5.8	3.9	8.8	1.6	− .2	−1.60	−1.20	.....	−1.70	−1.48	.0	−1.08
25	5.8	3.7	9.3	1.5	.....	−1.70	−1.70	−1.45	−1.70	−1.60	.0	.....
26	.....	3.7	10.0	1.7	− .2	−1.55	−1.70	−1.80	−1.70	.....	− .2	−1.15
27	5.7	3.7	10.6	.....	− .2	−1.50	.....	−1.90	−1.68	−1.62	.....	−1.00
28	5.4	3.2	10.8	1.6	− .2	−1.60	−1.90	−1.85	.....	−1.58	− .5	.....
29	4.9	.....	10.4	1.8	.0	.....	−1.90	−1.95	−1.68	−1.45	− .4	−1.00
30	.....	.....	.....	1.7	.....	−1.65	−1.80	−1.80	−1.65	−1.35	.....	−1.10
31	5.6	.....	9.1	.....	− .1	.....	−1.80	.....	.....	−1.40	.....	−1.18

NOTE.—Observer made no notes concerning ice. Discharge relation not materially affected by ice during 1913.

MANISTEE RIVER NEAR SHERMAN, MICH.

Location.—At north bridge, 1 mile from Sherman, Mich., immediately above mouth of Wheeler Creek.

Records available.—July 10, 1903, to December 31, 1913.

Drainage area.—900 square miles.

Gage.—Standard chain gage, read daily, morning and evening, to hundredths. Limits of use: Tenths throughout the entire range in stage during 1913.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Special studies are necessary to determine the winter flow, as the stream freezes over. The constancy of flow is remarkable and is due to the fact that the supply is derived from springs and ground water. The maximum recorded mean flow for any month from 1903 to 1908 is only two and one-half times the minimum recorded flow. Consequently a fairly close estimate of the discharge for the periods during which ice is present can be made by using climatological data and the observer's notes.

Accuracy.—Rating curve for 1913 well defined by numerous discharge measurements made by the Fargo Engineering Co., of Jackson, Mich. The new rating curve, which differs from that used prior to 1913 mainly above gage height 3.0 feet, gives the larger discharge, the percentage difference increasing with the stage from about 2½ per cent at gage height 3.0 feet to about 7½ per cent at gage height 6.0 feet. Discharge measurements made by the Fargo Engineering Co. during November and December, 1912, but not available before the publication of Water-Supply Paper No. 324, indicate that the new rating curve is applicable for 1912, and estimates of discharge as published for that year should be revised by those using them. At times the discharge relation may be affected by backwater from log jams.

Cooperation.—Station maintained in cooperation with William G. Fargo.

Discharge measurements of Manistee River near Sherman, Mich., in 1912–13.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1912.		*Feet.*	*Sec.-ft.*	1913.		*Feet.*	*Sec.-ft.*
Nov. 19	Tefft[a] and Aronson[a]	3.36	1,500	Mar. 25	Kephart[a] and Smits[a]	6.99	[c] 2,740
Dec. 3	Aronson[a] and Snyder[a]	3.74	1,790	26	do	6.26	[c] 2,640
7	Aronson[a] and Martin[a]	3.54	1,600	Apr. 2	do	4.91	2,230
9	do	3.20	1,470	3	do	5.12	2,360
10	do	3.05	1,470	4	do	5.34	2,490
11	do	3.00	1,390	5	do	5.50	2,590
14	do	2.64	1,430	9	do	4.53	2,030
				15	Kephart[a] and Calkins[a]	4.24	1,860
1913.				17	Kephart[a] and Smits[a]	3.95	1,690
Jan. 18	Kephart[a] and Smits[a]	3.39	1,540	23	do	3.54	1,450
19	do	3.18	1,410	May 13	Spring[a]	3.00	1,280
20	do	3.02	1,310	31	do	2.90	1,250
Mar. 17	Kephart,[a] Bahr,[a] and Burnett[a]	4.50	[b] 1,550	June 25	do	2.45	1,070
				July 25	do	2.29	982
17	do	4.40	[b] 1,450	Aug. 28	do	2.08	903
24	Kephart[a] and Smits[a]	5.88	2,400				

[a] Engineer of the Fargo Engineering Co., Jackson, Mich.
[b] Velocity determined by use of floats.
[c] Doubtful; meter out of order.

Daily gage height, in feet, of Manistee River near Sherman, Mich., for 1913.

[Margaret Munn, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	2.6	2.7	4.8	3.3	2.8	2.5	2.4	2.2	2.2	2.6	2.9
2	2.6	2.4	.....	5.0	3.3	2.8	2.5	2.4	2.1	2.5	2.6	2.9
3	2.6	2.4	2.6	5.1	3.2	2.8	2.5	2.4	2.1	2.6	2.6	2.9
4	2.6	2.3	2.5	5.3	3.1	2.7	2.5	2.4	2.1	2.6	2.6	2.8
5	2.5	1.9	2.5	5.5	3.0	2.7	2.6	2.4	2.1	2.5	2.6	2.8
6	2.5	1.7	2.4	5.5	3.2	2.6	2.6	2.4	2.2	2.4	2.5	2.8
7	2.5	2.6	2.3	5.2	3.3	2.7	2.6	2.3	2.1	2.4	2.5	2.7
8	2.6	3.9	2.5	4.8	3.3	2.7	2.5	2.3	2.1	2.4	2.6	2.7
9	2.3	3.2	2.6	4.6	3.2	2.8	2.4	2.4	2.1	2.4	2.5	2.7
10	2.4	3.2	2.6	4.4	3.1	2.7	2.4	2.4	2.1	2.4	2.5	2.7
11	2.7	3.4	2.7	4.4	3.0	2.6	2.3	2.4	2.1	2.6	2.5	2.7
12	2.8	2.9	2.8	4.5	3.0	2.6	2.3	2.3	2.1	2.7	2.5	2.7
13	2.4	2.8	3.0	4.5	3.0	2.5	2.4	2.2	2.1	2.6	2.5	2.7
14	2.4	3.0	4.9	4.4	3.0	2.5	2.3	2.2	2.1	2.6	2.6	2.7
15	2.5	3.0	6.2	4.3	3.2	2.5	2.3	2.4	2.1	2.6	2.6	2.7
16	2.7	2.8	5.5	4.1	3.2	2.4	2.3	2.4	2.2	2.6	2.6	2.7
17	3.1	2.7	4.4	4.0	3.2	2.4	2.3	2.3	2.4	2.8	2.6	2.6
18	3.4	2.8	4.0	3.9	3.1	2.4	2.5	2.3	2.6	3.0	2.6	2.6
19	3.2	2.8	4.2	3.8	2.9	2.4	2.5	2.3	2.6	3.1	2.9	2.6
20	3.0	2.9	4.7	3.7	2.9	2.6	2.4	2.2	2.5	3.0	3.7	2.6
21	2.8	3.0	4.9	3.6	3.3	2.8	2.3	2.2	2.5	2.9	3.8	2.5
22	2.6	2.9	5.1	3.6	3.5	2.7	2.3	2.2	2.5	2.8	3.7	2.5
23	2.7	2.5	4.9	3.5	3.6	2.6	2.3	2.2	2.5	2.8	3.7	2.4
24	2.8	2.4	6.1	3.5	3.6	2.5	2.3	2.2	2.4	2.8	3.6	2.4
25	2.6	2.3	7.0	3.5	3.4	2.5	2.2	2.1	2.3	2.8	3.4	2.4
26	2.7	2.6	6.3	3.6	3.3	2.6	2.2	2.1	2.3	2.7	3.2	2.2
27	2.7	2.8	5.5	3.7	3.2	2.6	2.5	2.1	2.3	2.7	3.0	2.1
28	2.5	2.8	5.0	3.7	3.1	2.6	2.6	2.1	2.2	2.7	3.0	2.2
29	2.4	.....	4.6	3.6	3.0	2.6	2.4	2.1	2.2	2.7	2.9	2.5
30	2.5	.....	4.4	3.5	2.9	2.6	2.4	2.1	2.2	2.7	2.9	2.4
31	2.7	.....	4.7	.....	2.9	.....	2.4	2.1	.....	2.7	.....	2.4

NOTE.—River partly frozen over at gage Feb. 6 and 9; control open. Discharge relation probably affected by ice about Feb. 7 to Mar. 6.

Daily discharge, in second-feet, of Manistee River near Sherman, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,160	1,110	.....	2,170	1,420	1,200	1,070	1,030	955	955	1,110	1,240
2	1,110	1,030	.....	2,290	1,420	1,200	1,070	1,030	919	1,070	1,110	1,240
3	1,110	1,030	.....	2,340	1,370	1,200	1,070	1,030	919	1,110	1,110	1,240
4	1,110	993	.....	2,460	1,330	1,160	1,070	1,030	919	1,110	1,110	1,200
5	1,070	852	.....	2,580	1,280	1,160	1,110	1,030	919	1,070	1,110	1,200
6	1,070	789	.....	2,580	1,370	1,110	1,110	1,030	955	1,030	1,070	1,200
7	1,070	.....	993	2,400	1,420	1,160	1,110	993	919	1,030	1,070	1,160
8	1,110	.....	1,070	2,170	1,420	1,160	1,070	993	919	1,030	1,110	1,160
9	993	.....	1,110	2,060	1,370	1,200	1,030	1,030	919	1,030	1,070	1,160
10	1,030	.....	1,110	1,950	1,330	1,160	1,030	1,030	919	1,030	1,070	1,160
11	1,160	.....	1,160	1,950	1,280	1,110	993	1,030	919	1,110	1,070	1,160
12	1,200	.....	1,200	2,010	1,280	1,110	993	993	919	1,160	1,070	1,160
13	1,030	.....	1,280	2,010	1,280	1,070	1,030	955	919	1,110	1,070	1,160
14	1,030	.....	2,230	1,950	1,280	1,070	993	955	919	1,110	1,110	1,160
15	1,070	.....	3,010	1,900	1,370	1,070	993	1,030	919	1,110	1,110	1,160
16	1,160	.....	2,580	1,800	1,370	1,030	993	1,030	955	1,110	1,110	1,160
17	1,330	.....	1,950	1,750	1,370	1,030	993	993	1,030	1,200	1,110	1,110
18	1,460	.....	1,750	1,700	1,330	1,030	1,070	993	1,110	1,280	1,110	1,110
19	1,370	.....	1,850	1,650	1,240	1,030	1,070	993	1,110	1,330	1,240	1,110
20	1,280	.....	2,120	1,600	1,240	1,110	1,030	955	1,070	1,280	1,600	1,110
21	1,200	.....	2,230	1,560	1,420	1,200	993	955	1,070	1,240	1,650	1,070
22	1,110	.....	2,340	1,560	1,510	1,160	993	955	1,070	1,200	1,600	1,070
23	1,160	.....	2,230	1,510	1,560	1,110	993	955	1,070	1,200	1,600	1,030
24	1,200	.....	2,950	1,510	1,560	1,070	993	955	1,030	1,200	1,560	1,030
25	1,110	.....	3,500	1,510	1,460	1,070	955	919	993	1,200	1,460	1,030
26	1,160	.....	3,070	1,560	1,420	1,110	955	919	993	1,160	1,370	955
27	1,160	.....	2,580	1,600	1,370	1,110	1,070	919	993	1,160	1,280	919
28	1,070	.....	2,290	1,600	1,330	1,110	1,110	919	955	1,160	1,280	955
29	1,030	.....	2,060	1,560	1,280	1,110	1,030	919	955	1,160	1,240	1,070
30	1,070	.....	1,950	1,510	1,240	1,110	1,030	919	955	1,160	1,240	1,030
31	1,160	.....	2,120	.....	1,240	.....	1,030	919	.....	1,160	.....	1,030

NOTE.—See "Accuracy" in station description. Discharge Feb. 7 to Mar. 6 estimated, because of ice, from gage heights, observer's notes, and climatologic records, 900 second-feet.

Monthly discharge of Manistee River near Sherman, Mich., for 1913.

[Drainage area, 900 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,460	993	1,140	1.27	1.46	B.
February	----------	789	914	1.02	1.06	C.
March	3,500	----------	1,810	2.01	2.32	C.
April	2,580	1,510	1,890	2.10	2.34	A.
May	1,560	1,240	1,360	1.51	1.74	A.
June	1,200	1,030	1,120	1.24	1.38	A.
July	1,110	955	1,030	1.14	1.31	A.
August	1,030	919	981	1.09	1.26	A.
September	1,110	919	974	1.08	1.20	A.
October	1,330	955	1,140	1.27	1.46	A.
November	1,650	1,070	1,230	1.37	1.53	A.
December	1,240	919	1,110	1.23	1.42	B.
The year	3,500	789	1,230	1.37	18.48	

NOTE.—See footnote to table of daily discharge.

STREAMS TRIBUTARY TO LAKE HURON.

AU SABLE RIVER NEAR LOVELLS, MICH.

Location.—In the SE. ¼ sec. 1, T. 26 N., R. 1 W., about 900 feet below mouth of North Branch of Au Sable River, about 11 miles southeast of Lovells, and about 8 miles southwest of Red Oak post office, Mich.

Records available.—September 11, 1908, to December 31, 1913.

Drainage area.—1,000 square miles (determined by Fargo Engineering Co.).

Gage.—Vertical staff gage attached to overhanging tree on left bank used September 11, 1908, to March 23, 1913, when new vertical staff, bolted to a 1½-inch pipe driven 8 feet into the bed of the river, was installed about 7 feet upstream from old gage. Duplicate of new gage was later installed on right bank a short distance upstream. Sea-level elevation of zeros of the gages, 1,004.69 feet. Gage is read morning and evening to tenths. Limits of use: Tenths throughout the entire range in stage during 1908–1913.

Control.—Sand and gravel; practically permanent.

Discharge measurements.—Made from boat at section about 500 feet upstream from gage.

Winter flow.—Discharge relation affected by ice.

Accuracy.—Estimates for periods during which discharge relation was probably affected by ice are based on insufficient data and should be used with due caution. The ratios of the monthly and yearly discharges at Lovells to those at Bamfield for 1909–1913 is shown in the following table of monthly discharge. The close agreement between these ratios indicates that the estimates of discharge are good.

Cooperation.—Daily gage heights and numerous discharge measurements furnished by William G. Fargo, of Jackson, Mich., who established and maintains the stations.

Discharge measurements of Au Sable River near Lovells, Mich., in 1908–1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1908.		*Feet.*	*Sec. ft.*	1913.		*Feet.*	*Sec. ft.*
Sept. 11	C. E. Sawyer	0.50	647	Apr. 13	Gray and Angell	3.05	1,990
Oct. 9	do	.38	590	14	do	2.85	1,860
10	(a)	.39	625	14	do	2.85	1,940
Nov. 27	(a)	.95	959	15	do	2.65	1,720
				21	do	1.90	1,400
1909.				23	do	2.10	1,490
Jan. 5	(a)	0.50	760	24	do	2.25	1,570
27	(a)	1.14	1,050	26	do	2.37	1,590
Apr. 4	(a)	1.38	1,080	May 6	do	1.88	1,380
4	(a)	1.38	1,090	8	do	1.70	1,300
16	(a)	3.00	1,800	26	Gray and Redhead	1.50	1,180
16	(a)	3.00	1,760	28	do	1.25	1,080
				June 9	do	.99	929
1912.				13	do	.81	872
Sept. 20	P. S. Monk	1.12	1,030	24	do	.71	836
				July 14	Spring	.55	733
1913.				28	do	1.55	753
Apr. 12	Gray and Angell	3.05	2,050	Sept. 2	do	.40	682
12	do	3.05	2,010				

a Hydrographer's name not available.

NOTE.—Measurement on Sept. 20, 1912, made by U. S. Geological Survey; all other measurements furnished by Wm. G. Fargo.

Daily gage height, in feet, of Au Sable River near Lovells, Mich, for 1908–1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1908.					1908.				
1		0.6	0.4	0.6	16	0.5	0.4	0.4	0.6
2		.4	.3	.7	17	.4	.3	.4	.5
3		.4	.4	1.0	18	.4	.4	.4	.5
4		.4	.3	.8	19	.6	.2	.4	.5
5		.4	.4	.6	20	.6	.2	.4	.6
6		.4	.4	.6	21	.6	.3	.4	.4
7		.4	.5	.5	22	.3	.3	.4	.4
8		.4	.4	.5	23	.4	.3	.4	.6
9		.4	.4	.5	24	.4	.4	.6	.5
10		.4	.4	.4	25	.3	.6	.8	.6
11	0.5	.4	.3	.5	26	.2	.5	1.1	.5
12	.4	.4	.4	.5	27	.2	.4	.9	.4
13	.2	.4	.3	.4	28	.4	.4	.8	.4
14	.2	.4	.4	.5	29	.6	.4	.7	.2
15	.7	.4	.4	.5	30	.4	.4	1.0	.4
					31		.4		.4

Daily gage height, in feet, of Au Sable River near Lovells, Mich., for 1908–1913—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	0.4	1.2	0.6	0.8	2.4	1.5	0.8	1.0	0.6	0.6	0.6	1.2
2	.7	1.1	.6	1.1	2.4	1.4	.8	.8	.6	.6	.7	1.0
3	.4	.6	.6	1.4	2.4	1.4	.8	.7	.6	.6	.7	1.0
4	.4	.6	.6	1.5	2.5	1.4	.8	.8	.6	.7	.7	.9
5	.5	.6	.5	2.2	2.6	1.2	.6	.8	.6	.6	.6	1.0
6	.4	.8	.5	3.0	2.6	1.2	.6	.8	.4	.6	.6	1.1
7	.4	.8	.5	3.0	2.5	1.4	.6	.7	.4	.4	.6	1.0
8	.7	.7	.6	3.0	2.4	1.4	.6	.7	.4	.4	.6	1.0
9	1.2	.8	.6	2.8	2.2	1.2	.6	.6	.4	.5	.6	1.0
10	.4	.8	.6	2.4	2.4	1.2	.6	.6	.5	.6	.6	1.0
11	.4	.6	.4	2.3	2.2	1.1	.6	.6	.5	.6	.6	.9
12	.6	.6	.5	2.8	2.1	1.2	.6	.6	.6	.4	.7	1.0
13	.8	.6	.6	3.4	1.9	1.0	.7	.6	.5	.6	.8	.8
14	1.2	.5	.6	3.2	2.0	1.4	.6	.6	.5	.6	.9	1.0
15	.4	.6	.5	3.0	2.2	1.4	.6	.6	.5	.6	.8	1.0
16	.6	.9	.6	2.9	2.4	1.2	.6	.6	.5	.7	.8	1.0
17	.8	.8	.6	2.7	2.6	1.4	.5	.6	.5	.9	.9	1.0
18	.4	.8	.5	2.6	2.6	1.5	.5	.6	.4	.8	1.0	1.0
19	.6	.7	.5	2.8	2.0	1.3	.5	.6	.4	.6	1.0	.8
20	.4	.6	.6	2.7	2.0	1.2	.4	.5	.4	.7	1.0	.9
21	.3	.6	.6	2.8	1.8	1.1	.6	.5	.4	.8	1.0	.8
22	.4	.6	.5	2.8	1.7	.9	.6	.5	.7	1.0	1.1	.9
23	.8	.6	.5	2.6	1.6	1.0	2.4	.4	.8	1.1	1.0	.9
24	1.2	.8	.6	2.3	1.6	1.0	2.0	.4	.7	1.0	.9	.8
25	1.3	.5	.7	2.2	1.5	1.0	1.8	.4	.7	.8	.8	.8
26	1.2	.6	.6	2.1	1.4	.8	1.5	.4	.6	.6	1.0	.8
27	1.2	.6	.8	2.2	1.4	.9	1.2	.4	.6	.7	1.0	.8
28	.9	.5	.8	2.2	1.7	.9	1.1	.5	.6	.7	1.2	.7
29	.8	.....	.8	2.2	1.7	.8	1.1	.6	.6	.6	1.3	.8
30	.6	.....	.7	2.2	1.6	.8	1.1	.5	.6	.6	1.3	1.2
31	.8	.....	.6	.....	1.6	.....	1.0	.6	.....	.6	.....	1.3
1910.												
1	.9	.5	.5	1.7	1.1	1.0	.3	.3	.4	.5	.8	.7
2	.8	.5	.5	1.6	1.1	1.0	.3	.3	.4	.5	.8	.6
3	.7	.5	.4	1.5	1.0	1.0	.3	.3	.4	.6	.9	.7
4	.5	.6	.5	1.4	1.0	.8	.3	.4	.4	.7	.8	.7
5	.6	.4	.6	1.4	.9	.9	.3	.3	.6	.8	.8	.7
6	.8	.6	.8	1.6	.9	.9	.3	.3	.8	.7	.6	.6
7	1.1	.6	1.0	1.6	.8	.8	.3	.4	.8	.8	.6	.8
8	1.2	.6	.8	1.5	.9	.8	.2	.3	.6	.7	.8	.8
9	1.4	.6	.8	1.4	.8	.8	.2	.3	.7	.6	.7	.8
10	1.8	.5	.7	1.4	.8	.7	.4	.4	.6	.6	.8	.9
11	1.2	.6	.8	1.4	.8	.7	.4	.4	.6	.6	.7	.8
12	.8	.6	.8	1.2	.7	.6	.4	.3	1.0	.6	.7	.6
13	.6	.5	.8	1.0	.7	.5	.6	.3	1.0	.5	.8	.6
14	.6	.4	.7	1.0	.7	.6	.5	.3	.9	.5	.7	.6
15	.8	.6	.7	1.0	.7	.6	.5	.4	.8	.5	.7	.6
16	.8	.6	.8	1.1	.7	.5	.4	.4	.8	.5	.6	.6
17	.8	.5	.8	1.3	.6	.6	.4	.5	.6	.5	.6	.6
18	.6	.6	.8	1.2	.8	.6	.4	.4	.7	.5	.6	.6
19	.6	.6	.6	1.2	.8	.6	.3	.3	.6	.5	.6	.5
20	.6	.6	2.0	1.1	.8	.7	.3	.3	.6	.5	.6	.4
21	.7	.5	2.2	1.1	.7	.6	.4	.3	.6	.6	.6	.6
22	.6	.5	2.6	1.0	.8	.6	.4	.3	.5	.7	.6	1.2
23	.8	.4	2.6	1.2	.8	.6	.4	.5	.5	.8	.6	.6
24	.8	.5	2.8	1.1	1.1	.5	.4	.4	.6	.7	.7	.5
25	.6	.5	2.8	1.1	1.1	.4	.4	.7	.6	.7	.8	.6
26	.6	.6	2.6	1.2	.8	.4	.4	1.0	.6	.6	.7	.7
27	.6	.7	2.6	1.4	.8	.4	.4	.8	.6	.8	.7	.6
28	.6	.6	2.3	1.3	.7	.4	.4	.8	.6	1.2	.8	.5
29	.6	.....	2.0	1.3	.8	.4	.3	.7	.5	1.0	.7	.5
30	.6	.....	2.0	1.2	.8	.4	.4	.6	.6	1.0	.7	.4
31	.5	.....	1.8	.....	1.0	.....	.4	.5	.....	.8	.....	.7

Daily gage height, in feet, of Au Sable River near Lovells, Mich., for 1908–1913—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.												
1	0.6	0.4	0.4	01.5	02.0	01.9	0.8	0.6	0.6	1.0	1.4	1.6
2	.6	.5	.5	1.4	2.2	1.9	.8	.8	.6	1.1	1.2	1.6
3	.6	.5	.5	1.2	2.1	1.8	.8	.8	.6	1.2	1.2	1.6
4	.7	.5	.5	1.4	2.0	1.8	.8	.6	.6	1.5	1.2	1.5
5	.7	.4	.4	1.6	1.8	1.8	.6	.6	.5	1.5	1.2	1.5
6	1.0	.6	.5	1.8	1.6	1.7	.7	.6	.6	1.8	1.2	1.5
7	1.2	.6	.4	1.8	1.5	1.7	.7	.6	.8	2.2	1.6	1.5
8	.6	.5	.4	1.8	1.4	1.6	.7	.7	.8	2.0	1.6	1.5
9	.4	.4	.4	1.7	1.4	1.5	.7	.6	.7	1.8	1.6	1.7
10	.6	.4	.5	2.0	1.4	1.4	.6	.6	.7	1.7	1.6	2.2
11	.5	.3	.6	2.0	1.4	1.4	.6	.7	.6	1.7	1.6	3.2
12	.5	.4	.6	2.2	1.4	1.4	.6	.6	.6	1.5	2.6	3.2
13	.5	.4	.7	2.8	1.4	1.4	.6	.6	.6	1.4	2.6	3.0
14	.5	.4	.8	3.8	1.2	1.4	.6	.6	.6	1.4	2.5	2.8
15	.5	.4	1.0	3.8	1.3	1.2	.6	.6	.8	1.2	2.3	2.4
16	.4	.5	.8	3.6	1.6	1.2	.6	.8	.8	1.2	2.2	2.2
17	.6	.6	.8	3.3	2.2	1.2	.6	.7	.7	1.6	2.1	2.1
18	.8	.7	.6	2.9	2.4	1.2	.6	.6	.6	1.6	2.2	2.0
19	.6	.6	.8	2.6	2.4	1.0	.6	.7	.6	1.5	2.1	1.9
20	.4	.6	.8	2.4	2.3	1.0	.5	.6	.6	1.4	2.0	1.8
21	.4	.6	1.0	2.4	2.2	1.0	.6	.6	.6	1.4	2.0	1.8
22	.4	.5	1.2	2.2	2.6	1.0	.6	.4	.6	1.6	1.9	1.7
23	.6	.5	1.2	2.0	3.0	.9	.5	.6	.6	1.7	1.9	1.8
24	.3	.6	1.2	2.0	3.0	1.1	.6	.5	.6	1.7	1.8	1.8
25	.4	.5	1.1	1.8	2.9	1.1	.8	.6	.6	1.7	1.7	1.8
26	.4	.6	1.6	1.8	2.6	1.1	.7	.5	.6	1.6	1.7	1.6
27	.5	.6	2.0	1.7	2.2	1.0	.6	.5	.6	1.5	1.7	1.6
28	.5	.6	2.0	1.6	2.0	1.0	.6	.5	.6	1.4	1.8	1.3
29	.5	.....	1.9	1.6	1.8	.9	.5	.6	1.0	1.3	1.6	1.4
30	.4	.....	1.8	1.6	1.6	.9	.6	.6	.8	1.3	1.6	1.5
31	.8	.....	1.6	.....	1.8	.....	.6	.6	.....	1.2	.....	1.5
1912.												
1	1.4	3.2	1.0	1.3	1.8	3.2	1.2	1.2	2.2	.8	.9	1.3
2	1.2	2.9	.9	1.2	1.6	3.0	1.2	1.2	2.4	.8	.9	2.0
3	1.8	2.9	1.0	1.2	1.6	2.8	1.2	1.1	2.6	.8	.9	2.2
4	1.8	3.5	1.1	1.4	1.6	2.6	1.3	1.1	2.4	.8	1.0	2.1
5	1.8	3.4	2.0	2.0	1.6	2.4	1.6	1.1	2.2	.8	1.0	2.1
6	1.9	3.2	3.2	3.0	1.6	2.4	1.6	1.0	2.0	.8	1.2	2.2
7	2.2	3.2	1.1	3.5	1.5	2.3	1.5	1.2	1.8	.8	1.2	2.0
8	3.8	3.3	1.0	3.4	1.5	2.2	1.5	1.3	1.6	.7	1.2	1.9
9	4.4	3.1	.7	3.1	1.6	2.1	1.3	1.2	1.6	.8	1.2	2.0
10	4.4	2.7	.7	2.9	1.4	2.0	1.4	1.5	1.6	.8	1.2	1.7
11	4.5	2.9	.8	2.8	1.5	1.8	1.4	1.4	1.8	.8	1.2	1.5
12	4.5	3.0	.8	2.9	1.8	1.9	1.3	1.4	1.6	1.2	1.0	1.4
13	4.6	3.0	.8	2.8	2.1	1.8	1.4	1.3	1.6	1.2	2.0	1.7
14	4.3	3.0	.8	2.8	1.9	1.8	1.4	1.2	1.5	1.2	2.3	1.4
15	4.2	3.0	.8	2.7	1.8	1.8	1.3	1.2	1.6	1.2	2.0	1.4
16	4.0	3.0	.8	2.6	1.8	1.8	1.2	1.2	1.8	1.0	1.8	1.4
17	3.9	2.8	.8	2.6	2.0	1.8	1.2	1.2	1.8	.9	1.8	1.5
18	4.0	1.2	.8	2.4	2.0	1.6	1.2	1.6	1.8	1.0	1.7	1.3
19	3.8	1.0	1.0	2.2	1.8	1.6	1.2	1.5	1.8	1.0	1.6	1.3
20	3.7	1.0	1.0	2.1	2.6	1.6	1.1	1.5	1.4	.9	1.6	1.3
21	3.6	1.0	1.0	2.0	2.8	1.5	1.2	1.4	1.0	.8	1.6	1.2
22	3.5	2.8	1.0	2.0	3.2	1.5	1.2	1.3	1.1	1.0	1.6	1.2
23	3.6	3.4	.9	2.2	3.6	1.5	1.2	1.3	1.1	1.2	1.5	1.1
24	3.6	3.0	1.0	2.0	3.6	1.4	1.3	1.6	1.0	1.1	1.6	1.2
25	3.5	1.0	1.0	2.0	3.4	1.4	1.3	1.8	1.0	1.0	1.5	1.2
26	3.4	.9	1.0	2.0	3.0	1.4	1.3	1.6	1.0	.9	1.5	1.1
27	3.4	1.0	1.0	1.9	2.8	1.4	1.2	1.6	.9	1.0	1.5	1.1
28	3.3	1.0	1.1	1.8	4.0	1.3	1.2	1.6	.9	.9	1.4	1.2
29	3.3	1.0	1.2	1.8	4.7	1.3	1.2	1.6	.8	.9	1.3	1.1
30	3.4	.....	1.2	1.8	4.2	1.2	1.2	1.6	.8	.8	1.3	1.1
31	3.0	.....	1.4	.....	3.8	.....	1.2	1.6	.....	.8	.....	1.1

Daily gage height, in feet, of Au Sable River near Lovells, Mich., for 1908–1913—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	1.0	0.9	0.7	2.8	2.0	1.1	0.8	0.7	0.4	0.4	0.7	1.0
2	1.1	.8	.6	2.6	1.9	1.0	.8	.6	.4	.5	.7	1.2
3	1.0	1.2	.6	3.0	1.6	1.1	.6	.6	.4	.5	.7	1.1
4	1.0	1.0	.7	3.8	1.6	1.1	.6	.6	.5	.5	.7	1.0
5	1.0	1.1	.7	3.8	1.6	1.0	.7	.6	.5	.5	.7	.9
6	1.1	2.8	.5	3.6	1.8	.9	.6	.5	.4	.4	.7	.9
7	.8	3.1	.8	3.4	1.8	1.2	.6	.5	.4	.5	.6	.9
8	1.1	3.0	.9	3.0	1.8	1.1	.5	.4	.4	.6	.7	.8
9	1.3	3.0	.7	2.7	1.6	1.0	.5	.5	.4	.6	.7	.9
10	1.2	3.0	.6	2.8	1.6	.9	.5	.6	.4	.6	.6	.8
11	1.1	2.6	.8	3.2	1.5	.9	.5	.5	.4	1.0	.6	.8
12	1.0	2.8	.8	3.1	1.5	.8	.5	.4	.3	1.0	.7	.8
13	1.2	3.0	.7	3.0	1.4	.8	.6	.4	.4	.9	.7	.8
14	.9	2.5	1.5	2.9	1.4	.8	.6	.4	.4	.7	.7	.8
15	1.0	2.5	2.9	2.6	1.5	.8	.5	.4	.3	.7	.7	.7
16	.9	2.4	2.1	2.4	1.6	.7	.5	.6	.3	.6	.6	.7
17	1.2	2.2	1.9	2.2	1.5	.7	.6	.6	.9	1.1	.7	.7
18	1.3	1.0	1.7	2.2	1.4	.7	.6	.6	.8	1.3	.7	.7
19	1.2	.8	2.0	2.2	1.4	.8	.6	.5	.8	1.2	1.0	.7
20	1.2	.8	3.0	2.1	1.3	.8	.5	.5	.7	1.0	1.6	.7
21	1.1	.8	3.1	2.0	1.4	.9	.5	.4	.8	1.0	1.5	.7
22	1.2	.6	2.8	2.0	1.9	.9	.4	.5	.7	1.0	1.5	.6
23	1.0	.6	2.6	2.1	1.8	.7	.5	.4	.7	1.2	1.5	.6
24	1.0	.7	3.8	1.9	1.7	.7	.5	.4	.6	1.3	1.4	.6
25	1.0	1.0	3.6	2.0	1.6	.6	.5	.4	.6	1.2	1.1	.6
26	1.0	.8	3.2	2.4	1.5	1.0	.4	.4	.5	1.0	1.0	.6
27	1.0	.7	3.0	2.3	1.4	1.4	.5	.4	.5	.8	1.0	.6
28	1.0	.6	2.6	2.2	1.3	1.2	.6	.4	.5	.8	1.0	.6
29	1.2	.....	2.2	2.0	1.3	1.0	.5	.4	.4	.8	1.0	.6
30	1.0	.....	2.3	2.0	1.2	1.0	.6	.4	.3	.8	1.0	.5
31	.9	.....	2.8	.....	1.2	.....	.5	.4	.....	.8	.....	.5

NOTE.—Discharge relation probably affected by ice about Feb. 1–2 and Dec. 29–31, 1909; Jan. 1–12, 1910; Jan. 4–8 and 17–19, 1911; Jan. 3 to Mar. 8, 1912; and Jan. 8–15, Feb. 3–27, and Mar. 7–9, 1913.

Daily discharge, in second-feet, of Au Sable River near Lovelle, Mich., for 1908–1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1908.					1908—Con.				
1	.....	727	633	727	16	680	633	633	727
2	.....	633	586	774	17	633	586	633	680
3	.....	633	633	915	18	633	633	633	680
4	.....	633	586	821	19	727	540	633	680
5	.....	633	633	727	20	727	540	633	727
6	.....	633	633	727	21	727	586	633	633
7	.....	633	680	680	22	586	586	633	633
8	.....	633	633	680	23	633	586	633	727
9	.....	633	633	680	24	633	633	727	680
10	.....	633	633	633	25	586	727	821	727
11	680	633	586	680	26	540	680	962	680
12	633	633	633	680	27	540	633	868	633
13	540	633	586	633	28	633	633	821	633
14	540	633	633	680	29	727	633	774	540
15	774	633	633	680	30	633	633	915	633
					31	.....	633	.....	633

Daily discharge, in second-feet, of Au Sable River near Lovells, Mich., for 1908–1913—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	633	.....	727	821	1,580	1,150	821	915	727	727	727	1,010
2	774	.....	727	962	1,580	1,100	821	821	727	727	774	915
3	633	727	727	1,100	1,580	1,100	821	774	727	727	774	915
4	633	727	727	1,150	1,630	1,100	821	821	727	774	774	868
5	680	727	680	1,480	1,680	1,010	727	821	727	727	727	915
6	633	821	680	1,870	1,680	1,010	727	821	633	727	727	962
7	633	821	680	1,870	1,630	1,100	727	774	633	633	727	915
8	774	774	727	1,870	1,580	1,100	727	774	633	633	727	915
9	1,010	821	727	1,770	1,480	1,010	727	727	633	680	727	915
10	633	821	727	1,580	1,580	1,010	727	727	680	727	727	915
11	633	727	633	1,530	1,480	962	727	727	680	727	727	868
12	727	727	680	1,770	1,440	1,010	727	727	727	633	774	915
13	821	727	727	2,060	1,340	915	774	727	680	727	821	821
14	1,010	680	727	1,960	1,390	1,100	727	727	680	727	868	915
15	633	727	680	1,870	1,480	1,100	727	727	680	727	821	915
16	727	868	727	1,820	1,580	1,010	727	727	680	774	821	915
17	821	821	727	1,720	1,680	1,100	680	727	680	868	868	915
18	633	821	680	1,680	1,680	1,150	680	727	633	821	915	915
19	727	774	680	1,770	1,390	1,060	680	727	633	727	915	821
20	633	727	727	1,720	1,390	1,010	633	680	633	774	915	868
21	586	727	727	1,770	1,290	962	727	680	633	821	915	821
22	633	727	680	1,770	1,240	868	727	680	774	915	962	868
23	821	727	680	1,680	1,200	915	1,580	633	821	962	915	868
24	1,010	821	727	1,530	1,200	915	1,390	633	774	915	868	821
25	1,060	680	774	1,480	1,150	915	1,290	633	774	821	821	821
26	1,010	727	727	1,440	1,100	821	1,150	633	727	727	915	821
27	1,010	727	821	1,480	1,100	868	1,010	633	727	774	915	821
28	868	680	821	1,480	1,240	868	962	680	727	774	1,010	774
29	821	.....	821	1,480	1,240	821	962	727	727	727	1,060	.....
30	727	.....	774	1,480	1,200	821	962	680	727	727	1,060	.....
31	821	.....	727	.....	1,200	.....	915	727	.....	727	.....	.....
1910.												
1	.....	680	680	1,240	962	915	586	586	633	680	821	774
2	.....	680	680	1,200	962	915	586	586	633	680	821	727
3	.....	680	633	1,150	915	915	586	586	633	727	868	774
4	.....	727	680	1,100	915	821	586	633	633	774	821	774
5	.....	633	727	1,100	868	868	586	586	727	821	821	774
6	.....	727	821	1,200	868	868	586	586	821	774	727	727
7	.....	727	915	1,200	821	821	586	633	821	821	727	821
8	.....	727	821	1,150	868	821	540	586	727	774	821	821
9	.....	727	821	1,100	821	821	540	586	774	727	774	821
10	.....	680	774	1,100	821	774	633	633	727	727	821	868
11	.....	727	821	1,100	821	774	633	633	727	727	774	821
12	.....	727	821	1,010	774	727	633	586	915	727	774	727
13	727	680	821	915	774	680	727	586	915	680	821	727
14	727	633	774	915	774	727	680	586	868	680	774	727
15	821	727	774	915	774	727	680	633	821	680	774	727
16	821	727	821	962	774	680	633	633	821	680	727	727
17	821	680	821	1,060	727	727	633	680	727	680	727	727
18	727	727	821	1,010	821	727	633	633	774	680	727	727
19	727	727	727	1,010	821	727	586	586	727	680	727	680
20	727	727	1,390	962	821	774	586	586	727	680	727	633
21	774	680	1,480	962	774	727	633	586	727	727	727	727
22	727	680	1,680	915	821	727	633	586	680	774	727	1,010
23	821	633	1,680	1,010	821	727	633	680	680	821	727	727
24	821	680	1,770	962	962	680	633	633	727	774	774	680
25	727	680	1,770	962	962	633	633	774	727	774	821	727
26	727	727	1,680	1,010	821	633	633	915	727	727	774	774
27	727	774	1,680	1,100	821	633	633	821	727	821	774	727
28	727	727	1,530	1,060	774	633	633	821	727	1,010	821	680
29	727	.....	1,390	1,060	821	633	586	774	680	915	774	680
30	727	.....	1,390	1,010	821	633	633	727	727	915	774	633
31	680	.....	1,290	.....	915	.....	633	680	.....	821	.....	774

Daily discharge, in second-feet, of Au Sable River near Lovells, Mich., for 1908–1913—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.												
1	727	633	633	1,150	1,390	1,340	821	727	727	915	1,100	1,200
2	727	680	680	1,100	1,480	1,340	821	821	727	962	1,010	1,200
3	727	680	680	1,010	1,440	1,290	821	821	727	1,010	1,010	1,200
4	.....	680	680	1,100	1,390	1,290	821	727	727	1,150	1,010	1,150
5	.....	633	633	1,200	1,290	1,290	727	727	680	1,150	1,010	1,150
6	.....	727	680	1,290	1,200	1,240	774	727	727	1,290	1,010	1,150
7	.....	727	633	1,290	1,150	1,240	774	727	821	1,480	1,200	1,150
8	.....	680	633	1,290	1,100	1,200	774	774	821	1,390	1,200	1,150
9	633	633	633	1,240	1,100	1,150	774	727	774	1,290	1,200	1,240
10	727	633	680	1,390	1,100	1,100	727	727	774	1,240	1,200	1,480
11	680	586	727	1,390	1,100	1,100	727	774	727	1,240	1,200	1,960
12	680	633	727	1,480	1,100	1,100	727	727	727	1,150	1,680	1,960
13	680	633	774	1,770	1,100	1,100	727	727	727	1,100	1,680	1,870
14	680	633	821	2,250	1,010	1,100	727	727	727	1,100	1,630	1,770
15	680	633	915	2,250	1,060	1,010	727	727	821	1,010	1,530	1,580
16	633	680	821	2,160	1,200	1,010	727	821	821	1,010	1,480	1,480
17	.....	727	821	2,010	1,480	1,010	727	774	774	1,200	1,440	1,440
18	.....	774	727	1,820	1,580	1,010	727	727	727	1,200	1,480	1,390
19	.....	727	821	1,680	1,580	915	727	774	727	1,150	1,440	1,340
20	633	727	821	1,580	1,530	915	680	727	727	1,100	1,390	1,290
21	633	727	915	1,580	1,480	915	727	727	727	1,100	1,390	1,290
22	633	680	1,010	1,480	1,680	915	727	633	727	1,200	1,340	1,240
23	727	680	1,010	1,390	1,870	868	680	727	727	1,240	1,340	1,290
24	586	727	1,010	1,390	1,870	962	727	680	727	1,240	1,290	1,290
25	633	680	962	1,290	1,820	962	821	727	727	1,240	1,240	1,290
26	633	727	1,200	1,290	1,680	962	774	680	727	1,200	1,240	1,200
27	680	727	1,390	1,240	1,480	915	727	680	727	1,150	1,240	1,200
28	680	727	1,390	1,200	1,390	915	727	680	727	1,200	1,290	1,060
29	680	.....	1,340	1,200	1,290	868	680	727	915	1,060	1,200	1,100
30	633	.....	1,290	1,200	1,200	868	727	727	821	1,060	1,200	1,150
31	821	.....	1,200	.....	1,290	.....	727	727	.....	1,010	.....	1,150
1912.												
1	1,100	.....	.....	1,060	1,290	2,060	1,050	1,050	1,530	863	909	1,100
2	1,010	.....	.....	1,010	1,200	1,950	1,050	1,050	1,640	863	909	1,430
3	.....	.....	.....	1,010	1,200	1,840	1,050	1,000	1,740	863	909	1,530
4	.....	.....	.....	1,100	1,200	1,740	1,100	1,000	1,640	863	955	1,480
5	.....	.....	.....	1,390	1,200	1,640	1,240	1,000	1,530	863	955	1,480
6	.....	.....	.....	1,870	1,200	1,640	1,240	955	1,430	863	1,050	1,530
7	.....	.....	.....	2,110	1,150	1,580	1,190	1,050	1,340	863	1,050	1,430
8	.....	.....	.....	2,060	1,150	1,530	1,190	1,100	1,240	817	1,050	1,380
9	.....	.....	774	1,920	1,200	1,480	1,100	1,050	1,240	863	1,050	1,430
10	.....	.....	774	1,820	1,100	1,430	1,140	1,190	1,240	863	1,050	1,290
11	.....	.....	821	1,770	1,150	1,340	1,140	1,140	1,340	863	1,050	1,190
12	.....	.....	821	1,820	1,290	1,380	1,100	1,140	1,240	1,050	955	1,140
13	.....	.....	821	1,770	1,440	1,340	1,140	1,100	1,240	1,050	1,430	1,290
14	.....	.....	821	1,770	1,340	1,340	1,140	1,050	1,190	1,050	1,580	1,140
15	.....	.....	821	1,720	1,290	1,340	1,100	1,050	1,240	1,050	1,430	1,140
16	.....	.....	821	1,680	1,290	1,340	1,050	1,050	1,340	955	1,340	1,140
17	.....	.....	821	1,680	1,390	1,340	1,050	1,050	1,340	909	1,340	1,190
18	.....	.....	821	1,580	1,390	1,240	1,050	1,240	1,340	955	1,290	1,100
19	.....	.....	915	1,480	1,290	1,240	1,050	1,190	1,340	955	1,240	1,100
20	.....	.....	915	1,440	1,680	1,240	1,000	1,190	1,140	909	1,240	1,100
21	.....	.....	915	1,390	1,770	1,190	1,050	1,140	955	863	1,240	1,050
22	.....	.....	915	1,390	1,960	1,190	1,050	1,100	1,000	955	1,240	1,050
23	.....	.....	868	1,480	2,160	1,190	1,050	1,100	1,000	1,050	1,190	1,000
24	.....	.....	915	1,390	2,160	1,140	1,100	1,240	955	1,000	1,240	1,050
25	.....	.....	915	1,390	2,060	1,140	1,100	1,340	955	955	1,190	1,050
26	.....	.....	915	1,390	1,870	1,140	1,100	1,240	955	909	1,190	1,000
27	.....	.....	915	1,340	1,770	1,140	1,050	1,240	909	955	1,190	1,000
28	.....	.....	962	1,290	2,350	1,100	1,050	1,240	909	909	1,140	1,050
29	.....	.....	1,010	1,290	2,850	1,100	1,050	1,240	863	909	1,100	1,000
30	.....	.....	1,010	1,290	2,580	1,050	1,050	1,240	863	863	1,100	1,000
31	.....	.....	1,100	.....	2,370	.....	1,050	1,240	.....	863	.....	1,000

Daily discharge, in second-feet, of Au Sable River near Lovells, Mich., for 1908–1913—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	955	909	817	1,840	1,430	1,000	863	817	680	680	817	955
2	1,000	863	771	1,740	1,380	955	863	771	680	725	817	1,050
3	955	.....	771	1,950	1,240	1,000	771	771	680	725	817	1,000
4	955	.....	817	2,370	1,240	1,000	771	771	725	725	817	955
5	955	.....	817	2,370	1,240	1,240	955	817	771	725	817	909
6	1,000	.....	725	2,270	1,340	909	771	725	680	680	817	909
7	863	.....	.....	2,160	1,340	1,050	771	725	680	725	771	909
8	.....	.....	.....	1,950	1,340	1,000	725	680	680	771	817	863
9	.....	.....	.....	1,790	1,240	955	725	725	680	771	817	909
10	.....	.....	771	1,840	1,240	909	725	771	680	771	771	863
11	.....	.....	863	2,060	1,190	909	725	725	680	955	771	863
12	.....	.....	863	2,000	1,190	863	725	680	635	955	817	863
13	.....	.....	817	1,950	1,140	863	771	680	680	909	817	863
14	.....	.....	1,190	1,900	1,140	863	771	680	680	817	817	863
15	.....	.....	1,900	1,740	1,190	863	725	680	635	817	817	817
16	909	.....	1,480	1,640	1,240	817	725	771	635	771	771	817
17	1,050	.....	1,380	1,530	1,190	817	771	771	909	1,000	817	817
18	1,100	.....	1,200	1,530	1,140	817	771	771	863	1,100	817	817
19	1,050	.....	1,430	1,530	1,140	863	771	725	863	1,050	955	817
20	1,050	.....	1,950	1,480	1,100	863	725	725	817	955	1,240	817
21	1,000	.....	2,000	1,430	1,140	909	725	680	863	955	1,190	817
22	1,050	.....	1,840	1,430	1,380	909	680	725	817	955	1,190	771
23	955	.....	1,740	1,480	1,340	817	725	680	817	1,050	1,190	771
24	955	.....	2,370	1,380	1,200	817	725	680	771	1,100	1,140	771
25	955	.....	2,270	1,430	1,240	771	725	680	771	1,050	1,000	711
26	955	.....	2,060	1,640	1,190	955	680	680	725	955	955	771
27	955	.....	1,950	1,580	1,140	1,140	725	680	725	863	955	771
28	955	771	1,740	1,530	1,100	1,050	771	680	725	863	955	771
29	1,050	.....	1,530	1,430	1,100	955	725	680	680	863	955	771
30	955	.....	1,580	1,430	1,050	955	771	680	635	863	955	725
31	909	.....	1,840	.....	1,050	.....	725	680	.....	863	.....	725

NOTE.—Discharge Sept. 11, 1908, to May 28, 1912, computed by engineers of the Geological Survey from a fairly well-defined rating curve based on 10 measurements made during 1908-9 by the Fargo Engineering Co. Discharge May 29, 1912, to Dec. 31, 1913, computed from a well-defined rating curve based on one measurement made by the engineers of the Survey Sept. 20, 1912, and 20 measurements made in 1913 by engineers of the Fargo Engineering Co.

Discharge estimated, because of ice, from gage heights, observer's notes, climatologic records, and discharge of adjacent drainage areas, as follows: Feb. 1–2, 1909, 770 second-feet; Dec. 29–31, 1909, 800 second-feet; Jan. 1–12, 1910, 700 second-feet; Jan. 4–8, 1911, 700 second-feet; Jan. 17–19, 1911, 630 second-feet; Jan. 3–31, 1912, 1,000 second-feet; Feb. 1–29, 1912, 1,000 second-feet; Feb. 1–29, 1912, 900 second-feet; Mar. 1–8, 1912, 800 second-feet; Jan. 8–15, 1913, 850 second-feet; Feb. 3–27, 1913, 800 second-feet; Mar. 7–9, 1913, 750 second-feet.

Monthly discharge of Au Sable River near Lovells, Mich., for 1908–1913.

[Drainage area, 1,000 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Ratio of Lovells to Bamfield.[a]	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1908.							
September 11–30	774	540	640	0.640	0.48	.....	
October	727	540	629	.629	.73	.....	
November	962	586	677	.677	.76	.....	
December	915	540	689	.689	.79	.....	
1909.							
January	1,060	586	767	.767	.88	0.66	
February	868	680	757	.757	.79	.67	
March	821	633	722	.722	.83	.61	
April	2,060	821	1,600	1.60	1.78	.65	
May	1,680	1,100	1,420	1.42	1.64	.68	
June	1,150	821	996	.996	1.11	.68	
July	1,580	633	852	.852	.98	.63	
August	915	633	727	.727	.84	.63	
September	821	633	699	.699	.78	.61	
October	962	633	757	.757	.87	.64	
November	1,060	727	843	.843	.94	.65	
December	1,010	774	875	.875	1.01	.66	
The year	2,060	586	918	.918	12.45	.65	

[a] The ratio of the drainage area of Au Sable River near Lovells to the drainage area at Bamfield is 0.70. See "Accuracy" in station description.

Monthly discharge of Au Sable River near Lovells, Mich., for 1908–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Ratio of Lovells to Bamfield.	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1910.							
January	----------	----------	732	0.732	0.84	[a]0.64	
February	774	633	702	.702	.73	[a].65	
March	1,770	633	1,080	1.08	1.24	[b].59	
April	1,240	915	1,050	1.05	1.17	.67	
May	962	727	839	.839	.97	.64	
June	915	633	749	.749	.84	.61	
July	727	540	618	.618	.71	.55	
August	915	586	650	.650	.75	.60	
September	915	633	743	.743	.83	.61	
October	1,010	680	757	.757	.87	.63	
November	868	727	776	.776	.87	.63	
December	1,010	633	750	.750	.86	.64	
The year	1,770	540	787	.787	10.68	.63	
1911.							
January	----------	586	675	.675	.78	[a].65	
February	774	586	683	.683	.71	[b].63	
March	1,390	633	879	.879	1.01	.60	
April	2,250	1,010	1,460	1.46	1.63	.68	
May	1,870	1,010	1,370	1.37	1.58	.68	
June	1,340	868	1,060	1.06	1.18	.67	
July	821	680	745	.745	.86	.61	
August	821	633	733	.733	.85	.62	
September	915	680	752	.752	.84	.62	
October	1,480	915	1,160	1.16	1.34	.68	
November	1,680	1,010	1,290	1.29	1.44	.67	
December	1,960	1,060	1,340	1.34	1.54	.66	
The year	2,250	586	1,010	1.01	13.76	.65	
1912.							
January	----------	----------	1,000	1.00	1.15	[a].67	C.
February	----------	----------	900	.900	.97	[a].64	C.
March	----------	----------	864	.864	1.00	[b].65	C.
April	2,110	1,010	1,520	1.52	1.70	.65	B.
May	2,850	1,100	1,590	1.59	1.83	.67	B.
June	2,060	1,050	1,380	1.38	1.54	.69	B.
July	1,240	1,000	1,090	1.09	1.26	.67	A.
August	1,340	955	1,130	1.13	1.30	.69	A.
September	1,740	863	1,220	1.22	1.36	.71	A.
October	1,050	817	921	.921	1.06	.70	A.
November	1,580	909	1,150	1.15	1.28	.68	A.
December	1,530	1,000	1,190	1.19	1.37	.70	A.
The year	2,850	----------	1,160	1.16	15.82	.67	
1913.							
January	1,100	863	946	.946	1.09	[b].71	B.
February	----------	----------	805	.805	.84	[a].67	C.
March	2,370	725	1,350	1.35	1.56	[b].63	B.
April	2,370	1,380	1,750	1.75	1.95	.67	A.
May	1,430	1,050	1,220	1.22	1.41	.69	A.
June	1,140	771	918	.918	1.02	.66	A.
July	863	680	750	.750	.86	.65	A.
August	817	680	718	.718	.83	.65	A.
September	909	635	727	.727	.81	.66	A.
October	1,100	680	871	.871	1.00	.71	A.
November	1,240	771	907	.907	1.01	.64	A.
December	1,050	.725	842	.842	.97	.65	B.
The year	2,370	----------	984	.984	13.35	.66	

[a] Discharge at Bamfield obtained by comparison with Lovells.
[b] Part of monthly discharge at Bamfield estimated by comparison with Lovells.

NOTE.—See footnote to table of daily discharge.

AU SABLE RIVER AT BAMFIELD, MICH.

Location.—At remains of old wooden highway bridge at Bamfield, near Glennie post office, Mich., in the NW. ¼ sec. 14, T. 25 N., R. 5 E., about 600 feet above mouth of Bamfields Creek.

Records available.—August 27, 1902, to December 31, 1913, when station was discontinued.

Drainage area.—1,420 square miles.

Gage.—Staff. Prior to 1913 gage was fastened to wooden crib pier of old bridge, about 600 feet above the steel bridge; read daily, morning and evening, to hundredths. Limits of use: Tenths throughout the range of stage for 1909–1913. On May 13, 1913, new gage was established at steel highway bridge 600 feet below old gage and set to read same as old gage at gage height 2.9 feet. Readings on the two gages probably agree for gage heights within ordinary range of stage. Elevation of zero of gage above sea level, 787.35 feet.

Control.—Shifts during extreme floods.

Discharge measurements.—Made from the steel bridge about 600 feet below wooden bridge at which measurements were formerly made. Bamfields Creek, which enters immediately above steel bridge, carries only a few second-feet of water.

Winter flow.—River frozen over two or three months each year, but open places, probably caused by inflow from springs, may be found throughout the winter.

Accuracy.—Discharge measurements made in 1913 by the Fargo Engineering Co. indicate a decided change in the discharge relation expressed by the rating curve used prior to 1909. Comparison of gage readings at Lovells and Bamfield show no material change in conditions at these stations during 1909–1911, and current-meter measurements at Lovells from 1909–1913 show no large changes in the discharge relation at that station within the period. The comparison further shows that a decided change in discharge relation at Bamfield—the result of scour—occurred during the high water of May, 1912, and another change during September, 1912, when there was a decided fill. Conditions remained practically permanent subsequent to this last change. The ratios of monthly and yearly discharges at Lovells to those at Bamfield, given in the table of monthly discharges, agree closely and indicate that the estimates of discharge published in the following tables are good.

Discharge measurements of Au Sable River at Bamfield, Mich., in 1909, 1912, and 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1909.		*Feet.*	*Sec.-ft.*	1913.		*Feet.*	*Sec.-ft.*
Jan. 12	Wm. M. O'Neill	1.19	[a] 1,050	Apr. 16	Gray and Angell [b]	3.58	2,390
14	do	1.22	[a] 856	18	do	3.29	2,100
Feb. 16	C. C. Covert	3.73	[a] 1,010	19	do	3.26	2,160
17	do	3.79	[a] 984	30	do	3.00	1,980
Mar. 13	do	1.25	1,180	May 3	do	2.80	1,830
13	do	1.21	1,140	14	do	2.41	1,630
				22	do	2.75	1,890
1912.				June 2	do	2.15	1,490
Sept. 18	P. S. Monk	2.30	1,450	5	do	2.00	1,380
				16	Gray and Banner [b]	1.80	1,270
1913.				18	Spring [b]	1.70	1,190
Apr. 8	Gray and Angell [b]	4.27	2,990	Sept. 4	do	1.55	1,130
9	do	3.95	2,630				

[a] Discharge relation affected by backwater from ice.
[b] Engineers of the Fargo Engineering Co., Jackson, Mich.

Daily gage height, in feet, of Au Sable River at Bamfield, Mich., for 1909–1913.

[Mrs. W. H. Bamfield, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	2.0	3.1	.....	4.2	3.0	2.2	2.0	1.6	1.2	1.3	1.7	2.5
2	2.0	3.5	.....	4.0	2.9	2.1	1.9	1.7	1.3	1.4	1.8	2.5
3	1.9	4.1	.....	4.3	2.8	2.1	1.8	1.7	1.4	1.5	1.8	2.3
4	2.0	4.5	3.7	5.5	2.7	2.1	1.7	1.7	1.5	1.4	1.9	2.1
5	2.0	.....	.....	5.4	2.7	2.0	1.8	1.6	1.5	1.3	1.9	2.1
6	2.0	.....	.....	4.9	3.1	2.0	1.6	1.6	1.5	1.4	2.0	2.1
7	2.0	.....	.....	4.6	3.0	2.2	1.5	1.5	1.4	1.3	1.9	2.1
8	1.9	.....	.....	4.4	2.9	2.1	1.3	1.5	1.5	1.4	1.8	2.1
9	1.9	.....	.....	4.0	2.8	2.1	1.4	1.5	1.4	1.6	1.8	1.9
10	2.1	.....	.....	3.8	2.7	2.0	1.4	1.7	1.3	1.8	1.9	1.9
11	2.2	3.8	3.9	4.6	2.6	2.0	1.6	1.6	1.3	1.5	2.0	1.8
12	2.4	.....	.....	4.5	2.5	1.9	1.5	1.5	1.3	2.0	2.1	1.8
13	2.6	.....	.....	4.2	2.5	1.9	1.6	1.4	1.3	2.0	2.0	1.8
14	2.8	.....	3.9	4.0	2.4	1.9	1.6	1.4	1.3	1.9	2.2	1.8
15	2.5	.....	5.6	3.8	2.5	1.8	1.6	1.4	1.3	1.7	2.3	1.8
16	2.3	.....	4.5	3.6	2.7	1.8	1.5	1.4	1.2	1.6	1.7	1.7
17	2.0	.....	4.0	3.4	2.6	1.7	1.6	1.7	1.6	1.8	1.7	1.7
18	2.2	3.9	3.3	3.3	2.5	1.8	1.7	1.6	2.0	1.9	1.7	1.6
19	2.2	.....	3.4	3.2	2.4	1.8	1.6	1.5	2.0	2.3	1.8	1.6
20	2.3	.....	4.3	3.1	2.4	2.0	1.5	1.5	1.7	2.2	1.9	1.6
21	2.3	.....	4.9	3.0	2.4	2.0	1.6	1.5	1.9	2.0	2.0	1.7
22	2.3	.....	4.5	3.1	2.9	2.0	1.5	1.6	1.8	2.0	2.0	1.8
23	2.0	.....	4.1	3.2	2.9	1.9	1.4	1.6	1.8	2.0	2.1	1.8
24	1.9	.....	5.4	3.2	2.8	1.8	1.6	1.5	1.7	1.8	2.2	1.8
25	2.2	3.8	5.7	3.2	2.7	1.8	1.6	1.5	1.6	1.8	2.3	1.8
26	2.0	.....	5.0	3.5	2.6	1.9	1.5	1.4	1.5	1.7	2.5	1.8
27	2.0	.....	4.3	3.5	2.5	2.6	1.5	1.3	1.5	1.8	2.6	1.9
28	2.0	.....	3.8	3.4	2.4	2.6	1.7	1.4	1.4	1.8	2.7	1.8
29	2.2	.....	3.6	3.2	2.3	2.3	1.6	1.4	1.4	1.8	2.6	1.6
30	2.4	.....	3.5	3.0	2.3	2.2	1.5	1.3	1.3	1.7	2.4	1.5
31	2.8	.....	3.8	.....	2.2	.....	1.5	1.3	.....	1.7	.....	1.5

NOTE.—Discharge relation probably affected by ice about Jan. 10–16 and Jan. 29–Mar. 17.

Daily discharge, in second-feet, of Au Sable River at Bamfield, Mich., for 1909–1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1,050	1,000	1,140	1,340	2,340	1,700	1,300	1,340	1,140	1,100	1,140	1,570
2	1,050	1,100	1,140	1,570	2,410	1,630	1,300	1,300	1,140	1,140	1,240	1,460
3	1,050	1,200	1,140	1,760	2,340	1,570	1,240	1,240	1,140	1,140	1,200	1,340
4	1,140	1,200	1,140	1,830	2,570	1,570	1,300	1,240	1,240	1,200	1,200	1,340
5	1,050	1,400	1,140	2,040	2,570	1,520	1,240	1,240	1,140	1,200	1,140	1,300
6	1,000	1,500	1,140	2,810	2,570	1,520	1,200	1,240	1,100	1,100	1,140	1,400
7	900	1,200	1,140	3,390	2,490	1,570	1,140	1,240	1,100	1,100	1,140	1,400
8	1,000	1,000	1,140	3,130	2,340	1,520	1,140	1,200	1,050	1,050	1,140	1,400
9	1,100	1,000	1,140	2,890	2,260	1,460	1,140	1,200	1,100	1,050	1,140	1,300
10	1,300	1,200	1,200	2,570	2,190	1,460	1,200	1,140	1,100	1,100	1,240	1,300
11	1,200	1,200	1,240	1,630	2,110	1,460	1,200	1,200	1,300	1,200	1,140	1,340
12	1,050	1,000	1,140	2,410	2,040	1,400	1,200	1,140	1,140	1,140	1,200	1,300
13	850	1,000	1,140	2,810	1,960	1,460	1,200	1,140	1,140	1,050	1,240	1,340
14	856	1,000	1,140	3,390	1,900	1,520	1,200	1,140	1,100	1,140	1,300	1,400
15	900	1,000	1,140	3,050	2,110	1,570	1,200	1,140	1,050	1,140	1,300	1,400
16	1,000	1,010	1,140	2,810	2,490	1,570	1,200	1,140	1,100	1,340	1,300	1,460
17	1,000	984	1,140	2,730	2,410	1,570	1,100	1,100	1,100	1,200	1,300	1,400
18	1,000	950	1,140	2,570	2,490	1,760	1,100	1,100	1,100	1,240	1,340	1,340
19	1,100	1,100	1,200	2,570	2,340	1,630	1,240	1,140	1,050	1,240	1,400	.....
20	1,100	1,200	1,140	2,730	1,960	1,520	1,140	1,100	1,050	1,240	1,300	.....
21	1,140	1,100	1,140	2,650	1,900	1,520	1,300	1,050	1,100	1,240	1,400	.....
22	1,240	1,100	1,140	2,730	1,830	1,400	1,340	1,050	1,140	1,300	1,460	.....
23	1,340	1,140	1,140	2,730	1,830	1,340	1,900	1,100	1,300	1,340	1,400	.....
24	1,630	1,200	1,200	2,650	1,700	1,340	2,190	1,140	1,240	1,340	1,340	.....
25	1,760	1,240	1,240	2,260	1,630	1,300	1,960	1,140	1,300	1,300	1,340	.....
26	1,570	1,200	1,240	2,190	1,630	1,240	1,760	1,140	1,240	1,240	1,300	.....
27	1,520	1,200	1,300	2,110	1,570	1,140	1,520	1,100	1,200	1,140	1,400	.....
28	1,460	1,200	1,300	2,190	1,700	1,100	1,400	1,140	1,200	1,140	1,570	.....
29	1,340	.....	1,300	2,190	1,700	1,140	1,460	1,200	1,140	1,140	1,570	.....
30	1,240	.....	1,300	2,260	1,700	1,300	1,520	1,140	1,140	1,140	1,520	.....
31	1,000	.....	1,300	.....	1,630	.....	1,460	1,100	.....	1,140	.....	.....

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.										
1	.....	1,830	1,520	1,400	1,050	1,000	1,240	1,100	1,300	1,200
2	.....	1,830	1,460	1,400	1,000	1,000	1,050	1,100	1,300	1,240
3	.....	1,630	1,460	1,400	1,000	1,000	1,000	1,140	1,300	1,240
4	.....	1,570	1,400	1,340	963	1,050	1,100	1,200	1,240	1,240
5	.....	1,570	1,340	1,300	1,000	1,000	1,140	1,240	1,240	1,240
6	.....	1,570	1,300	1,340	1,050	1,000	1,240	1,300	1,240	1,240
7	1,400	1,570	1,300	1,340	1,050	1,050	1,240	1,300	1,300	1,200
8	1,460	1,630	1,240	1,300	1,300	1,050	1,300	1,240	1,300	1,240
9	1,460	1,630	1,240	1,300	1,240	1,050	1,200	1,200	1,300	1,240
10	1,460	1,570	1,240	1,240	1,240	1,000	1,140	1,140	1,300	1,300
11	1,340	1,570	1,240	1,200	1,460	1,050	1,200	1,140	1,240	1,240
12	1,570	1,520	1,240	1,200	1,200	1,050	1,240	1,140	1,240	1,200
13	1,700	1,460	1,240	1,200	1,100	1,100	1,400	1,100	1,300	1,200
14	1,760	1,460	1,240	1,140	1,100	1,050	1,400	1,100	1,240	1,240
15	1,900	1,400	1,240	1,140	1,140	1,100	1,340	1,100	1,200	1,200
16	2,040	1,400	1,240	1,200	1,200	1,300	1,240	1,050	1,200	1,140
17	2,110	1,460	1,240	1,200	1,140	1,140	1,240	1,050	1,300	1,140
18	2,040	1,520	1,200	1,200	1,050	1,100	1,240	1,050	1,300	1,140
19	2,110	1,520	1,240	1,200	1,050	1,050	1,240	1,050	1,300	1,100
20	2,040	1,520	1,300	1,200	1,050	1,000	1,200	1,100	1,240	1,140
21	2,110	1,570	1,240	1,240	1,050	1,100	1,240	1,200	1,200	1,100
22	2,570	1,570	1,300	1,200	1,050	1,100	1,200	1,300	1,200	1,100
23	2,650	1,520	1,340	1,200	1,050	1,050	1,140	1,240	1,140	.....
24	2,730	1,570	1,460	1,140	1,240	1,050	1,140	1,200	1,140	.....
25	2,650	1,460	1,460	1,100	1,100	1,100	1,200	1,200	1,140	.....
26	2,570	1,570	1,400	1,100	1,340	1,140	1,200	1,300	1,140	.....
27	2,340	1,570	1,340	1,100	1,240	1,140	1,140	1,400	1,140	.....
28	2,190	1,570	1,300	1,100	1,050	1,140	1,200	1,400	1,200	.....
29	2,110	1,460	1,240	1,050	1,240	1,200	1,240	1,460	1,240	.....
30	1,960	1,570	1,240	1,000	1,050	1,140	1,140	1,340	1,200	.....
31	1,960	.....	1,300	.....	1,050	1,100	.....	1,300	.....	.....

Daily discharge, in second-feet, of Au Sable River at Bamfield, Mich., for 1909–1913—Contd.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.											
1		1,200	1,760	1,960	1,960	1,520	1,140	1,240	1,460	1,570	2,260
2		1,200	1,900	2,260	1,900	1,520	1,200	1,200	1,460	1,570	2,260
3		1,200	1,520	2,110	1,830	1,460	1,200	1,240	1,460	1,570	2,260
4		1,140	1,570	2,110	1,760	1,400	1,200	1,240	1,700	1,520	1,570
5		1,140	1,760	1,900	1,830	1,340	1,200	1,140	1,630	1,520	1,630
6		1,140	2,110	1,830	1,830	1,340	1,200	1,200	1,900	1,460	1,630
7		1,140	2,110	1,700	1,760	1,300	1,200	1,240	2,110	1,520	1,630
8		1,140	1,900	1,630	1,760	1,300	1,140	1,300	2,190	1,700	1,630
9		1,140	1,900	1,630	1,700	1,240	1,140	1,240	1,960	1,760	1,700
10		1,200	2,040	1,570	1,700	1,240	1,200	1,240	1,960	1,700	2,110
11		1,300	2,260	1,570	1,700	1,200	1,200	1,240	1,830	1,700	2,650
12		1,340	2,490	1,570	1,700	1,140	1,140	1,200	1,760	2,340	3,050
13		1,300	2,570	1,520	1,760	1,140	1,140	1,200	1,830	3,130	2,730
14		1,460	3,390	1,520	1,760	1,000	1,140	1,140	1,630	2,890	2,570
15		1,520	3,390	1,520	1,570	1,050	1,140	1,240	1,520	2,810	2,410
16		1,460	2,890	1,700	1,520	1,100	1,240	1,300	1,460	2,650	2,340
17		1,340	2,730	1,900	1,570	1,100	1,300	1,240	1,630	2,570	2,260
18	1,300	1,300	2,650	2,340	1,520	1,140	1,240	1,240	1,760	2,490	2,340
19	1,240	1,300	2,650	2,340	1,400	1,140	1,200	1,200	1,830	2,410	2,260
20	1,240	1,240	2,410	2,260	1,400	1,140	1,200	1,140	1,700	1,570	2,260
21	1,240	1,340	2,260	2,190	1,400	1,200	1,140	1,140	1,570	1,570	1,960
22	1,240	1,520	2,110	2,340	1,400	1,200	1,140	1,200	1,570	1,630	1,900
23	1,200	1,570	1,900	2,570	1,340	1,200	1,140	1,140	1,760	1,700	1,830
24	1,140	1,520	1,900	2,810	1,340	1,200	1,140	1,140	1,830	1,700	1,830
25	1,140	1,520	1,830	2,730	1,300	1,200	1,140	1,200	1,760	1,760	1,760
26	1,200	1,760	1,830	2,570	1,300	1,200	1,100	1,200	1,700	1,830	1,760
27	1,200	2,110	1,760	2,260	1,340	1,200	1,140	1,240	1,630	1,760	1,700
28	1,200	2,260	1,760	2,040	1,340	1,200	1,140	1,200	1,570	1,760	1,700
29		2,570	1,760	1,900	1,340	1,140	1,200	1,300	1,570	1,700	1,630
30		1,960	1,760	1,760	1,340	1,140	1,200	1,340	1,570	1,830	1,630
31		1,830		1,830		1,140	1,240		1,520		1,630

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.										
1		1,630	1,760	3,300	1,520	1,460	1,830	1,210	1,320	1,930
2		1,570	1,700	2,890	1,570	1,460	2,190	2,210	1,320	2,340
3		1,570	1,700	2,730	1,570	1,520	2,490	1,210	1,380	2,410
4		1,700	1,700	2,650	1,630	1,520	2,340	1,260	1,320	2,270
5		2,410	1,630	2,490	1,760	1,570	2,260	1,260	1,320	2,130
6		3,210	1,630	2,340	1,700	1,520	2,110	1,210	1,380	2,060
7		3,560	1,630	2,340	1,760	1,520	1,900	1,210	1,500	2,000
8		3,480	1,570	2,190	1,830	1,570	1,830	1,160	1,620	2,000
9		3,050	1,570	2,110	1,760	1,630	1,760	1,160	1,560	2,000
10		2,810	1,570	2,040	1,700	1,630	1,830	1,210	1,500	2,060
11		2,650	1,520	2,040	1,700	1,760	1,830	1,260	1,440	1,930
12		2,650	1,830	2,040	1,630	1,760	1,760	1,440	1,380	1,740
13		2,570	1,960	2,040	1,570	1,700	1,760	1,620	1,740	1,930
14		2,650	2,110	1,960	1,700	1,570	1,700	1,560	2,410	1,740
15		2,730	1,830	1,900	1,900	1,520	1,830	1,440	2,200	1,560
16		2,650	1,760	1,900	2,040	1,460	1,900	1,380	2,270	1,500
17		2,650	1,960	1,760	1,760	1,460	2,040	1,320	2,270	1,560
18		2,490	1,900	1,760	1,700	1,630	1,620	1,320	1,500	1,560
19		2,340	1,830	1,760	1,630	1,760	1,560	1,820	1,860	1,440
20		2,190	2,190	1,760	1,570	1,760	1,560	1,260	1,680	1,440
21		2,190	2,890	1,700	1,520	1,700	1,500	1,260	1,620	1,440
22		2,040	2,970	1,700	1,460	1,760	1,440	1,260	1,680	1,440
23		2,110	3,300	1,630	1,460	1,760	1,440	1,380	1,740	1,440
24		2,040	3,840	1,630	1,520	1,760	1,380	1,380	1,800	1,440
25		2,110	3,300	1,630	1,630	1,700	1,380	1,380	1,800	1,440
26	1,400	1,360	3,130	1,570	1,570	1,700	1,380	1,320	1,740	1,440
27	1,400	1,900	3,050	1,570	1,570	1,630	1,320	1,260	1,740	1,380
28	1,460	1,830	3,210	1,570	1,460	1,630	1,260	1,260	1,680	1,380
29	1,520	1,830	4,020	1,520	1,460	1,760	1,260	1,320	1,740	1,380
30	1,630	1,760	4,420	1,520	1,460	1,760	1,210	1,320	1,740	1,380
31	1,760		3,740		1,460	1,760		1,320		1,380

Daily discharge, in second-feet, of Au Sable River at Bamfield, Mich., for 1909–1913—Contd.

Day.	Jan.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.											
1	1,380	.....	2,880	2,000	1,500	1,380	1,160	950	1,000	1,210	1,680
2	1,380	.....	2,720	1,930	1,440	1,320	1,210	1,000	1,050	1,260	1,680
3	1,320	.....	2,960	1,860	1,440	1,260	1,210	1,050	1,100	1,260	1,560
4	1,380	.....	3,960	1,800	1,440	1,210	1,210	1,100	1,050	1,320	1,440
5	1,380	.....	3,880	1,800	1,380	1,260	1,160	1,100	1,000	1,320	1,440
6	1,380	.....	3,450	2,060	1,380	1,160	1,160	1,100	1,050	1,380	1,440
7	1,380	.....	3,200	2,000	1,500	1,100	1,100	1,050	1,000	1,320	1,440
8	1,320	.....	3,040	1,930	1,440	1,000	1,100	1,100	1,050	1,260	1,440
9	1,320	.....	2,720	1,860	1,440	1,050	1,100	1,050	1,160	1,260	1,320
10	.....	.....	2,560	1,800	1,380	1,050	1,210	1,000	1,260	1,320	1,320
11	.....	.....	3,200	1,740	1,380	1,160	1,160	1,000	1,100	1,380	1,260
12	.....	.....	3,120	1,680	1,320	1,100	1,100	1,000	1,380	1,440	1,260
13	.....	.....	2,880	1,680	1,320	1,160	1,050	1,000	1,380	1,380	1,260
14	.....	.....	2,720	1,620	1,320	1,160	1,050	1,000	1,320	1,500	1,260
15	.....	.....	2,560	1,680	1,260	1,160	1,050	1,000	1,210	1,560	1,260
16	.....	.....	2,410	1,800	1,260	1,100	1,050	950	1,160	1,210	1,210
17	1,380	.....	2,270	1,740	1,210	1,160	1,210	1,160	1,260	1,210	1,210
18	1,500	2,200	2,200	1,680	1,260	1,210	1,160	1,380	1,320	1,210	1,160
19	1,500	2,270	2,130	1,620	1,260	1,160	1,100	1,380	1,560	1,260	1,160
20	1,560	2,960	2,060	1,620	1,380	1,100	1,100	1,210	1,500	1,320	1,160
21	1,560	3,450	2,000	1,620	1,380	1,160	1,100	1,320	1,380	1,380	1,210
22	1,560	3,120	2,060	1,930	1,380	1,100	1,160	1,260	1,380	1,380	1,260
23	1,380	2,800	2,130	1,930	1,320	1,050	1,160	1,260	1,380	1,440	1,260
24	1,320	3,880	2,130	1,860	1,260	1,160	1,100	1,210	1,260	1,500	1,260
25	1,500	4,140	2,130	1,800	1,260	1,160	1,100	1,160	1,260	1,560	1,260
26	1,380	3,540	2,340	1,740	1,320	1,100	1,050	1,100	1,210	1,680	1,260
27	1,380	2,960	2,340	1,680	1,740	1,100	1,000	1,100	1,260	1,740	1,320
28	1,380	2,560	2,270	1,620	1,740	1,210	1,050	1,050	1,260	1,800	1,260
29	.....	2,410	2,130	1,560	1,560	1,160	1,050	1,050	1,260	1,740	1,160
30	.....	2,340	2,000	1,560	1,500	1,100	1,000	1,000	1,210	1,620	1,100
31	.....	2,560	.....	1,500	.....	1,100	1,000	.....	1,210	.....	1,100

NOTE.—Discharge Jan. 1, 1909, to May 11, 1912, computed from rating curve based on discharge measurements made during March, 1909, and the form of the previous rating curve; discharge from May 12 to Sept. 17, 1912, also computed from the above rating curve by making proper allowance for scour which occurred during May, 1912 (see "Accuracy" in station desrription); discharge Sept. 18, 1912, to Dec. 31, 1913, computed from a rating curve based on numerous measurements made by the Fargo Engineering Co. during 1913, well defined between 1,100 and 3,540 second-feet (gage heights 1.5 and 5.0 feet), and fairly well defined beyond those points.

Discharge Jan. 6–20 and Jan. 31 to Feb. 22, 1909, estimated, because of ice, from gage heights, four discharge measurements, observer's notes, and climatologic records.

Discharge estimated, because of ice, from gage heights, observer's notes, climatologic records and discharge of Au Sable River at Lovells, as follows: Dec. 19–31, 1909, 1,230 second-feet; Jan. 1–31, 1910, 1,140 second-feet; Feb. 1–28, 1910, 1,080 second-feet; Mar. 1–6, 1910, 1,080 second-feet; Dec. 23–31, 1910, 1,100 second-feet; Jan. 1–31, 1911, 1,040 second-feet; Feb. 1–17, 1911, 1,000 second-feet; Jan. 1–31, 1912, 1,500 second-feet; Feb. 1–29, 1912, 1,400 second-feet; Mar. 1–25, 1912, 1,280 second-feet; Jan. 10–16, 1913, 1,350 second-feet; Jan. 29–31, 1913, 1,380 second feet; Feb. 1–28, 1913, 1,200 second-feet; Mar. 1–17, 1913, 1,470 second-feet.

Monthly discharge of Au Sable River at Bamfield, Mich., for 1909–1913.

[Drainage area, 1,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	[a] Ratio of Lovells to Bamfield.	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1909.							
January	1,760	850	1,160	0.817	0.94	0.66	
February	1,500	950	1,130	.796	.83	.67	
March	1,300	1,140	1,180	.831	.96	.61	
April	3,390	1,340	2,470	1.74	1.94	.65	
May	2,570	1,570	2,090	1.47	1.70	.68	
June	1,760	1,100	1,460	1.03	1.15	.68	
July	2,190	1,100	1,350	.951	1.10	.63	
August	1,340	1,050	1,160	.817	.94	.63	
September	1,300	1,050	1,150	.810	.90	.61	
October	1,340	1,050	1,180	.831	.96	.64	
November	1,570	1,140	1,290	.908	1.01	.65	
December	1,570	.....	1,320	.930	1.07	.66	
The year	3,390	850	1,410	.993	13.50	.65	

[a] The ratio of the drainage area of Au Sable River near Lovells to the drainage area at Bamfield is 0.70. See "Accuracy" in station description.

Monthly discharge of Au Sable River at Bamfield, Mich., for 1909–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Ratio of Lovells to Bamfield.	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1910.							
January	.....	.....	1,140	0.803	0.93	*a* 0.64	
February	.....	.....	1,080	.761	.79	*a*, 65	
March	2,730	.....	1,830	1.29	1.49	*b*. 59	
April	1,830	1,400	1,560	1.10	1.23	.67	
May	1,520	1,200	1,310	.923	1.06	.64	
June	1,400	1,000	1,220	.859	.96	.61	
July	1,460	963	1,120	.789	.91	.55	
August	1,300	1,000	1,080	.761	.88	.60	
September	1,400	1,000	1,210	.852	.95	.61	
October	1,460	1,050	1,200	.845	.97	.63	
November	1,300	1,140	1,240	.873	.97	.63	
December	1,300	.....	1,170	.824	.95	.64	
The year	2,730	.....	1,260	.887	12.09	.63	
1911.							
January	.....	.....	1,040	.732	.84	*a*, 65	
February	.....	.....	1,080	.761	.79	*b*. 63	
March	2,570	1,140	1,460	1.03	1.19	.60	
April	3,390	1,520	2,160	1.52	1.70	.68	
May	2,810	1,520	2,000	1.41	1.63	.68	
June	1,960	1,300	1,580	1.11	1.24	.67	
July	1,520	1,000	1,220	.859	.99	.61	
August	1,300	1,100	1,180	.831	.96	.62	
September	1,340	1,140	1,220	.859	.96	.62	
October	2,190	1,460	1,700	1.20	1.38	.68	
November	3,130	1,460	1,920	1.35	1.51	.67	
December	3,050	1,570	2,030	1.43	1.65	.66	
The year	3,390	.....	1,550	1.09	14.84	.65	
1912.							
January	.....	.....	1,500	1.06	1.22	*a*. 67	
February	.....	.....	1,400	.986	1.06	*a*. 64	
March	1,760	.....	1,330	.937	1.08	*b*. 65	
April	3,560	1,570	2,340	1.65	1.84	.65	
May	4,420	1,520	2,360	1.66	1.91	.67	
June	3,300	1,520	2,000	1.41	1.57	.69	
July	2,040	1,460	1,630	1.15	1.33	.67	
August	1,760	1,460	1,640	1.15	1.33	.69	
September	2,490	1,210	1,720	1.21	1.35	.71	
October	1,620	1,160	1,310	.923	1.06	.70	
November	2,410	1,320	1,680	1.18	1.32	.68	
December	2,410	1,380	1,710	1.20	1.38	.70	
The year	4,420	1,160	1,720	1.21	16.45	.67	
1913.							
January	.....	1,320	1,390	.979	1.13	*b*. 71	C.
February	.....	.....	1,200	.845	.88	*a*. 67	C.
March	4,140	.....	2,130	1.50	1.73	*b*. 63	C.
April	3,960	2,000	2,620	1.85	2.06	.67	A.
May	2,060	1,500	1,760	1.24	1.43	.69	A.
June	1,740	1,210	1,390	.979	1.09	.66	A.
July	1,380	1,000	1,150	.810	.93	.65	A.
August	1,210	1,000	1,110	.782	.90	.65	A.
September	1,380	950	1,100	.775	.86	.66	A.
October	1,560	1,000	1,230	.866	1.00	.71	A.
November	1,800	1,210	1,410	.993	1.11	.64	A.
December	1,680	1,100	1,300	.915	1.05	.65	B.
The year	4,140	950	1,480	1.04	14.17	.66	

a Discharge at Bamfield obtained by comparison with Lovells.
b Part of discharge at Bamfield obtained by comparison with Lovells.

NOTE.—See footnote to table of daily discharge.

TITTABAWASSEE RIVER AT FREELAND, MICH.

Location.—At highway bridge at Freeland, Mich.

Records available.—August 22, 1903, to August 3, 1906; October 28, 1906, to December 31, 1909; January 1, 1912, to December 31, 1913.

Drainage area.—2,530 square miles.[1]

Cooperation.—Estimates of daily discharge were made and furnished by G. S. Williams, consulting engineer, Ann Arbor, Mich.

Daily discharge, in second-feet, of Tittabawassee River at Freeland, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,710	1,620	1,805	3,575	2,510	1,080	908	746	790	685	1,110	1,300
2	1,625	1,585	1,815	3,700	2,190	1,050	872	770	812	675	1,140	1,600
3	1,570	1,480	1,815	3,400	1,920	1,050	930	758	813	645	1,170	1,920
4	1,525	1,490	1,760	4,850	1,600	1,025	900	758	730	663	1,190	2,070
5	1,485	1,435	1,720	5,910	1,530	1,000	872	746	702	685	1,170	2,065
6	1,400	1,395	1,725	5,400	1,490	965	803	730	712	702	1,170	2,030
7	1,390	1,360	1,905	4,650	1,460	953	758	740	690	718	1,200	2,000
8	1,395	1,300	2,180	4,425	1,380	930	722	930	675	758	1,220	2,060
9	1,415	1,355	2,430	4,275	1,350	900	712	1,825	698	832	1,240	1,990
10	1,430	1,395	2,730	4,050	1,320	884	690	2,930	712	900	1,270	1,750
11	1,430	1,500	2,950	3,325	1,300	872	675	3,860	702	930	1,300	1,600
12	1,420	1,620	3,870	3,575	1,300	832	645	3,280	685	1,005	1,310	1,390
13	1,405	1,625	4,910	3,350	1,470	815	645	2,320	680	1,030	1,360	1,300
14	1,395	1,600	5,400	3,075	1,680	795	625	2,150	675	1,058	1,350	1,390
15	1,390	1,520	6,950	2,950	1,850	785	567	2,000	675	1,070	1,300	1,300
16	1,830	1,530	8,280	2,850	2,000	765	567	1,900	608	1,100	1,270	1,240
17	2,405	1,560	7,000	2,740	2,230	718	570	1,825	625	1,065	1,230	1,200
18	3,400	1,760	5,275	2,600	2,240	702	592	1,750	620	1,035	1,200	1,170
19	4,025	1,950	4,225	2,510	2,200	690	620	1,510	653	990	1,215	1,140
20	3,775	2,150	4,350	2,420	1,920	680	658	1,600	667	960	1,230	1,100
21	3,400	2,300	4,650	2,320	1,760	675	685	1,390	690	990	1,285	1,080
22	3,080	2,210	4,925	2,160	1,600	675	712	1,238	712	990	1,350	1,040
23	2,630	2,050	5,400	2,150	1,490	827	787	1,058	735	1,080	1,535	1,000
24	2,220	2,005	5,910	2,570	1,450	930	758	1,025	712	1,110	1,825	930
25	2,020	1,870	6,850	3,125	1,400	832	746	990	702	1,085	1,600	870
26	1,950	1,860	6,350	3,300	1,380	712	758	965	675	1,050	1,480	800
27	1,860	1,830	5,780	3,490	1,330	930	770	930	690	1,035	1,390	755
28	1,760	1,820	5,350	3,425	1,300	930	774	930	702	1,020	1,350	700
29	1,760	.....	4,575	3,300	1,180	930	746	882	712	1,035	1,300	680
30	1,710	.....	4,275	2,940	1,150	908	730	850	702	1,070	1,300	685
31	1,655	.....	3,900	.....	1,060	.....	722	813	.....	1,100	.....	690

Monthly discharge of Tittabawassee River at Freeland, Mich., for 1913.

[Drainage area, 2,530 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	4,025	1,390	1,980	0.783	0.90
February	2,300	1,300	1,680	.664	.69
March	8,280	1,720	4,230	1.67	1.92
April	5,910	2,150	3,410	1.35	1.51
May	2,510	1,060	1,610	.636	.73
June	1,080	675	861	.340	.38
July	930	567	726	.287	.33
August	3,860	730	1,430	.565	.65
September	813	608	699	.276	.31
October	1,110	645	938	.371	.43
November	1,825	1,110	1,300	.514	.57
December	2,070	680	1,320	.522	.60
The year	8,280	567	1,680	.664	9.02

[1] Revised since last report.

STREAMS TRIBUTARY TO LAKE ERIE.

HURON RIVER AT DEXTER, MICH.

Location.—At the highway bridge at Dexter, Mich., one-fourth mile below mouth of Mill Creek.

Records available.—September 1, 1904, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Standard chain, attached to bridge; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 0.5, half-tenths from 0.5 to 1.5, and tenths above 1.5 feet.

Control.—The high water that carried out the gage on March 12, 1908, produced permanent change in the bed of the river; a small headrace runs to an abandoned mill on the left bank, but at ordinary stages little or no water flows into this canal; at high stages a small amount of water may pass around the gage through this race.

Discharge measurements.—Made from a boat several hundred feet below gage or from bridge to which gage is attached.

Winter flow.—Little ice forms at this section; current is swift.

Accuracy.—Discharge relation that existed prior to March 12, 1908, was altered as the result of the change in the river bed produced at that time; gage heights only slightly affected by ice. The station was inspected September 23, 1912, when the chain was found to be 0.13 too long. It was correct on October 17, 1908. Gage readings published for 1909, 1910, and 1911 should be corrected on account of this elongation of the chain.

Cooperation.—Station maintained in cooperation with Eastern Michigan Edison Co., Washtenaw division, Ann Arbor, Mich.

No discharge measurements were made at this station during the year 1913.

Daily gage height, in feet, of Huron River at Dexter, Mich., for 1913.

[D. M. Litchfield, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nv.	Dec.
1	0.00	1.7	0.18	2.9	0.9	0.7	−0.20	−0.35	−0.20	−0.25	0.15	0.52
2	.00	1.4	.15	2.8	.8	.6	− .28	− .38	− .20	− .20	.15	.55
3	− .02	1.0	.25	3.4	.65	.5	− .30	− .35	− .25	− .20	.10	.52
4	− .05	1.0	.10	3.8	.6	.5	− .30	− .35	− .25	− .22	.10	.48
5	.25	.8	.10	3.5	.5	.42	− .22	− .38	− .30	− .25	.05	.45
6	.42	.7	− .02	3.2	.48	.32	− .28	− .40	− .25	− .20	.02	.48
7	.5	.7	.20	3.0	.38	.28	− .30	− .40	− .25	− .18	.02	.5
8	.5	.6	.20	2.8	.30	.22	− .32	− .38	− .28	− .22	.00	.42
9	.6	.48	.40	2.6	.28	.18	− .35	− .28	− .28	− .22	.02	.38
10	.6	.40	.8	2.6	.20	.18	− .35	− .28	− .25	− .22	.02	.35
11	.32	.30	1.05	2.8	.22	.12	− .35	− .25	− .30	− .18	.02	.32
12	.40	.38	1.2	2.7	.20	.10	− .40	− .25	− .30	− .20	.08	.30
13	.38	.48	1.3	2.5	.22	.12	− .40	− .28	− .30	− .20	.18	.30
14	.28	.48	1.8	2.2	.28	.02	− .48	− .30	− .30	− .18	.25	.30
15	.20	.18	1.9	2.1	.48	.00	− .48	− .30	− .32	− .20	.28	.28
16	1.0	.20	1.6	2.0	1.25	− .08	− .42	− .30	− .35	− .20	.25	.25
17	2.5	.15	1.5	1.8	1.4	− .08	− .38	− .30	− .30	− .20	.20	.22
18	2.4	− .02	1.6	1.6	1.3	− .10	− .40	− .28	− .38	− .15	.22	.20
19	2.2	− .05	1.5	1.5	1.15	− .12	− .48	− .25	− .30	− .12	.32	.20
20	2.8	.25	1.4	1.4	1.0	− .20	− .40	− .25	− .30	− .12	.45	.20
21	3.0	.30	1.5	1.2	1.0	− .20	− .35	− .22	− .30	− .12	.42	.18
22	3.0	.30	1.6	1.05	1.0	− .15	− .35	− .20	− .30	− .08	.35	.12
23	2.8	.30	1.5	1.0	1.0	− .15	− .35	− .22	− .30	− .02	.30	.10
24	2.8	.30	2.8	.9	.9	− .12	− .40	− .22	− .30	.05	.30	.10
25	2.7	.30	3.2	.8	.7	− .15	− .40	− .18	− .30	.00	.28	.10
26	2.6	.20	3.4	.9	.6	− .15	− .40	− .20	− .30	.00	.22	.10
27	2.5	.25	2.8	1.0	1.0	− .20	− .38	− .22	− .28	.05	.22	.05
28	2.3	.20	2.7	1.1	1.1	− .20	− .30	− .22	− .28	.20	.28	.00
29	2.2	.....	2.9	1.0	1.0	− .20	− .30	− .22	− .28	.22	.32	.00
30	1.7	.....	3.0	.9	1.0	− .20	− .30	− .25	− .28	.20	.38	.05
31	1.6	.....	3.0	.....	.8	.....	− .30	− .20	.....	.12	.....	.05

NOTE.—Observer made complete notes concerning ice. Discharge relation probably affected by ice about Jan. 5–13, and Jan. 28 to Feb. 17.

HURON RIVER AT GEDDES, MICH.

Location.—At dam and power plant of the Eastern Michigan Edison Co., at Geddes, Mich., half a mile above mouth of Fleming Creek.

Records available.—February 1, 1904, to December 31, 1913.

Drainage area.—757 square miles.

Determination of discharge.—The flow of the river at this point is computed from records of the operation of the power plant and records of depth of flow over dam.

Cooperation.—Estimates of daily discharge were made and furnished by G. S. Williams, consulting engineer, Ann Arbor, Mich.

Daily discharge, in second-feet, of Huron River at Geddes, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	270	1,825	535	2,368	1,133	1,142	382	124	302	172	380	591
2	286	1,410	378	2,370	1,064	997	297	135	182	198	301	601
3	326	1,222	476	2,605	1,030	848	288	122	201	203	360	623
4	312	1,019	418	3,352	903	664	313	57	182	197	419	572
5	229	905	284	2,886	875	862	321	61	167	183	360	540
6	498	872	448	2,708	815	764	334	133	162	174	319	542
7	744	622	336	2,348	804	830	311	127	236	207	308	509
8	727	946	432	2,234	664	790	311	124	422	203	292	655
9	645	1,184	846	2,124	638	850	328	111	155	193	274	586
10	427	873	1,306	2,164	650	492	243	195	167	199	313	422
11	720	777	1,163	2,465	645	520	144	107	250	215	304	510
12	776	534	1,261	2,328	608	478	179	156	188	200	330	473
13	631	395	1,415	2,014	566	487	179	294	202	173	308	480
14	603	448	1,912	1,925	630	538	233	140	179	183	414	480
15	518	580	1,825	1,921	887	454	280	65	103	210	406	496
16	789	664	1,685	1,673	2,027	472	319	112	163	215	420	473
17	2,110	349	1,420	1,424	1,465	448	332	203	148	223	404	285
18	2,120	352	1,495	1,516	1,540	428	353	104	145	231	415	476
19	1,875	395	1,519	1,421	1,232	389	333	194	153	236	396	459
20	2,175	476	1,493	1,196	1,221	431	205	190	148	236	435	439
21	2,155	560	1,478	1,125	1,200	391	95	219	167	257	451	430
22	2,181	565	1,428	1,147	1,255	369	180	229	343	252	439	590
23	2,140	527	1,398	1,073	1,208	316	84	177	164	294	440	460
24	2,255	548	2,497	1,299	1,129	376	131	242	319	307	437	404
25	2,045	567	2,790	1,053	1,058	355	112	125	163	288	436	500
26	2,065	538	2,763	1,076	1,095	334	110	230	165	303	456	321
27	1,900	533	2,289	1,226	1,232	365	154	154	141	305	399	335
28	1,913	541	2,014	1,404	1,364	327	153	193	152	340	453	358
29	1,745	.....	2,300	1,198	1,211	324	213	193	149	369	408	269
30	1,655	.....	2,330	1,231	1,227	350	93	217	156	406	449	339
31	1,652	.....	2,407	.....	1,142	.....	157	211	.....	387	.....	342

Monthly discharge of Huron River at Geddes, Mich., for 1913.

[Drainage area, 757 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	2,255	229	1,240	1.64	1.89
February	1,825	349	722	.954	.99
March	2,790	284	1,430	1.89	2.18
April	3,352	1,053	1,830	2.42	2.70
May	2,027	566	1,050	1.39	1.60
June	1,142	316	546	.721	.80
July	382	84	231	.305	.35
August	294	57	159	.210	.24
September	422	103	192	.254	.28
October	406	172	244	.322	.37
November	456	274	384	.507	.57
December	655	269	470	.621	.72
The year	3,352	57	708	.935	12.69

HURON RIVER AT FLAT ROCK, MICH.

Location.—At the highway bridge at Flat Rock, Mich., 2,000 feet below the crossing of the Detroit, Toledo & Ironton Railway.

Records available.—August 6, 1904, to December 31, 1913.

Drainage area.—1,000 square miles.

Gage.—Staff; gage read daily, morning and evening, to tenths. Limits of use: Half-tenths below 1.5 and tenths above 1.5 feet.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Regulation.—At ordinary stages flow of the river is controlled by a dam and power plant immediately above station, but operation of this plant is assumed to have little effect on diurnal fluctuations of stage.

Winter flow.—Ice jams form below the station and cause backwater at the gage; in general the section above the station is kept open by the power plant.

Accuracy.—Station last inspected September 25, 1912; a measurement on this date indicates marked change in discharge relation since October 16, 1908.

Cooperation.—Station maintained in cooperation with Eastern Michigan Edison Co., Washtenaw division, Ann Arbor, Mich.

Daily gage height, in feet, of Huron River at Flat Rock, Mich., for 1913.

[C. L. Metler, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	4.8	3.2	7.7	4.0	3.8	0.85	0.6	1.05	1.1	2.1	2.7
2	1.8	7.1	3.2	7.6	3.8	3.4	1.05	.6	.95	1.2	2.1	3.1
3	1.8	7.4	2.6	7.5	3.6	3.4	1.2	.6	.9	1.1	.85	3.0
4	1.7	7.6	2.9	7.8	3.6	3.3	1.0	.6	.95	1.35	1.9	3.0
5	1.8	6.8	3.0	8.2	2.8	2.6	.8	.30	1.0	1.0	2.2	3.0
6	1.8	6.0	3.0	8.0	3.2	3.0	.8	.6	.95	1.1	2.1	2.9
7	2.2	6.0	2.4	7.7	3.0	2.9	.8	.7	.....	1.0	2.0	2.7
8	3.0	5.4	2.6	7.4	2.9	2.6	.8	.9	1.1	1.1	2.0	2.8
9	3.1	5.2	2.8	7.0	2.8	2.7	1.1	.9	.9	1.1	1.9	2.8
10	2.8	5.7	4.6	7.0	2.4	3.0	1.05	.6	.9	1.1	1.4	2.8
11	2.8	5.8	7.2	7.4	2.4	2.0	.7	.8	.9	1.05	1.9	2.6
12	2.9	5.2	6.6	7.6	2.3	1.8	.8	.7	.95	1.0	1.8	2.6
13	3.0	4.6	6.6	7.3	2.4	1.8	.6	.9	.95	1.1	2.0	2.6
14	3.3	3.8	6.4	7.0	2.2	1.8	.35	1.25	.....	1.05	2.0	2.6
15	3.0	3.8	6.2	6.6	2.2	1.8	.40	1.15	.9	1.45	2.2	2.4
16	2.9	4.4	6.0	6.2	3.6	1.6	.5	.9	.8	1.8	2.2	2.5
17	4.4	3.8	5.2	6.0	5.2	1.8	.5	.5	.85	1.25	2.2	2.2
18	6.8	3.4	4.8	5.4	5.0	1.8	.6	.5	1.0	1.1	2.1	2.2
19	8.2	3.4	4.7	5.2	4.8	1.8	.6	.75	.8	1.6	2.4	2.1
20	7.7	3.4	4.8	5.0	4.4	1.4	.5	.95	1.05	1.15	2.2	2.0
21	7.3	3.2	5.1	4.8	4.0	1.2	.55	.95	.9	1.3	2.2	2.0
22	8.2	3.9	5.6	4.6	4.4	1.1	.30	1.0	.85	1.3	2.2	1.8
23	7.8	3.7	5.6	4.3	4.2	1.05	.5	.8	1.05	1.15	2.3	2.2
24	7.8	3.2	6.6	4.1	4.1	1.0	.40	1.0	1.05	1.9	2.3	2.2
25	7.9	3.4	8.2	4.0	3.8	1.1	.55	.95	1.0	1.9	2.5	2.0
26	7.2	3.4	8.5	3.6	3.8	1.2	.40	1.05	1.0	1.9	2.4	1.8
27	6.9	3.4	8.4	3.9	4.6	1.2	.40	1.1	1.0	1.4	2.2	2.0
28	6.7	3.2	7.8	4.2	4.9	1.2	.7	.85	.9	2.1	2.4	2.2
29	6.7	.....	7.3	4.5	5.0	1.0	.8	.95	.7	2.0	2.2	2.0
30	6.0	.....	7.4	4.4	4.4	1.1	.8	.95	.7	2.2	2.4	2.2
31	5.0	.....	7.7	.....	4.0	.....	1.0	.....	.....	2.2	.....	2.0

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during 1913.

CATTARAUGUS CREEK AT VERSAILLES, N. Y.

Location.—On a three-span highway bridge in the village of Versailles, about 6 miles below Gowanda, 2¼ miles above mouth of Clear Creek (coming in from the right), and about 8 miles above mouth of stream.

Records available.—September 23, 1910, to December 31, 1913. Data published also in annual reports of the State of New York Conservation Commission and the New York State engineer and surveyor.

Drainage area.—467 square miles.

Gage.—Chain, fastened to the upstream side of the first span from the right-hand end of the bridge; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 6.0, half-tenths from 6.0 to 7.5, and tenths above 7.5 feet.

Control.—Rock and gravel. Shifted by flood in March, 1913.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—The flood of March, 1913, reached gage height 11.6 feet at 5.40 p. m. March 25, as recorded by the gage observer. Later determinations, made by engineers of the Geological Survey and based upon high-water marks, indicate that flood crest may have exceeded height noted by observer. The corresponding discharge was approximately 30,000 second-feet, or 64 second-feet per square mile of drainage area.

Accuracy.—Discharge curve fairly well defined. Estimates as published fairly good.

Discharge measurements of Cattaraugus Creek at Versailles, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Mar. 30	C. S. DeGolyer	6.35	1,870	Apr. 30	C. S. De Golyer	6.37	1,850
31	do	6.22	1,510	Aug. 14	G. H. Canfield	4.87	122
Apr. 29	do	7.06	3,580	Oct. 31	R. S. Barnes	5.19	287

Daily gage height, in feet, of Cattaraugus Creek at Versailles, N. Y., for 1913.

[James Palmer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.15	5.80	5.80	6.2	5.95	5.45	5.02	4.90	4.75	4.85	5.20	5.12
2	5.9	5.60	5.57	6.0	5.75	5.62	4.98	4.93	4.77	4.90	5.22	5.12
3	6.55	5.63	5.40	5.95	5.62	5.42	4.98	4.87	4.77	5.08	5.22	5.12
4	6.25	5.70	5.53	6.1	5.58	5.30	5.08	4.85	4.75	5.00	5.25	5.12
5	6.0	5.50	5.57	5.98	5.52	5.25	5.20	4.87	4.70	4.95	5.20	5.12
6	7.25	5.47	6.6	5.82	5.42	5.20	5.18	4.85	4.65	4.95	5.12	5.12
7	8.2	5.53	7.3	5.82	5.42	6.6	5.02	4.85	4.65	4.82	5.05	5.12
8	8.5	5.73	7.25	5.72	5.38	5.78	5.12	4.85	4.67	4.85	5.00	5.20
9	6.85	5.67	7.6	5.75	5.32	5.52	4.98	4.90	4.73	4.85	5.35	5.12
10	6.45	5.67	8.4	5.72	5.30	5.35	5.10	5.03	4.67	4.82	6.3	5.15
11	6.4	5.77	7.25	6.4	5.30	5.30	5.05	4.93	4.67	4.85	5.65	5.12
12	8.5	.....	6.85	6.05	5.30	5.20	5.00	4.93	4.67	5.00	5.52	5.08
13	6.75	.....	7.05	5.80	5.28	5.15	5.00	4.93	4.67	5.05	6.1	5.18
14	6.35	.....	7.5	5.68	5.22	5.10	5.00	4.87	4.75	4.95	6.1	5.25
15	6.25	.....	7.15	5.58	5.22	5.12	5.00	4.77	4.67	4.95	5.78	5.25
16	6.85	.....	6.65	5.52	5.30	5.12	4.95	4.77	4.70	4.90	5.50	5.28
17	9.0	.....	6.15	5.52	5.32	5.10	4.95	4.75	4.70	4.85	5.40	5.22
18	9.8	.....	5.97	5.52	5.38	5.08	4.95	4.75	4.78	4.90	5.35	5.18
19	7.45	.....	6.15	5.58	5.30	5.08	4.90	4.13	4.75	4.95	5.38	5.18
20	7.1	8.6	5.97	6.0	5.22	5.10	4.95	4.67	4.75	5.15	6.1	5.18
21	8.0	6.75	5.87	5.42	5.22	5.32	4.95	4.65	4.72	5.25	6.1	5.18
22	8.0	7.25	5.83	5.52	5.78	5.18	4.90	4.83	4.75	5.35	5.50	5.18
23	7.7	6.35	5.97	6.4	5.50	5.10	4.90	4.97	4.80	5.42	5.32	5.28
24	7.15	6.05	6.55	6.2	5.42	5.08	5.00	4.95	4.80	5.52	5.25	5.52
25	6.65	5.73	11.4	5.70	5.32	5.18	4.92	4.95	4.75	5.60	5.20	5.48
26	6.4	5.37	8.2	5.52	5.30	5.68	4.87	4.93	4.80	5.48	5.18	5.35
27	6.35	5.83	9.4	9.0	5.40	5.32	4.87	4.87	4.80	5.32	5.18	5.25
28	6.25	5.97	8.3	8.4	7.4	5.10	4.97	4.90	4.85	5.20	5.20	5.18
29	6.25	.....	7.1	7.3	6.15	5.08	4.90	4.90	4.75	5.18	5.15	5.25
30	6.15	.....	6.35	6.3	5.65	5.10	4.87	4.85	4.75	5.20	5.12	5.18
31	6.0	.....	6.25	.....	5.48	.....	4.87	4.83	.....	5.18	.....	5.18

NOTE.—Discharge relation affected by ice from about Feb. 3 to Mar. 10.

Daily discharge, in second-feet, of Cattaraugus Creek at Versailles, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,230	794	.....	1,510	1,120	508	191	135	85	118	300	248
2	907	586	.....	1,180	838	683	171	148	91	135	315	248
3	1,920	.....	.....	1,120	683	479	171	124	91	224	315	248
4	1,380	.....	.....	1,340	639	375	224	118	85	180	338	248
5	1,030	.....	.....	1,150	576	338	300	124	70	158	300	248
6	3,630	.....	.....	927	479	300	287	118	55	158	248	248
7	6,820	.....	.....	927	479	2,330	191	118	55	107	208	248
8	7,900	.....	.....	800	443	875	248	118	61	118	180	300
9	2,570	.....	.....	875	392	576	171	135	79	118	418	248
10	1,720	.....	.....	800	375	418	235	196	61	107	1,700	268
11	1,630	.....	3,630	1,900	375	375	208	148	61	118	718	248
12	7,900	.....	2,570	1,260	375	300	180	148	61	180	576	224
13	2,340	.....	3,070	900	360	268	180	148	61	208	1,340	287
14	1,540	.....	4,400	752	315	235	180	124	85	158	1,340	338
15	1,380	.....	3,340	639	315	248	180	91	61	158	875	338
16	2,570	.....	2,120	576	375	248	158	91	70	135	555	360
17	9,700	.....	1,230	576	392	235	158	85	70	118	460	315
18	12,500	.....	993	576	443	224	158	85	94	135	418	287
19	4,240	.....	1,230	639	375	224	135	79	85	158	443	287
20	3,200	.....	993	1,180	315	235	158	61	85	268	1,340	287
21	6,100	.....	873	479	315	392	158	55	76	338	1,340	287
22	6,100	.....	828	576	875	287	135	110	85	418	555	287
23	5,060	.....	993	1,900	555	235	135	164	100	479	392	360
24	3,340	.....	1,920	1,510	479	224	180	158	100	576	338	576
25	2,120	.....	18,300	775	392	287	144	158	85	660	300	536
26	1,630	.....	7,640	576	375	752	124	148	100	536	287	418
27	1,540	.....	11,100	10,800	460	392	124	124	100	392	287	338
28	1,380	.....	8,040	8,840	4,630	235	164	135	118	300	300	287
29	1,380	.....	3,670	4,300	1,420	224	135	135	85	287	268	338
30	1,230	.....	1,800	1,700	718	235	124	118	85	300	248	287
31	1,030	.....	1,600	.....	536	.....	124	110	.....	287	.....	287

NOTE.—Channel shifted by floods; new rating curve used beginning Mar. 26, 1913.

Monthly discharge of Cattaraugus Creek at Versailles, N. Y., for 1913.

[Drainage area, 467 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,500	907	3,450	7.39	8.52	D.
February	.....	.....	750	1.61	1.68	D.
March	18,300	.....	3,060	6.55	7.55	D.
April	10,800	479	1,700	3.64	4.06	C.
May	4,630	315	659	1.41	1.63	B.
June	2,330	224	425	.910	1.02	B.
July	300	124	175	.375	.43	B.
August	196	55	123	.263	.30	B.
September	118	55	80	.170	.19	B.
October	660	107	246	.53	.61	B.
November	1,700	180	557	1.19	1.33	B.
December	576	224	307	.66	.76	B.
The year	18,300	55	966	2.07	28.08	

NOTE.—Discharge Feb. 3 to Mar. 10, inclusive, estimated by comparison with records on Genesee River, Allegheny River, and Little Tonawanda Creek.

LITTLE TONAWANDA CREEK AT LINDEN, N. Y.

Location.—At the stone arch highway bridge in the village of Linden, 600 feet northeast of Erie Railroad station, and 3 miles above junction with Tonawanda Creek.

Records available.—July 8, 1912, to December 31, 1913.

Drainage area.—22.0 square miles (measured on topographic sheets of United States Geological Survey).

Gage.—Vertical staff on right-hand upstream abutment of bridge; lower 2 feet of enameled iron graduated to hundredths of a foot; upper 4 feet of bronze graduated to half-tenths. An auxiliary gage fastened to the right-hand downstream abutment of the bridge is used to check upper gage. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 1.5, half-tenths from 1.5 to 2.5, and tenths above 2.5 feet.

Control.—A standard Francis weir has been constructed under the upstream side of the bridge, having a length of 2.01 feet and a height of 8 inches. When the water overtops this weir it flows over a 2-inch plank about 13 feet long, including the 2 feet of weir. The weir was carried away by a floating tree on March 25, 1913, and was duplicated June 20, 1913.

Discharge measurements.—High-water measurements made from a cable and car 1,000 feet above weir; low-water measurements made by wading above weir.

Floods.—Flood of March, 1913, reached maximum stage at noon March 25, with a discharge of 1,300 second-feet, or 59 second-feet per square mile of drainage area. These figures are based on hourly gage heights recorded by the gage observer.

Accuracy.—At gage height 0.69, or below, flow is confined to weir. During such stages the accuracy of the data will be the accuracy of a properly constructed Francis weir. For stages above gage height 0.69 weir has been rated with a current meter, and data for such stages should also be excellent. Good rating curve of weir in its damaged condition obtained by current-meter measurements.

Discharge measurements of Little Tonawanda Creek at Linden, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 18	C. S. De Golyer	5.90	601	Jan. 22	C. S. De Golyer	1.90	74.4
18	do	6.28	672	Mar. 27	do	[a] 14.46	581
18	do	5.80	572	27	do	[a] 13.24	377
19	do	2.67	143	Apr. 1	do	[a] 9.94	41.0
19	do	2.43	119	1	do	[a] 9.93	41.5
20	do	2.31	107	May 6	C. C. Covert	[a] 9.25	14.4
20	do	2.76	150	June 18	C. S. De Golyer	[a] 8.74	2.38
20	do	2.85	156	21[b]	do	.70	3.73
22	do	[c] 1.89	76.9	21[b]	do	.70	3.55
22	do	1.86	72.4	Aug. 14[b]	G. H. Canfield	.24	0.55

[a] Gage height referred to datum 10 feet below that used for weir in its undamaged condition.
[b] Measurement made by wading.
[c] Gage height variable during this measurement. Give more weight to other measurements of same date.

Daily gage height, in feet, of Little Tonawanda Creek at Linden, N. Y., for 1913.

[C. L. Schenck, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.28	1.14	1.10	9.95	9.80	8.94	0.51	0.27	0.23	0.22	0.27	0.73
2	1.22	1.22	1.03	9.74	9.62	9.36	.48	.24	.22	.22	.26	.71
3	1.5	1.18	1.06	9.82	9.48	9.06	.48	.24	.23	.21	.27	.72
4	1.08	1.18	1.08	10.15	9.38	8.96	.46	.30	.26	.21	.28	.72
5	1.30	.....	1.08	9.91	9.29	8.90	.71	.26	.24	.20	.26	.71
6	1.75	.....	1.03	9.76	9.23	8.89	.56	.27	.23	.20	.26	.69
7	3.2	.....	1.02	9.72	9.14	8.93	.50	.28	.22	.20	.26	.72
8	2.4	.....	1.02	9.68	9.12	8.94	.45	.24	.22	.18	.26	.80
9	1.6	.....	1.09	9.57	9.09	8.88	.44	.24	.21	.18	.56	.72
10	1.6	.....	2.5	9.54	9.04	8.84	.42	.39	.20	.20	.90	.73
11	2.2	.....	2.7	10.7	9.02	8.84	.42	.32	.19	.23	.72	.69
12	3.7	.....	2.4	9.89	9.00	8.82	.42	.26	.19	.24	.60	.72
13	2.0	.94	2.8	9.71	8.98	8.80	.40	.25	.19	.21	.64	.80
14	1.8	.93	4.4	9.58	8.96	8.78	.37	.24	.18	.20	.73	.87
15	1.5	.92	3.2	9.48	8.94	8.76	.37	.23	.18	.20	.72	.84
16	2.8	.98	1.95	9.42	8.98	8.76	.36	.22	.18	.21	.66	.79
17	6.5	.94	1.5	9.32	8.96	8.73	.36	.22	.20	.21	.64	.79
18	5.7	.92	1.55	9.26	9.00	8.73	.38	.21	.27	.22	.62	.78
19	2.6	.94	1.65	9.35	8.94	[a] 8.72	.36	.20	.22	.22	.70	.74
20	2.5	1.6	1.65	9.20	8.90	.....	.54	.18	.21	.32	1.16	.72
21	3.4	1.9	1.65	9.12	8.88	.70	.42	.18	.26	.27	.94	.71
22	1.85	2.4	1.36	9.13	9.10	.65	.34	.22	.28	.23	.89	.70
23	2.0	1.55	1.22	10.0	8.99	.56	.33	.26	.22	.22	.86	.74
24	2.4	1.47	2.3	9.80	8.95	.52	.36	.24	.21	.27	.84	.82
25	1.6	1.30	.....	9.49	8.92	.52	.39	.26	.21	.33	.85	.86
26	1.5	1.16	[a]13.1	9.34	8.88	.50	.34	.24	.22	.32	.82	.79
27	1.7	1.16	14.6	9.84	8.90	.80	.33	.22	.20	.30	.80	.74
28	1.36	1.12	10.9	13.7	10.05	.73	.34	.22	.20	.28	.76	.79
29	1.27	.....	10.8	10.3	9.39	.61	.32	.42	.20	.26	.74	.75
30	1.29	.....	10.45	10.1	9.11	.56	.30	.28	.19	.29	.74	.79
31	1.5	.....	10.3	.....	9.00	.....	.24	124	.....	.28	.....	.80

[a] All gage heights from Mar. 26 to June 19, while weir was damaged, referred to a datum 10.00 feet lower than datum of regular gage. Limits of use during this period: hundredths below 10.0, half-tenths from 10.0 to 11.0 and tenths above 11.0 feet.

Daily discharge, in second-feet, of Little Tonawanda Creek at Linden, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	26.2	18.1	16	42	35	6.1	2.18	0.82	0.63	0.59	0.82	4.1
2	22.5	22.5	13.2	33	28	18	1.99	.68	.59	.59	.77	3.7
3	43.0	20.2	14.4	36	22	9.0	1.99	.68	.63	.55	.82	3.9
4	15.2	20.2	15.2	53	18	6.6	1.87	.96	.77	.55	.87	3.9
5	27.5	17.0	15.2	40	16	5.2	3.7	.77	.68	.51	.77	3.7
6	63	15.0	13.2	33	14	5.0	2.51	.82	.63	.51	.77	3.48
7	199	13.5	12.8	32	11	5.9	2.12	.87	.59	.51	.77	3.9
8	117	12.5	12.8	30	11	6.1	1.81	.68	.59	.43	.77	5.6
9	51	11.5	15.6	26	9.7	4.8	1.74	.68	.55	.43	2.51	3.9
10	51	10.5	126	25	8.5	4.1	1.62	1.45	.51	.51	8.4	4.1
11	99	10.0	144	88	8	4.1	1.62	1.07	.47	.63	3.9	3.48
12	261	9.8	117	40	7.5	3.7	1.62	.77	.47	.68	2.79	3.9
13	83	9.8	154	31	7	3.3	1.51	.72	.47	.55	3.07	5.6
14	67	9.5	360	26	6.6	3.0	1.34	.68	.43	.51	4.1	7.5
15	43	9.1	199	22	6.1	2.7	1.34	.63	.43	.51	3.9	6.6
16	154	11.2	79	20	7	2.7	1.28	.59	.43	.55	3.21	5.3
17	711	9.8	43	17	6.6	2.3	1.28	.59	.51	.55	3.07	5.3
18	567	9.1	47	15	7.5	2.3	1.39	.55	.82	.59	2.93	5.1
19	135	9.8	55	18	6.1	2.2	1.28	.51	.59	.59	3.60	4.2
20	126	51	55	13	5.2	2.8	2.38	.43	.55	1.07	19.1	3.9
21	223	75	55	11	4.8	3.6	1.62	.43	.77	.82	9.7	3.7
22	71	117	32	11	10	3.14	1.17	.59	.87	.63	8.1	3.6
23	83	47	22.5	45	7.3	2.51	1.12	.77	.59	.59	7.2	4.2
24	117	40.6	108	35	6.4	2.25	1.28	.68	.55	.82	6.6	6.1
25	51	27.5	1,070	23	5.7	2.25	1.45	.77	.55	1.12	6.9	7.2
26	43	19.1	357	17	4.8	2.12	1.17	.68	.59	1.07	6.1	5.3
27	59	19.1	606	37	5.2	5.6	1.12	.59	.51	.96	5.6	4.2
28	32	17.0	104	450	48	4.1	1.17	.59	.51	.87	4.6	5.3
29	25.6	.....	96	62	19	2.86	1.07	1.62	.51	.77	4.2	4.4
30	26.9	.....	71	50	10	2.51	0.96	.87	.47	.91	4.2	5.3
31	43	.....	62	.....	7.5	.....	0.82	.68	.....	.87	.....	5.6

NOTE.—Discharge Feb. 5–12 estimated by interpolation and comparison with records of Genesee River at St. Helena. Discharge Mar. 25 to June 20, while the weir was damaged, computed from a rating curve well defined by 6 discharge measurements.

Monthly discharge of Little Tonawanda Creek at Linden, N. Y., for 1913.

[Drainage area, 22.0 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	711	15.2	117	5.32	6.13	A.
February	117	9.1	23.7	1.08	1.12	A.
March	1,070	12.8	132	6.00	6.92	B.
April	450	11.0	46.0	2.09	2.33	A.
May	48	4.8	11.9	.541	.62	A.
June	18	2.0	4.33	.197	.22	A.
July	3.7	.82	1.60	.073	.08	A.
August	1.62	.43	.749	.034	.04	A.
September	.87	.43	.575	.026	.03	A.
October	1.12	.43	.672	.031	.04	A.
November	19.1	.77	4.34	.197	.22	A.
December	7.5	3.48	4.71	.214	.25	A.
The year	1,070	.43	29.2	1.33	18.00	

STREAMS TRIBUTARY TO LAKE ONTARIO.

GENESEE RIVER AT ST. HELENA, N. Y.

Location.—At steel highway bridge, about 6 miles above mouth of Silver Lake outlet, 9½ miles above Canaseraga Creek, and 5½ miles below village of Portageville and site of proposed storage dam of State of New York Conservation Commission.

Records available.—August 14, 1908, to December 31, 1913. Published also in annual reports of the New York State engineer and surveyor and State of New York Conservation Commission.

Drainage area.—1,030 square miles.

Gages.—Chain gage, fastened to upstream side of middle span of bridge; read twice daily to hundredths. Limits of use: Hundredths below 2.5 until March 10, and below 3.0 after that date, half-tenths from these limits to 4.0, and tenths above 4.0. Since August 24, 1911, a Gurley self-recording gage with intake pipe to the well a few feet downstream from the chain gage; datum of recording gage same as that of chain gage, but slope of water surface makes readings different. Gage heights from self-recording gage used to hundredths.

Control.—Gravel and rocks; shifting.

Discharge measurements.—At high stages made from the bridge; at low and medium stages either by wading or from bridge.

Winter flow.—Discharge relation usually but slightly affected by ice; determination of winter discharge considered good.

Floods.—Highest stage during flood of March 25–30, 1913, 12.0 feet, read by chain gage at 8 a. m. March 26. Automatic gage was not recording correctly during this period because intake pipe was clogged by gravel, but the records indicate crest of flood from 3 to 5 a. m. March 26, with a somewhat higher stage than that recorded at 8 a. m. on same date. The discharge corresponding to a gage height of 12.0 feet was 37,800 second-feet, or 36.7 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well defined; data as published considered excellent.

Discharge measurements of Genesee River at St. Helena, N. Y., in 1913.

Date.	Hydrographer.	Gage height.[a]	Discharge.	Date.	Hydrographer.	Gage height.[a]	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 13[b]	C. C. Covert	4.61	617	June 23[d]	C. S. DeGolyer	2.62	300
21[b]	C. S. De Golyer	4.81	1,220	24[d]	do	2.53	256
Mar. 12	C. C. Covert	4.96	3,315	Aug. 14[d]	G. H. Canfield	1.82	33.2
28	C. S. De Golyer	[c]8.41	13,400	14[d]	do	1.82	33.0
28	do	[c]7.73	10,300	Oct. 30	R. S. Barnes	2.93	487
Apr. 2	do	[c]4.59	2,270				

[a] From automatic gage except as noted.
[b] Measurement made under complete ice cover.
[c] From chain gage on bridge.
[d] Measurement made by wading.

Daily gage height, in feet, of Genesee River at St. Helena, N. Y., for 1913.

[Herman Piper, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.75	3.54	3.7	5.2	4.9	3.25	2.32	2.01	2.06	2.02	2.75	2.81
2	3.41	2.85	3.25	4.5	4.5	3.6	2.27	2.08	2.00	2.00	2.67	2.76
3	3.84	2.84	3.15	4.4	4.2	3.3	2.25	1.90	1.97	2.20	2.62	2.73
4	4.92	2.95	2.85	4.7	3.9	3.1	2.11	2.12	1.94	2.18	2.68	2.72
5	4.25	2.76	2.9	5.8	3.75	2.97	2.27	2.00	1.93	1.72	2.56	2.70
6	4.23	2.74	2.8	4.7	3.55	2.86	2.28	2.01	1.93	2.19	2.51	2.66
7	6.40	2.7	2.7	4.5	3.4	3.6	2.37	2.01	1.83	2.16	2.48	2.66
8	7.71	2.6	2.6	4.3	3.3	3.6	2.24	2.00	1.97	2.05	2.45	2.73
9	6.96	2.6	2.85	4.2	3.15	3.1	2.21	2.00	1.92	1.85	2.72	2.75
10	5.14	4.2	6.0	4.0	3.1	2.88	2.16	1.89	1.90	2.12	5.45	2.71
11	5.06	4.4	6.0	4.4	3.05	2.86	2.16	2.13	1.88	1.96	4.20	2.77
12	7.22	4.7	5.4	4.5	3.1	2.77	2.19	2.08	1.89	2.26	3.65	2.77
13	5.81	.....	5.38	4.1	3.0	2.62	2.17	1.99	1.87	2.40	3.46	2.75
14	4.69	4.48	5.82	3.85	2.88	2.54	2.23	1.99	1.87	2.11	3.77	2.78
15	4.29	4.46	5.88	3.8	2.94	2.52	2.19	1.98	.....	2.02	3.93	2.91
16	4.64	4.49	4.93	3.65	2.78	2.56	2.19	1.92	.....	2.09	3.63	2.90
17	6.98	4.61	3.95	3.5	2.84	2.36	2.15	1.87	.....	1.96	3.47	2.79
18	8.07	4.38	3.58	3.4	2.76	2.24	2.12	1.96	.....	2.15	3.39	2.74
19	6.62	4.40	3.67	3.3	2.68	2.22	2.14	1.98	.....	1.81	3.29	2.70
20	5.34	4.51	3.52	3.3	2.72	2.45	2.06	1.94	.....	2.35	3.53	2.56
21	6.48	4.81	3.51	3.1	2.68	3.2	2.23	1.95	.....	2.46	3.52	2.62
22	5.01	4.44	3.47	2.95	3.2	2.92	2.13	1.87	.....	2.61	3.36	2.62
23	4.60	4.27	3.22	3.3	3.15	2.72	2.12	1.99	.....	2.62	3.19	2.65
24	6.17	3.1	3.75	4.2	3.1	.....	2.06	1.88	.....	2.40	3.12	2.73
25	4.85	3.0	11.2	3.65	3.1	2.47	2.09	2.10	.....	2.59	3.06	3.06
26	4.36	2.85	11.2	3.4	2.98	2.61	2.19	2.01	.....	2.70	2.99	2.91
27	4.24	2.75	10.8	3.4	3.05	2.58	2.03	2.01	.....	3.64	2.93	2.73
28	3.89	2.7	8.1	9.5	5.4	2.56	2.17	1.89	.....	3.18	2.87	2.74
29	3.68	.....	6.2	8.0	4.5	2.40	2.06	2.08	.....	2.89	2.82	2.78
30	3.47	.....	5.5	6.0	3.8	2.42	2.14	2.07	.....	2.82	2.80	2.82
31	3.50	.....	5.4	.....	3.5	.....	2.07	1.89	.....	2.82	.....	2.87

NOTE.—Gage heights affected by ice Feb. 10–23, inclusive. Gage heights Feb. 7–12, Feb. 24 to Mar. 12, Mar. 25 to June 23, Oct. 1–23, and Dec. 28–31 (all inclusive) are means of two readings per day on chain gage. From Mar. 25 to June 23 intake pipe of automatic gage well was covered with gravel, rendering the automatic gage record useless. Remainder of gage heights computed as means of 24 hourly gage heights from automatic gage record.

Daily discharge, in second-feet, of Genesee River at St. Helena, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,580	1,300	1,340	3,380	2,800	666	169	71	84	69	372	408
2	1,140	612	875	2,130	2,130	1,000	150	90	68	64	327	378
3	1,710	605	785	1,980	1,710	708	144	46	61	114	302	360
4	3,590	689	560	2,450	1,340	548	98	101	55	109	333	355
5	2,330	548	590	4,680	1,160	461	150	68	53	20	273	344
6	2,300	535	530	2,450	950	395	154	71	53	111	249	322
7	7,690	474	474	2,130	800	1,000	188	71	35	103	235	322
8	12,800	424	424	1,840	708	1,000	140	68	61	76	222	360
9	9,610	424	560	1,710	586	548	130	68	50	36	355	372
10	4,100	410	5,990	1,460	548	406	114	44	46	92	4,360	349
11	3,910	400	5,170	1,980	514	395	114	104	43	56	1,950	384
12	10,600	400	3,790	2,130	548	344	123	90	44	132	1,180	384
13	5,850	617	4,210	1,580	480	268	117	66	41	178	966	372
14	3,120	520	5,240	1,280	406	233	136	66	41	90	1,330	390
15	2,390	460	5,390	1,220	443	224	123	64	.....	69	1,550	474
16	3,030	400	3,260	1,060	349	241	123	50	.....	85	1,160	467
17	9,680	340	3,300	900	383	164	110	41	.....	56	977	396
18	14,600	300	1,100	800	338	126	101	59	.....	100	890	366
19	8,430	300	1,200	708	296	120	107	64	.....	29	791	344
20	4,580	300	1,030	708	317	217	84	55	.....	161	1,040	273
21	7,950	1,220	1,020	548	296	624	136	57	.....	201	1,030	302
22	3,790	1,050	977	449	624	430	104	41	.....	263	860	302
23	2,950	900	728	708	586	317	101	66	.....	268	701	317
24	6,940	740	1,300	1,710	548	260	84	43	.....	200	638	360
25	3,440	660	31,100	1,060	548	231	92	95	.....	287	588	588
26	2,510	560	31,100	800	468	297	123	71	.....	344	532	474
27	2,310	502	27,900	800	514	282	76	71	.....	1,170	488	360
28	1,780	474	11,970	19,000	3,790	273	117	44	.....	692	447	328
29	1,480	.....	5,680	11,600	2,130	200	84	90	.....	460	415	349
30	1,210	.....	4,000	5,170	1,220	209	107	87	.....	415	402	372
31	1,250	.....	3,790	.....	900	.....	87	44	.....	415	.....	401

NOTE.—Discharge Feb. 10–23 estimated from measurements made Feb. 13 and Feb. 21 and hydrograph comparison with records of Genesee River at Rochester. New rating curve used beginning Mar. 13 1913, probably a backwater curve up to some time during the flood, when it became the open-water curve.

Monthly discharge of Genesee River at St. Helena, N. Y., for 1913.

[Drainage area, 1,030 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	14,600	1,140	4,800	4.66	5.37	A.
February	1,300	*a* 300	577	.560	.58	C.
March	31,100	424	5,330	5.17	5.96	B.
April	19,000	449	2,610	2.53	2.82	B.
May	3,790	296	917	.890	1.03	A.
June	1,000	120	406	.394	.44	B.
July	188	76	119	.116	.13	A.
August	104	41	66.6	.065	.07	B.
September	.....	.....	50	.049	.05	C.
October	1,170	20	208	.202	.23	A.
November	4,360	222	832	.808	.90	A.
December	588	273	373	.362	.42	A.
The year	31,100	20	1,370	1.33	18.00	

a Estimated.

NOTE.—Discharge Sept. 15–30, inclusive, estimated by comparison with records of Genesee River at Jones Bridge and Rochester.

GENESEE RIVER AT JONES BRIDGE, NEAR MOUNT MORRIS, N. Y.

Location.—At highway bridge known as Jones Bridge, about 5 miles below the village of Mount Morris, 6 miles by river above the village of Geneseo, 1¾ miles below the inflow of Canaseraga Creek, and about 1¾ miles above the mouth of Beads Creek.

Records available.—May 22, 1903, to April 30, 1906; August 12, 1908, to December 31, 1913. Data also in annual reports of the State engineer and surveyor and the State of New York Conservation Commission.

Drainage area.—1,410 square miles.

Gage.—Chain, fastened to upstream side of highway bridge; read daily morning and evening to hundredths. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 5.0, and tenths above 5.0 feet.

Control.—Sandy clay; likely to shift, but, as shown by measurements, fairly permanent in recent years.

Discharge measurements.—Made at all stages from footbridge erected on the outriggers of the bridge.

Winter flow.—Discharge relation for the winter months considerably affected by ice. Volume of flow during the winter months determined chiefly by comparison with the flow of the Genesee at Rochester and at St. Helena.

Floods.—The crest of the flood of March 25–30, 1913, reached gage height 27.6 feet, as shown by the observer's gage readings and later verified by engineers of the Geological Survey from high-water marks. The corresponding discharge of 19,300 second-feet, or 13.7 second-feet per square mile of drainage area, was much less than the maximum rate of run-off of Genesee River at St. Helena. This apparent discrepancy is explained by the large amount of river storage between the two stations, which also accounts for the much longer duration of the high stage at Jones Bridge, the mean discharge at the latter station for the two days, March 26 and 27, being 19,200 second-feet, or 13.6 second-feet per square mile.

Accuracy.—Discharge curve well developed; data as published for open-water periods probably good.

Discharge measurements of Genesee River at Jones Bridge, near Mount Morris, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 20[a]	C. S. De Golyer	6.96	672
Apr. 28	do	22.62	14,400
June 25	do	4.44	467

[a] Measurement made under complete ice cover.

Daily gage height, in feet, of Genesee River at Jones Bridge, near Mount Morris, N. Y., for 1913.

[J. W. Trewer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.7	6.5	.....	11.8	14.0	5.9	4.2	3.7	3.41	3.28	4.7	4.7
2	6.4	6.2	.....	9.4	10.1	6.8	4.1	3.45	3.55	3.32	4.7	4.7
3	6.8	6.2	.....	8.6	8.6	6.0	4.25	3.20	3.5	3.30	4.5	4.6
4	10.8	6.0	.....	9.1	7.7	5.7	3.85	3.55	3.48	3.45	4.40	4.5
5	8.8	6.2	.....	11.7	7.0	5.3	3.8	3.5	3.40	3.46	4.35	4.5
6	8.6	6.7	.....	9.6	6.6	5.1	3.8	3.49	3.47	3.5	4.3	4.5
7	16.2	.....	.....	8.8	6.1	5.1	4.0	3.30	3.36	3.7	4.35	4.5
8	18.9	.....	.....	8.3	5.9	6.2	3.85	3.38	3.30	3.7	4.55	4.5
9	20.6	.....	.....	7.9	5.8	5.6	3.9	3.36	3.31	3.9	5.4	4.6
10	13.8	.....	17.6	7.5	5.5	5.1	3.85	3.37	3.32	3.5	11.6	4.5
11	10.8	.....	19.6	7.7	5.4	4.8	3.7	3.34	3.34	3.40	8.0	4.6
12	17.3	.....	18.0	8.8	5.3	4.7	3.85	3.42	3.36	3.40	7.2	4.65
13	16.6	.....	12.4	7.6	5.2	4.6	3.7	3.47	3.36	3.95	6.8	4.7
14	11.1	.....	13.8	7.0	5.1	4.45	3.8	3.40	3.31	3.9	6.4	4.65
15	9.4	.....	14.6	6.8	5.0	4.35	3.8	3.26	3.26	3.8	6.7	4.85
16	9.2	.....	12.6	6.6	5.0	4.3	3.8	3.36	3.30	3.75	6.0	4.95
17	17.4	.....	8.6	6.3	4.95	4.35	3.6	3.18	3.30	3.44	5.8	4.7
18	23.5	.....	7.3	5.9	4.9	4.15	3.65	3.04	3.30	3.5	5.8	4.6
19	22.5	.....	7.3	5.8	4.9	4.25	3.6	3.14	3.34	3.48	5.7	4.5
20	15.8	7.0	6.9	5.7	4.9	.....	3.6	3.18	3.34	3.7	5.6	4.5
21	18.4	.....	6.8	5.6	4.8	.....	3.7	3.14	3.18	4.15	5.6	4.5
22	13.2	.....	6.7	5.5	5.1	.....	3.75	3.20	3.28	4.25	5.7	4.5
23	10.3	.....	6.3	5.7	5.5	.....	3.65	3.17	3.22	4.35	5.2	4.35
24	16.0	.....	6.4	7.6	5.3	.....	3.5	3.22	3.54	4.35	5.2	4.35
25	11.2	.....	22.2	6.6	5.4	.....	3.5	3.11	3.31	4.2	5.2	4.9
26	9.5	.....	27.5	6.0	5.1	4.55	3.6	3.45	3.44	4.5	4.95	4.8
27	9.0	.....	27.5	5.9	4.8	4.6	3.55	3.6	3.36	5.0	4.95	5.8
28	8.0	.....	26.6	22.5	10.0	4.75	3.6	4.0	3.40	5.3	4.9	6.3
29	7.1	.....	23.6	25.6	9.6	4.4	3.55	3.7	3.25	5.2	4.8	.....
30	6.7	.....	17.4	21.4	7.3	4.15	3.48	3.7	3.48	4.9	4.75	.....
31	6.7	.....	12.7	.....	6.5	.....	3.55	3.30	.....	4.7	.....	.....

NOTE.—Discharge relation affected by ice about Feb. 5 to Mar. 9, and Dec. 27–31.

Daily discharge, in second-feet, of Genesee River at Jones Bridge, near Mount Morris, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,210	1,500	.....	5,020	6,760	1,180	364	198	126	98	572	572
2	1,450	1,340	.....	3,330	3,820	1,670	328	136	160	106	572	572
3	1,670	1,340	.....	2,790	2,790	1,230	383	82	148	102	484	528
4	4,310	1,230	.....	3,120	2,210	1,060	244	160	143	136	442	484
5	2,920	.....	.....	4,940	1,790	860	228	148	124	138	422	484
6	2,790	.....	.....	3,470	1,560	760	228	148	141	148	402	484
7	8,630	.....	.....	2,920	1,280	760	294	102	115	198	422	484
8	11,000	.....	.....	2,600	1,180	1,340	244	120	102	198	506	484
9	12,500	.....	.....	2,340	1,120	1,010	260	115	104	260	910	528
10	6,600	.....	9,840	2,090	960	760	244	117	104	148	4,870	484
11	4,310	.....	11,600	2,210	910	618	198	111	111	124	2,400	528
12	9,570	.....	10,200	2,920	860	572	244	129	115	124	1,910	550
13	8,970	.....	5,480	2,150	810	528	198	141	115	277	1,670	572
14	4,520	.....	6,600	1,790	760	463	228	124	104	260	1,450	550
15	3,330	.....	7,270	1,670	710	422	228	94	94	228	1,620	641
16	3,190	.....	5,640	1,560	710	402	228	115	102	213	1,230	687
17	9,660	.....	2,790	1,400	687	422	172	79	102	134	1,120	575
18	15,200	.....	1,970	1,180	664	346	185	58	102	148	1,120	528
19	14,200	.....	1,970	1,120	664	383	172	72	111	143	1,060	484
20	8,290	672	1,730	1,060	664	383	172	79	111	198	1,010	484
21	10,600	.....	1,670	1,010	618	402	198	72	79	346	1,010	484
22	6,120	.....	1,620	960	760	402	213	82	98	383	1,060	484
23	3,960	.....	1,400	1,060	960	422	185	77	86	422	810	422
24	8,460	.....	1,450	2,150	860	442	148	86	158	422	810	422
25	4,590	.....	14,000	1,560	910	463	148	68	104	364	810	664
26	3,400	.....	19,200	1,230	760	506	172	136	134	484	687	618
27	3,050	.....	19,200	1,180	618	528	160	172	115	710	687	.....
28	2,400	.....	18,300	14,200	3,750	595	172	294	124	860	664	.....
29	1,850	.....	15,300	17,300	3,470	442	160	198	92	810	618	.....
30	1,620	.....	9,660	13,300	1,970	346	143	198	143	664	595	.....
31	1,620	.....	5,720	.....	1,500	.....	160	102	.....	572	.....	.....

NOTE.—Discharge June 20–25 interpolated.

Monthly discharge of Genesee River at Jones Bridge, near Mount Morris, N. Y., for 1913.

[Drainage area, 1,410 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	15,200	1,450	5,900	4.18	4.82	B.
February	.....	.....	881	.625	.65	D.
March	19,200	.....	5,840	4.14	4.77	D.
April	17,300	960	3,450	2.45	2.73	B.
May	6,760	618	1,520	1.08	1.24	A.
June	1,670	346	657	.466	.52	A.
July	383	143	216	.153	.18	A.
August	287	58	123	.087	.10	B.
September	162	79	116	.082	.09	B.
October	860	98	304	.216	.25	A.
November	4,870	402	1,060	.752	.84	A.
December	687	422	529	.375	.43	A.
The year	19,200	58	1,730	1.23	16.62	

NOTE.—Discharge Feb. 5 to Mar. 9 estimated from one discharge measurement and comparison with records at St. Helena and Rochester. Discharge Dec. 27-31 estimated by comparison with St. Helena and Rochester.

GENESEE RIVER AT ROCHESTER, N. Y.

Location.—At highway bridge known locally as Elmwood Avenue Bridge, at north end of South Park, 3½ miles above center of city of Rochester, 3½ miles below mouth of Black Creek, and 7½ miles above mouth of river.

Records available.—February 9, 1904, to December 31, 1913. Data also in annual reports of the State engineer and surveyor and State of New York Conservation Commission. Elevation of water surface, measurements, and records of flo[illegible] Genesee River at Rochester during flood stages and low water previous to [illegible] published in annual reports of the State engineer and surveyor, 1902, 1903, a[illegible] 1904, and in Water-Supply Papers 24, 65, and 97.

Drainage area.—2,360 square miles.

Gage.—Gurley automatic water-stage register in pump house immediately below bridge on right bank installed in December, 1910. Prior to 1910 a staff gage bolted to the downstream end of first pier from right-hand abutment; read once daily. Elevation of zero of gage, 506.848 feet, Barge canal datum, and 245.591 feet, Rochester city datum.

Control.—Gravel, smooth; considered permanent.

Discharge measurements.—Made from bridge at which staff gage is attached. Prior to 1904, measurements and elevations of water surface taken in conjunction with measurements of water flowing over and around Johnson-Seymour dam in the city of Rochester.

Winter flow.—Affected by ice for short periods, though as a rule channel is open.

Floods.—Crest of flood of March 25–30, 1913, reached gage height 15.02 feet on the afternoon of March 28, the high-water mark being referenced by gage observer and later referred to gage datum by engineers of the Geological Survey. Corresponding discharge, 42,000 second-feet, or 17.8 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well developed for all stages; published data considered good for periods of open water.

Cooperation.—Gage heights furnished by Rochester Light & Railway Co.

56525°—WSP 354—15——5

Discharge measurements of Genesee River at Rochester, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Jan. 23	C. S. De Golyer	5.28	8,860	Apr. 3	C. S. De Golyer	4.03	5,620
Feb. 19[a]	do	1.72	963	6	do	2.51	2,480
Mar. 30	C. C. Covert	11.98	31,800	Nov. 1	R. S. Barnes	1.32	589
30	do	11.31	27,500				

[a] Measurement made by wading.

Daily gage height, in feet, of Genesee River at Rochester, N. Y., for 1913.

[G. A. Bailey, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.02	2.70	1.74	6.69	8.02	2.28	1.29	0.93	0.91	0.80	1.28	1.28
2	2.47	2.90	1.87	4.96	5.96	2.15	1.23	.90	.90	.81	1.25	1.25
3	2.34	2.47	2.18	5.07	4.12	2.38	1.18	.87	.88	.82	1.18	1.29
4	2.70	2.25	1.99	4.11	3.37	2.16	1.13	.85	.85	.80	1.20	1.27
5	3.58	2.13	1.89	4.45	2.98	1.96	1.14	.88	.85	.79	1.19	1.24
6	3.22	2.50	1.80	4.66	2.71	1.78	1.13	.88	.86	.79	1.15	1.23
7	4.07	2.91	1.83	4.02	2.49	1.62	1.08	.86	.80	.75	1.13	1.24
8	5.78	2.77	1.98	3.68	2.32	1.83	1.05	.85	.80	.84	1.08	1.18
9	7.02	2.52	1.63	3.42	2.18	2.08	1.08	.87	.83	.85	1.08	1.22
10	7.29	2.33	3.14	3.20	2.07	1.84	1.08	.88	.81	.91	1.37	1.23
11	5.11	2.41	5.60	3.33	1.97	1.67	1.08	.87	.80	.92	3.40	1.22
12	5.38	2.31	6.36	3.98	1.89	1.56	1.06	.87	.80	.90	2.71	1.21
13	6.84	2.22	6.32	3.77	1.85	1.49	1.04	.85	.79	.86	2.09	1.25
14	5.80	2.31	6.07	3.27	1.80	1.43	.97	.87	.....	.82	1.83	1.26
15	4.54	1.76	6.46	2.96	1.73	1.38	.96	.86	.....	.90	1.93	1.31
16	3.86	1.71	6.14	2.75	1.69	1.32	1.02	.84	.73	.90	2.12	1.38
17	5.20	1.70	.....	2.59	1.67	1.30	1.02	.83	.79	.90	1.95	1.34
18	7.92	1.70	.....	2.42	1.66	1.30	1.00	.77	.78	.91	1.81	1.27
19	8.84	1.65	3.19	2.34	1.61	1.25	.97	.84	.76	.89	1.76	1.22
20	8.82	1.65	3.14	.....	1.57	1.22	.97	.81	.78	.87	1.70	1.19
21	7.76	1.90	3.02	2.12	1.53	1.24	.98	.80	.79	.84	1.81	1.13
22	6.98	2.32	2.86	2.05	1.51	1.35	.97	.83	.79	.94	1.90	1.17
23	5.32	2.66	2.68	2.11	1.65	1.53	.98	.83	.80	.96	1.79	1.19
24	5.06	3.06	2.57	2.75	1.85	1.43	.97	.81	.81	1.10	1.64	1.22
25	5.70	2.52	5.05	2.80	1.80	1.38	.95	.81	.83	1.12	1.59	1.42
26	4.52	2.06	9.00	2.52	1.75	1.50	.93	.82	.86	1.12	1.52	1.59
27	3.89	1.86	11.94	2.26	1.68	1.58	.92	.81	.83	1.21	1.48	1.30
28	6.66	1.75	14.74	3.62	1.91	1.73	.94	.90	.83	1.61	1.39	1.24
29	3.09	.....	14.22	7.35	3.94	1.63	.94	1.06	.79	1.67	1.41	1.25
30	2.80	.....	11.79	8.21	3.45	1.42	.93	.97	.77	1.44	1.34	1.27
31	2.69	.....	9.54	.....	2.69	.....	.94	.91	.....	1.30	.....	1.29

NOTE.—Gage heights affected by ice Feb. 6-20, inclusive. Mean daily gage height computed as mean of 24 hourly gage heights for each day. Gage heights Mar. 28-29 computed from hourly gage heights observed by an employee of the Rochester Railway and Light Co.

Daily discharge, in second-feet, of Genesee River at Rochester, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,630	2,820	1,200	13,100	17,300	2,070	598	271	257	190	587	587
2	2,410	3,190	1,400	8,020	10,900	1,840	532	250	250	196	554	554
3	2,170	2,410	1,900	8,320	5,840	2,240	480	232	238	202	480	598
4	2,820	2,020	1,580	5,820	4,120	1,860	432	220	220	190	500	576
5	4,570	1,810	1,420	6,670	3,340	1,530	442	238	220	186	490	542
6	3,810	1,700	1,290	7,220	2,840	1,260	432	238	226	186	451	532
7	5,720	1,590	1,340	5,600	2,440	1,030	387	226	190	170	432	542
8	10,300	1,470	1,570	4,790	2,140	1,340	362	220	190	214	387	480
9	14,100	1,380	1,040	4,220	1,900	1,730	387	232	208	220	387	521
10	14,900	1,300	3,650	3,770	1,710	1,350	387	238	196	257	692	532
11	8,430	1,220	9,820	4,030	1,550	1,100	387	232	190	264	4,180	521
12	9,180	1,170	12,100	5,500	1,430	942	370	232	190	250	2,840	510
13	13,500	1,130	12,000	5,000	1,360	846	353	220	186	226	1,740	554
14	10,400	1,300	11,200	3,910	1,290	768	299	232	178	202	1,340	564
15	6,900	1,100	12,400	3,300	1,180	705	292	226	170	250	1,490	622
16	5,210	1,040	11,400	2,910	1,130	633	336	214	162	250	1,790	705
17	8,680	1,010	7,800	2,620	1,100	610	336	208	186	250	1,520	656
18	16,900	980	5,600	2,320	1,080	610	320	178	182	257	1,300	576
19	20,000	963	3,750	2,170	1,010	554	299	214	174	244	1,230	521
20	19,900	950	3,650	1,980	956	521	299	196	182	232	1,140	490
21	16,400	1,440	3,420	1,790	900	542	306	190	186	214	1,300	432
22	13,900	2,140	3,110	1,680	874	668	299	208	186	278	1,440	470
23	9,020	2,750	2,780	1,780	1,070	900	306	208	190	292	1,270	490
24	8,290	3,490	2,590	2,910	1,360	768	299	196	196	405	1,060	521
25	10,100	2,500	8,260	3,000	1,290	705	285	196	208	423	984	755
26	6,850	1,700	20,500	2,500	1,210	860	271	202	226	423	887	984
27	5,290	1,380	30,900	2,030	1,110	970	264	196	208	510	833	610
28	13,000	1,210	41,000	4,660	1,460	1,180	278	250	208	1,010	718	542
29	3,550	.....	39,100	15,100	5,410	1,040	278	370	186	1,100	742	554
30	3,000	.....	30,300	17,900	4,280	755	271	299	178	780	656	576
31	2,800	.....	22,300	.....	2,800	.....	278	257	.....	610	.....	598

Monthly discharge of Genesee River at Rochester, N. Y., for 1913.

[Drainage area, 2,360 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	20,000	1,630	8,830	3.74	4.31	A.
February	3,490	a 950	1,680	.712	.74	B.
March	41,000	1,040	10,000	4.24	4.89	B.
April	17,900	1,680	5,150	2.18	2.43	A.
May	17,300	874	2,790	1.18	1.36	A.
June	2,240	521	1,060	.449	.50	A.
July	598	264	350	.148	.17	A.
August	370	178	229	.097	.11	B.
September	257	162	199	.084	.09	B.
October	1,100	170	338	.143	.16	A.
November	4,180	387	1,110	.470	.52	A.
December	984	432	571	.242	.28	A.
The year	41,000	162	2,710	1.15	15.56	

a Estimated.

NOTE.—Discharge interpolated Mar. 17, 18, Apr. 20, and Sept. 14 and 15.

CANADICE LAKE OUTLET NEAR HEMLOCK, N. Y.

Location.—In outlet at foot of lake, which discharges to Genesee River through Hemlock Lake outlet and Honeoye Creek.

Records available.—April, 1903, to December, 1913. Data also in annual reports of the New York State engineer and surveyor and the reports of the city engineer of Rochester, N. Y.

Drainage area.—12.6 square miles, of which 0.7 square mile is lake surface.

Gage.—Hook gage, in channel above gate.

Computation of discharge.—Outflow is measured over a standard thin-edged weir with a 5-foot crest and two end contractions, so arranged with needle timbers at the ends that the length may be increased to 14.96 feet with no end contractions during high water. The weir crest stands 3 feet above the stream channel and is never submerged by backwater. Two additional rectangular gates, each 1 foot square, with three complete contractions and a fourth partial contraction at the bottom, afford by-passes during high water. Depth of water on weir is read each morning to hundredths of a foot by means of the hook gage. Each change of the gates is also noted. Corrections are made for velocity of approach for the higher stages. All computations are made by the Francis formula.

Diversions.—No water is diverted from Canadice Lake above the station.

Regulation.—Outflow of lake at dam above weir controlled by the gates.

Winter flow.—Pool above weir is free from ice throughout winter.

Accuracy.—Observations and computations made with care; results should be very good.

Cooperation.—Data collected and furnished for publication by E. A. Fisher, city engineer, Rochester, N. Y.

Monthly discharge of Canadice Lake outlet near Hemlock, N. Y., for 1913.

[Drainage area, 12.6 square miles.]

Month.	Discharge in second-feet.		Run-off (depth in inches on drainage area).	Mean elevation of lake above low-water mark.
	Mean.	Per square mile.		
January	47.094	3.74	4.31	2.687
February	17.637	1.40	1.46	1.275
March	33.161	2.63	3.03	1.897
April	29.264	2.32	2.59	2.912
May	19.122	1.52	1.75	2.657
June	6.859	.544	.61	2.517
July	6.500	.516	.59	2.276
August	4.529	.359	.41	1.500
September	4.451	.353	.39	.818
October	3.737	.296	.34	.341
November	3.964	.315	.35	.427
December	4,016	.319	.37	.389
The year	15.028	1.20	16.20	1.641

NOTE.—Terminal water surface for 1913 was 0.90 foot lower than for the previous year, corresponding to a draft on storage of 26,948,500 cubic feet or a discharge of 0.855 second-foot for the year.

OWASCO OUTLET NEAR AUBURN, N. Y.

Location.—On farm of George Ridley, 3¾ miles below State dam at outlet of Owasco Lake, 2 miles below center of city of Auburn.

Records available.—November 17, 1912, to December 31, 1913.

Drainage area.—206 square miles (measured on United States Geological Survey topographic sheets).

Gage.—Gurley automatic water-stage register installed over concrete well 3½ feet square and 6 feet deep (inside dimensions). Gage well connected with river by 4-inch cast-iron pipe.

Control.—Gage heights registered by this gage controlled by low concrete weir situated a short distance below the gage. Crest of weir 1 foot wide; slopes of both upstream and downstream faces, ½ : 1. A small horizontal apron built on a level with bed of stream extends downstream 2½ feet from toe of dam. Left-hand end of dam for a distance of 50 feet has mean elevation of gage height 1.28 feet; remaining 50 feet of crest of dam is at gage height 2.12 feet.

Discharge measurements.—Made during low water by wading at a section directly opposite the gage, and from a cable and car at the same section in high water.

Winter flow.—Ice does not form to a sufficient extent to obstruct the control.

Diversions.—An average flow of about 10 second-feet is pumped from Owasco Lake for the municipal water supply of the city of Auburn; proportion returning to stream above gaging station not known.

Floods.—High water of March 25–30, 1913, reached gage height 4.6 feet, as determined from high-water marks by engineers of the Geological Survey. Corresponding discharge, 2,750 second-feet, or 13.3 second-feet per square mile of drainage area.

Accuracy.—Discharge measurements consistent; estimates excellent. The mean daily discharge as obtained from a gage height representing the mean of 24 hourly gage heights is subject to considerable error. The mean daily gage height is therefore not published and the mean daily discharge in the following table is the mean of 24 hourly discharges.

Discharge measurements of Owasco outlet near Auburn, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 14	C. S. De Golyer	3.44	1,010	Apr. 1	C. C. Covert	3.89	1,530
15	do	3.28	878	4	C. S. De Golyer	3.57	1,180
15	do	3.28	879	Aug. 16[a]	G. H. Canfield	1.61	28.5
Feb. 18	do	2.52	335				

[a] Measurement made by wading.

Daily discharge, in second-feet, of Owasco outlet near Auburn, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	207	608	194	1,600	203	a168	149	132	109	.....	52.9	106
2	218	a 534	a 196	1,470	204	174	129	119	117	.....	a 56.2	83.4
3	320	469	230	1,300	234	171	132	a 36.6	91.5	78.6	80.8	95.2
4	367	424	203	1,220	a 117	175	98	130	92.8	56.6	63.8	83.9
5	a 388	391	210	1,170	209	171	133	115	87.4	a 56.0	76.7	90.8
6	471	386	197	a1,110	198	181	a 69.4	121	71.1	90.1	66.8	78.2
7	569	306	214	1,030	154	165	127	114	a 86.3	79.6	70.2	a 83.3
8	606	231	234	924	169	a152	135	112	106	71.6	46.8	84.6
9	675	a 207	a 216	820	172	171	131	87.1	91.9	73.3	a 99.9	92
10	741	200	227	810	176	163	134	a 26.5	87.7	67.7	89.5	95
11	754	207	234	803	a 151	174	124	108	91.7	64.7	67.1	98
12	a 830	247	249	813	175	161	97.7	95.8	84.1	a 47.3	66.3	100
13	905	289	243	a 763	165	154	a 62.1	104	86	99.1	77.3	102
14	915	244	278	716	160	177	128	114	86	74.4	76.0	106
15	844	213	377	648	161	a 59.8	124	103	86	74.4	56.0	110
16	799	a 166	a 464	598	150	135	136	81.1	85	70.6	a 70.0	115
17	853	200	502	545	155	128	123	a 28.4	85	67.3	122	117
18	931	189	472	522	a 147	119	139	103	84	56.7	80.9	109
19	a 955	183	452	504	156	129	143	103	83	a 53.3	94.9	90.2
20	1,010	187	440	a460	158	126	a 94.5	91.3	83	113	93.4	74.8
21	961	178	430	413	157	109	147	97.6	83	83.5	90.7	a 117
22	932	180	425	351	170	a 18.7	135	96.9	82	70	71.2	144
23	948	a 169	a 410	332	156	112	148	81.8	82	70	a 76.2	112
24	881	204	410	265	153	126	131	a 34.0	82	69.4	103	110
25	858	183	410	276	a 107	132	124	101	81	60.2	83.8	110
26	a 821	196	1,000	326	170	133	125	94.7	81	a 90.2	89.8	117
27	765	194	2,000	a 187	164	130	a 69.1	90.4	80	99.5	67.4	130
28	708	197	2,700	256	139	94.2	132	90.1	80	77.3	105	133
29	681	.....	2,750	207	156	a 19.6	123	128	80	72.6	78.5	134
30	654	.....	a2,300	205	113	132	137	79.7	79	74.2	a 78.0	134
31	643	.....	1,800	.....	175	.....	114	a 78.8	79	70.9	.....	135

a Sunday.

NOTE.—Discharge Mar. 20-31, Sept. 13 to Oct. 2, Dec. 9-14, and 25-31, inclusive, estimated from Owasco Lake records. See "Accuracy" in station description.

Monthly discharge of Owasco outlet near Auburn, N. Y., for 1913.

[Drainage area, 206 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,010	207	716	3.48	4.01	A.
February	608	a 166	264	1.28	1.33	A.
March	2,750	194	660	3.20	3.69	B.
April	1,600	a 187	688	3.34	3.73	A.
May	234	a 107	164	.796	.92	A.
June	181	a 18.7	135	.655	.74	A.
July	149	a 62.1	122	.592	.68	A.
August	132	a 26.5	93.5	.454	.52	A.
September	117	71.1	89.5	.434	.48	C.
October	113	a 47.3	73.8	.358	.41	A.
November	122	46.8	78.4	.381	.43	A.
December	144	74.8	106	.515	.59	B.
The year	2,750	a 18.7	266	1.29	17.53	

a Sunday.

NOTE.—Figures indicate the flow as controlled by dam at outlet of Owasco Lake. See footnote to table of daily discharge.

ONEIDA RIVER AT CAUGHDENOY, N. Y.

Location.—At Caughdenoy, about 6 miles above the old Euclid station at Oak Orchard State dam, half a mile below the mouth of Caughdenoy Creek, and 5 miles below Lake Oneida.

Records available.—August 30, 1902, to December 31, 1909 (at Euclid); January 1, 1910, to December 31, 1913 (at Caughdenoy station). Data published also in annual reports of New York State engineer and surveyor.

Drainage area.—1,377 square miles.

Gage.—Staff on right-hand side of stream, about 150 feet upstream from dam.

Discharge measurements.—Discharge measured over a masonry dam 415 feet long, completed at Caughdenoy during the summer of 1909. Crest of dam practically level at elevation 369.4 feet; ogee in cross section; upstream part of crest with slope or batter of 1 foot rise in 2 feet horizontal width; downstream part of crest rounded, with radius of 3.24 feet. Discharge over the dam computed from formulas derived from experiments made by engineers of the United States Geological Survey on a dam of ogee cross section similar in form; correction made for velocity of approach.

Diversions.—In the summer and to some extent in the winter water is diverted past left-hand end of dam through Caughdenoy lock. Estimate of amount so diverted is included in calculated discharge of the river.

Mean daily discharge, in second-feet, of Oneida River at Caughdenoy, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
1	2,737	5,696	2,922	7,979	3,891	2,072	1,019	172	.....	.....	412
2	3,106	5,322	2,922	8,583	3,891	2,122	926	151	.....	.....	283
3	3,258	5,322	3,106	8,836	3,570	2,122	926	259	.....	.....	172
4	2,600	4,958	2,922	8,583	3,411	2,072	1,019	172	.....	.....	172
5	3,258	4,584	2,737	7,979	3,411	2,021	926	222	.....	.....	82
6	3,570	4,584	2,600	8,281	3,258	2,021	283	172	.....	.....	82
7	4,222	4,222	2,330	7,979	2,922	1,703	412	172	.....	.....	412
8	4,584	4,222	2,072	7,979	2,600	1,703	746	151	.....	.....	172
9	5,322	3,891	2,198	7,979	2,463	1,648	832	172	.....	.....	570
10	5,322	3,891	2,330	8,281	2,198	1,648	1,703	151	.....	.....	746
11	5,696	3,570	2,330	8,583	2,147	1,512	659	151	.....	.....	746
12	5,322	3,570	2,600	7,700	2,198	1,566	659	172	.....	.....	570
13	5,696	3,891	3,106	7,400	2,072	1,703	832	121	.....	82	570
14	5,696	3,570	3,258	7,064	2,072	1,430	412	121	.....	82	570
15	5,322	3,258	3,891	7,638	2,021	1,367	385	43	.....	172	412
16	4,958	3,258	4,958	6,496	1,945	1,430	385	43	.....	172	412
17	5,696	3,570	5,322	6,496	2,021	1,219	385	30	.....	283	412
18	6,082	3,258	6,082	6,082	1,824	1,324	344	22	.....	172	283
19	6,496	3,258	5,322	4,958	1,324	1,430	344	.....	.....	283	412
20	6,738	2,922	5,322	5,322	1,566	1,219	385	82	.....	283	412
21	6,738	2,737	5,696	4,958	1,566	1,261	385	22	.....	412	412
22	7,064	2,922	6,082	5,322	1,566	1,119	344	82	.....	412	283
23	7,400	2,922	5,696	4,958	1,824	1,119	412	.....	.....	283	926
24	7,064	3,106	6,082	4,958	1,703	1,119	344	22	.....	570	283
25	6,738	2,922	6,496	4,584	1,703	1,219	344	22	.....	412	412
26	6,496	3,106	6,738	4,584	1,824	1,119	385	82	.....	412	570
27	6,082	2,922	7,979	4,389	2,198	1,079	307	22	82	570	1,324
28	6,738	2,737	8,836	4,222	2,072	1,019	222	.....	172	926	926
29	7,064	.....	9,640	3,891	2,198	1,159	172	.....	22	412	746
30	6,738	.....	10,721	3,570	2,072	1,019	222	22	.....	570	412
31	6,082	.....	9,923	.....	2,072	.....	344	.....	.....	.....	283

Monthly discharge of Oneida River at Caughdenoy, N. Y., for 1913.

[Drainage area, 1,377 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	7,400	2,600	5,480	3.98	4.59
February	5,696	2,737	3,721	2.70	2.81
March	10,721	2,072	4,910	3.57	4.12
April	8,836	3,570	6,491	4.71	5.26
May	3,891	1,324	2,310	1.68	1.94
June	2,072	1,019	1,485	1.08	1.21
July	1,703	172	550	.399	.46
August	259	22	110	.080	.09
September					
October 27–29	172	22			
November	926	82	362	.263	.303
December	1,324	82	467	.339	.391

SALMON RIVER AT STILLWATER BRIDGE, NEAR REDFIELD, N. Y.

Location.—On Stillwater highway bridge, 6¼ miles by road east of Altmar, one-fourth mile above proposed dam of Ontario Power Co., seven-eighths of a mile below Pennock Brook, and 7 miles below mouth of North Branch.

Records available.—June 24, 1911, to December 16, 1913.

Drainage area.—191 square miles.

Gage.—Chain, attached to upstream side of bridge; read daily morning and evening to hundredths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.5, and tenths above 3.5 feet.

Control.—Small stone and gravel.

Discharge measurements.—Made from the bridge or by wading.

Floods.—Crest of flood of March 25–30, 1913, reached gage height 10.5 feet on the afternoon of March 27, as recorded by the gage observer and later verified from high-water marks by engineers of the Geological Survey. Corresponding discharge approximately 10,000 second-feet, or 52.4 second-feet per square mile of drainage area.

Accuracy.—Conditions good; open-water records considered excellent.

Cooperation.—Gage read by an employee of the Salmon River Power Co., of Niagara Falls, N. Y.

Discharge measurements of Salmon River at Stillwater Bridge, near Redfield, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 24[a]	C. S. De Golyer	4.54	763	May 9	R. S. Barnes	2.10	180
Mar. 11[b]	R. S. Barnes	3.06	421	29	C. S. De Golyer	4.65	1,490
29	C. C. Covert	5.49	2,320	30	....do	3.58	785
Apr. 14	R. S. Barnes	4.85	1,630	Nov. 4	G. H. Canfield	2.57	326
14	....do	4.85	1,660	4	....do	2.70	400

[a] Open water at gage; ice cover at control.

[b] Very slight ice effect.

Daily gage height, in feet, of Salmon River at Stillwater Bridge, near Redfield, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.8	3.8	.....	6.6	2.7	2.7	1.67	1.52	1.54	1.58	2.8	2.95
2	3.6	3.4	3.0	5.4	2.6	3.2	1.66	1.54	1.52	1.69	2.6	2.85
3	3.9	3.5	3.0	4.5	2.45	2.9	1.65	1.52	1.50	2.3	2.5	3.0
4	5.3	3.6	2.95	6.2	2.35	2.6	1.62	1.54	1.48	2.2	2.7	3.15
5	5.6	3.4	2.9	7.4	2.3	2.45	1.61	1.52	1.48	1.92	2.95	3.6
6	5.4	3.9	2.85	6.0	2.25	2.3	1.60	1.50	1.48	1.82	2.75	3.35
7	7.0	4.2	2.8	5.0	2.2	2.7	1.60	1.48	1.46	1.74	2.55	3.45
8	7.0	4.2	2.75	4.6	2.15	3.2	1.60	1.47	1.46	1.70	2.4	5.4
9	6.4	4.1	2.7	3.7	2.1	2.75	1.62	1.50	1.45	1.68	2.95	4.2
10	5.8	3.8	2.9	3.5	2.1	2.45	2.65	1.60	1.44	1.66	4.7	3.9
11	5.2	3.6	3.2	4.8	2.05	2.3	2.55	1.62	1.43	1.64	3.7	3.35
12	6.2	3.5	3.5	5.9	2.05	2.2	2.15	1.57	1.43	1.84	3.3	3.2
13	5.9	3.3	3.7	5.2	2.05	2.1	2.9	1.52	1.45	2.05	3.0	3.2
14	5.1	3.2	5.1	4.8	2.05	2.0	2.4	1.50	1.48	2.01	3.7	3.2
15	4.5	3.2	7.4	4.7	2.05	1.96	2.05	1.47	1.47	1.91	3.6	3.05
16	4.4	3.1	7.5	4.6	2.0	1.93	1.90	1.48	1.46	1.91	3.15	3.1
17	5.6	3.0	5.9	4.3	2.05	1.90	1.84	1.44	1.48	1.87	3.0	3.5
18	8.9	3.0	5.0	3.9	2.15	1.83	1.74	1.44	1.53	1.85	2.8	.....
19	8.9	2.95	4.7	3.7	2.25	1.80	1.71	1.42	1.64	2.2	2.85	.....
20	6.8	2.95	5.7	3.4	2.1	1.88	1.66	1.40	1.60	3.9	6.3	.....
21	8.0	3.1	7.4	3.2	2.05	1.92	1.66	1.38	1.88	5.5	5.4	.....
22	7.0	3.5	8.4	3.1	2.95	1.86	1.62	1.54	3.00	4.5	4.2	.....
23	5.6	4.5	5.8	3.0	4.4	1.84	1.61	1.82	2.86	3.7	3.8	.....
24	6.2	4.6	5.5	3.0	3.6	1.77	1.62	1.81	2.11	3.4	3.8	.....
25	5.3	4.4	8.8	2.9	3.1	1.70	1.74	1.70	1.84	5.3	3.5	.....
26	4.6	4.0	9.2	2.8	2.75	1.68	1.65	1.60	1.75	4.8	3.35	.....
27	4.6	.....	9.7	2.75	2.7	1.79	1.60	1.64	1.58	3.9	3.25	.....
28	4.4	.....	8.4	2.7	4.1	1.86	1.60	1.60	1.64	3.35	3.1	.....
29	4.3	.....	5.8	3.1	4.6	1.76	1.60	1.64	1.61	3.2	3.05	.....
30	3.9	.....	4.8	2.95	3.6	1.71	1.60	1.64	1.58	3.25	3.05	.....
31	3.8	.....	5.3	.....	3.0	.....	1.56	1.58	.....	3.05	.....	.....

NOTE.—Discharge relation affected by ice Feb. 6 to Mar. 1. Old dam which formed control at high water washed out by flood Mar. 26, 1913. Gage readings discontinued Dec. 17 on account of backwater which was caused by construction of new dam and which may slightly affect all gage heights for December.

Daily discharge, in second-feet, of Salmon River at Stillwater Bridge, near Redfield, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	672	672	430	3,520	374	374	90	63	67	74	414	478
2	598	532	410	2,150	336	594	88	67	63	93	336	435
3	712	564	410	1,380	283	456	86	63	60	235	300	500
4	1,515	598	396	3,020	250	336	81	67	57	206	374	570
5	1,780	532	381	4,580	235	283	79	63	57	138	478	806
6	1,600	.....	367	2,780	220	235	77	60	57	118	394	670
7	3,260	.....	353	1,780	206	374	77	57	54	103	318	723
8	3,260	.....	340	1,460	193	594	77	56	54	95	266	1,400
9	2,560	.....	326	862	180	394	81	60	52	91	478	1,000
10	1,960	.....	381	750	180	283	355	77	51	88	1,200	900
11	1,440	.....	469	1,620	168	235	318	81	50	84	862	670
12	2,350	.....	564	2,670	168	206	193	72	50	122	644	594
13	2,050	.....	634	1,960	168	180	456	63	52	168	500	594
14	1,360	.....	1,360	1,620	168	156	266	60	57	158	862	594
15	985	.....	3,780	1,540	168	147	168	56	56	136	806	523
16	935	.....	3,910	1,460	156	141	134	57	54	136	570	546
17	1,780	.....	2,050	1,240	168	134	122	51	57	128	500	.....
18	5,840	.....	1,290	980	193	120	103	51	65	124	414	.....
19	5,840	.....	1,100	862	220	114	97	48	84	206	435	.....
20	3,020	.....	1,870	696	180	130	88	45	77	980	2,000	.....
21	4,580	.....	3,780	594	168	138	88	42	130	1,750	1,750	.....
22	3,260	.....	5,140	546	478	126	81	67	505	1,385	1,170	.....
23	1,780	.....	1,960	500	1,310	122	79	118	439	862	920	.....
24	2,350	763	1,690	500	806	108	81	116	183	696	920	.....
25	1,520	.....	5,700	456	546	95	103	95	122	1,600	750	.....
26	1,040	.....	7,100	414	394	91	86	77	104	1,400	670	.....
27	1,040	.....	7,800	394	374	112	77	84	74	980	619	.....
28	935	.....	5,980	374	1,100	126	77	77	84	670	546	.....
29	885	.....	2,560	546	1,460	106	77	84	79	594	523	.....
30	712	.....	1,620	478	806	97	77	84	74	619	523	.....
31	672	.....	2,050	.....	500	.....	70	74	.....	523	.....	.....

NOTE.—New discharge rating curve used beginning Mar. 26, 1913, on account of old dam being washed out. Discharge for December may be too large on account of backwater from new dam under construction below the station.

Monthly discharge of Salmon River at Stillwater Bridge, near Redfield, N. Y., for 1913.

[Drainage area, 191 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,840	598	2,010	10.5	12.11	B.
February	.....	.....	466	2.44	2.54	D.
March	7,800	326	2,140	11.2	12.91	C.
April	4,580	374	1,390	7.28	8.12	A.
May	1,460	156	392	2.05	2.36	A.
June	594	91	220	1.15	1.28	A.
July	456	70	127	.665	.77	A.
August	118	42	68.9	.361	.42	B.
September	505	50	98.9	.518	.58	A.
October	1,750	74	470	2.46	2.84	A.
November	2,000	266	685	3.59	4.00	B.
December 1-16	1,400	.....	514	2.69	3.10	C.
The year	7,800	42	718	3.76	51.03	

NOTE.—See footnote to table of daily discharge.

SALMON RIVER NEAR PULASKI, N. Y.

Location.—At highway bridge known locally as Fox's bridge, about 2½ miles above the village of Pulaski, 2¼ miles above Trout Brook, and 6½ miles above mouth of river.

Records available.—September 5, 1900, to June 30, 1907; August 16 to December 6, 1908; July 14, 1910, to December 31, 1913. Data published also in reports of New York State engineer and surveyor, New York State Water Supply Commission, and State of New York Conservation Commission.

Drainage area.—260 square miles.

Gage.—Chain gage installed July 23, 1902; vertical staff attached to upstream end of center pier of bridge, read September 5, 1900, to the winter of 1901–1902, when it was destroyed by ice; zero of chain gage 1.20 feet below that of original staff gage. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.5, and tenths above 4.5.

Control.—Gravel; fairly permanent.

Discharge measurements.—Made either by wading or from bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—Crest of flood of March 25-30, 1913, reached gage height 8.2 feet during the night of March 27–28, as indicated by records of the gage observer and by determinations from high-water marks by engineers of the Geological Survey. Corresponding discharge approximately 13,300 second-feet, or 51 second-feet per square mile of drainage area.

Accuracy.—Open-water curve well developed. Published data considered good.

Discharge measurements of Salmon River near Pulaski, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 29	C. S. De Golyer	4.38	1,700
Nov. 3[a]	G. H. Canfield	3.10	392

[a] Measurement made by wading.

Daily gage height, in feet, of Salmon River near Pulaski, N. Y., for 1913.

[Seymour J. Fox, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	3.7	.....	5.9	3.25	3.2	2.50	2.35	2.35	2.35	3.3	3.25
2	3.6	3.45	.....	4.8	3.15	3.5	2.50	2.32	2.30	2.48	3.2	3.2
3	3.9	3.5	.....	4.6	3.1	3.35	2.48	2.30	2.30	2.70	3.1	3.3
4	4.5	3.6	.....	5.3	3.0	3.2	2.48	2.32	2.30	2.75	3.1	3.4
5	4.6	3.35	.....	6.2	3.0	3.0	2.45	2.35	2.30	2.65	3.4	3.7
6	4.7	3.3	.....	5.4	2.92	2.95	2.45	2.30	2.28	2.52	3.25	3.5
7	5.7	.....	.....	4.6	2.90	3.0	2.42	2.30	2.25	2.48	3.15	3.45
8	5.6	.....	.....	4.1	2.85	3.65	2.40	2.30	2.30	2.45	3.0	4.5
9	5.0	.....	.....	4.0	2.82	3.3	2.48	2.30	2.23	2.40	3.1	3.9
10	4.6	.....	.....	3.85	2.80	3.1	2.85	2.38	2.25	2.40	4.3	3.9
11	4.7	.....	.....	4.5	2.82	2.98	3.15	2.42	2.25	2.38	4.0	3.6
12	5.0	.....	.....	5.3	2.80	2.88	3.0	2.38	2.25	2.45	3.6	3.4
13	4.8	.....	.....	4.9	2.80	2.80	3.2	2.35	2.25	2.70	3.4	3.5
14	4.5	.....	5.8	4.6	2.80	2.80	3.0	2.30	2.25	2.60	3.8	3.45
15	4.2	.....	6.5	4.6	2.80	2.70	2.95	2.30	2.25	2.60	3.9	3.45
16	4.15	.....	6.5	4.4	2.80	2.70	2.62	2.30	2.25	2.60	3.55	3.45
17	4.8	.....	5.3	4.25	2.80	2.68	2.58	2.30	2.28	2.60	3.35	3.4
18	6.6	.....	4.8	4.0	2.80	2.60	2.52	2.30	2.32	2.58	3.3	3.4
19	6.5	.....	4.9	3.9	2.95	2.60	2.50	2.25	2.42	2.60	3.25	3.2
20	5.6	.....	5.0	3.85	2.85	2.62	2.45	2.25	2.38	3.7	5.0	3.2
21	6.2	.....	6.3	3.65	2.80	2.65	2.48	2.25	2.48	4.9	5.0	3.25
22	5.6	.....	7.0	3.5	3.3	2.65	2.40	2.30	3.25	4.6	4.2	3.2
23	5.4	.....	5.4	3.5	4.4	2.58	2.40	2.50	3.0	3.9	3.8	3.1
24	5.2	.....	5.5	3.4	3.85	2.50	2.40	2.52	2.75	3.9	3.8	3.3
25	4.7	.....	6.8	3.4	3.65	2.55	2.50	2.48	2.68	4.8	3.7	3.25
26	4.4	.....	7.3	3.3	3.3	2.48	2.48	2.40	2.50	4.6	3.5	3.25
27	4.3	.....	7.4	3.3	3.2	2.62	2.40	2.40	2.50	4.2	3.5	2.95
28	4.0	.....	7.0	3.25	3.9	2.62	2.40	2.40	.....	3.7	3.4	2.92
29	3.7	.....	5.5	3.45	4.5	2.60	2.38	2.40	2.35	3.6	3.3	3.0
30	3.8	.....	4.8	3.4	3.8	2.52	2.38	2.42	2.38	3.6	3.3	3.05
31	3.8	.....	5.0	.....	3.5	.....	2.35	2.40	.....	3.45	.....	3.0

NOTE.—Discharge relation affected by ice Feb. 7 to Mar. 13.

Daily discharge, in second-feet, of Salmon River near Pulaski, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,020	845	.....	4,250	500	465	118	79	79	79	535	500
2	760	642	.....	2,090	432	680	118	72	68	112	465	465
3	1,020	680	.....	1,800	400	570	112	68	68	191	400	535
4	1,680	760	.....	2,940	340	465	112	72	68	213	400	605
5	1,800	570	.....	5,080	340	340	104	79	68	172	605	845
6	1,940	535	.....	3,140	296	312	104	68	65	125	500	680
7	3,770	.....	.....	1,800	285	340	96	68	60	112	432	642
8	3,550	.....	.....	1,220	260	802	90	68	68	104	340	1,680
9	2,400	.....	.....	1,120	245	535	112	68	60	90	400	1,020
10	1,800	.....	.....	978	235	400	260	86	60	90	1,440	1,020
11	1,940	.....	.....	1,680	245	329	432	96	60	86	1,120	760
12	2,400	.....	.....	2,940	235	275	340	86	60	104	760	605
13	2,090	.....	.....	2,240	235	235	465	79	60	191	605	680
14	1,680	.....	4,000	1,800	235	235	340	68	60	152	930	642
15	1,330	.....	6,000	1,800	235	191	312	68	60	152	1,020	642
16	1,280	.....	6,000	1,560	235	191	160	68	60	152	720	642
17	2,090	.....	2,940	1,380	235	183	145	68	65	152	570	605
18	6,330	.....	2,090	1,120	235	152	125	68	72	145	535	605
19	6,000	.....	2,240	1,020	312	152	118	60	96	152	500	465
20	3,550	.....	2,400	978	260	160	104	60	86	845	2,400	465
21	5,080	.....	5,370	802	235	172	112	60	112	2,240	2,400	500
22	3,550	.....	7,750	680	535	172	90	68	500	1,800	1,330	465
23	3,140	.....	3,140	680	1,560	145	90	118	340	1,020	930	400
24	2,750	.....	3,340	605	978	118	90	125	213	1,020	930	535
25	1,940	.....	7,020	605	802	135	118	112	183	2,090	845	500
26	1,560	.....	8,880	535	535	112	112	90	118	1,800	680	500
27	1,440	.....	9,270	535	465	160	90	90	118	1,330	680	312
28	1,120	.....	7,750	500	1,020	160	90	90	98	845	605	296
29	845	.....	3,340	642	1,680	152	86	90	79	760	535	340
30	930	.....	2,090	605	930	125	86	96	86	760	535	370
31	930	.....	2,400	.....	680	.....	79	90	.....	642	.....	340

NOTE.—Discharge computed from a well-defined rating curve.

Monthly discharge of Salmon River near Pulaski, N. Y., for 1913.

[Drainage area, 260 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	6,330	760	2,310	8.88	10.24	B.
February	.....	.....	530	2.04	2.12	D.
March	9,270	.....	2,980	11.5	13.26	B.
April	5,080	500	1,570	6.04	6.74	B.
May	1,680	235	491	1.89	2.18	B.
June	802	112	282	1.08	1.20	B.
July	465	79	155	.596	.69	B.
August	125	60	80	.308	.36	B.
September	500	60	106	.408	.46	B.
October	2,240	79	572	2.20	2.54	B.
November	2,400	340	805	3.10	3.46	B.
December	1,680	296	602	2.32	2.68	B.
The year	9,270	60	879	3.38	45.93	

NOTE.—Discharge Feb. 7 to Mar. 13, inclusive, estimated by comparison with records of Black River near Boonville.

ORWELL BROOK NEAR ALTMAR, N. Y.

Location.—At highway bridge 1½ miles by road northwest of Altmar and one-eighth mile above confluence of Orwell Brook with Salmon River.

Records available.—June 23, 1911, to December 31, 1913.

Drainage area.—22.1 square miles.

Gage.—Standard chain attached to downstream side of bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Control.—Composed of small stone and gravel.

Discharge measurements.—Made by wading at low stages; from bridge at high stages.

Winter flow.—Discharge relation probably affected by ice.

Floods.—Maximum gage height recorded by observer during high water of March 25–30, 1913, 4.8 feet on morning of March 27. Corresponding discharge, about 460 second-feet, or 21 second-feet per square mile of drainage area. Determinations made later from high-water marks by engineers of the Geological Survey indicate that crest of flood may have exceeded stage recorded by observer.

Accuracy.—Discharge rating curve well defined; estimates good.

The following discharge measurement was made by C. S. De Golyer by wading at a section 300 feet above the gage:

May 30, 1913: Gage height, 2.42 feet; discharge, 47.3 second-feet.

Daily gage height, in feet, of Orwell Brook near Altmar, N. Y., for 1913.

[Mrs. A. G. White, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.60	2.65	2.40	3.0	2.20	2.15	1.85	1.75	1.70	1.80	2.35	2.25
2	2.35	2.75	2.25	2.92	2.20	2.36	1.85	1.75	1.70	1.82	2.25	2.28
3	3.2	2.78	2.78	2.78	2.15	2.28	1.84	1.75	1.70	1.85	2.20	2.30
4	3.35	2.72	2.62	3.2	2.15	2.20	1.82	1.75	1.70	1.79	2.25	2.35
5	3.05	2.62	2.45	3.05	2.15	2.12	1.80	1.75	1.70	1.78	2.25	2.35
6	3.15	3.0	2.45	2.92	2.12	2.08	1.80	1.74	1.70	1.75	2.20	2.30
7	3.75	.....	2.52	2.78	2.10	2.50	1.79	1.72	1.70	1.75	2.15	2.40
8	3.7	.....	2.62	2.68	2.05	2.35	1.79	1.75	1.69	1.75	2.10	2.82
9	3.5	.....	2.85	2.62	2.05	2.18	1.80	1.75	1.68	1.75	2.38	2.72
10	3.35	.....	2.92	2.50	2.05	2.08	1.98	1.80	1.68	1.75	2.58	2.48
11	3.3	.....	2.82	3.05	2.05	2.05	1.88	1.76	1.70	1.75	2.42	2.42
12	3.2	.....	2.78	2.95	2.05	2.02	1.88	1.75	1.70	1.95	2.35	2.58
13	3.1	.....	2.88	2.72	2.02	2.00	2.05	1.72	1.70	1.95	2.32	2.38
14	3.05	.....	4.7	2.60	2.02	1.98	1.91	1.71	1.70	1.90	2.45	2.35
15	2.81	.....	4.8	2.48	2.02	1.95	1.85	1.70	1.70	1.85	2.35	2.35
16	2.85	3.8	4.0	2.40	2.02	1.95	1.84	1.70	1.70	1.85	2.34	2.35
17	4.0	3.75	4.0	2.38	2.02	1.94	1.82	1.70	1.75	1.85	2.25	2.44
18	4.3	3.7	4.0	2.40	2.11	1.90	1.81	1.70	1.75	1.90	2.22	2.42
19	4.0	3.7	3.15	2.40	2.10	1.90	1.80	1.70	1.70	2.00	2.30	2.41
20	3.5	3.7	3.4	2.35	2.05	1.95	1.78	1.70	1.70	3.0	2.95	2.35
21	3.9	3.2	4.0	2.35	2.05	1.95	1.78	1.70	1.78	3.1	2.68	2.35
22	3.4	2.80	3.6	2.68	2.72	1.94	1.75	1.78	2.16	2.75	2.55	2.32
23	3.05	2.70	3.1	3.0	2.55	1.90	1.75	1.80	1.88	2.55	2.50	2.40
24	3.4	2.80	3.25	3.0	2.40	1.86	1.80	1.75	1.80	2.95	2.45	2.40
25	3.1	3.1	4.2	2.25	2.40	1.85	1.80	1.70	1.80	2.90	2.40	2.40
26	2.88	3.0	4.6	2.25	2.40	1.95	1.79	1.70	1.80	2.92	2.35	2.35
27	2.98	2.70	4.8	2.30	2.75	1.99	1.76	1.70	1.78	2.64	2.30	2.70
28	2.78	2.45	3.8	2.62	2.70	1.94	1.75	1.70	1.78	2.55	2.25	2.52
29	2.62	.....	3.2	3.5	2.58	1.86	1.75	1.80	1.78	2.40	2.25	2.45
30	2.50	.....	3.0	2.25	2.36	1.85	1.75	1.75	1.75	2.40	2.25	2.45
31	2.60	.....	3.1	.....	2.22	.....	1.75	1.70	.....	2.40	.....	2.40

NOTE.—Discharge relation affected by ice about Feb. 6–28.

Daily discharge, in second-feet, of Orwell Brook near Altmar, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	66	72	47	119	30	26	11	8	6	9	42	34
2	42	84	34	108	30	43	11	8	6	10	34	36
3	149	88	88	88	26	36	11	8	6	11	30	38
4	173	81	68	149	26	30	10	8	6	9	34	42
5	126	68	52	126	26	24	9	8	6	8	34	42
6	142	.....	52	108	24	22	9	7	6	8	30	38
7	241	.....	58	88	23	56	9	7	6	8	26	47
8	232	.....	68	76	20	42	9	8	6	8	23	94
9	198	.....	98	68	20	29	9	8	6	8	45	81
10	173	.....	108	56	20	22	16	9	6	8	64	54
11	165	.....	94	126	20	20	12	8	6	8	49	49
12	149	.....	88	112	20	18	12	8	6	15	42	64
13	134	.....	102	81	18	17	20	7	6	15	40	45
14	126	.....	431	66	18	16	13	6	6	13	52	42
15	92	.....	453	54	18	15	11	6	6	11	42	42
16	98	.....	288	47	18	15	11	6	6	11	42	42
17	288	.....	288	45	18	15	10	6	8	11	34	51
18	347	.....	288	47	24	13	9	6	8	13	32	49
19	288	.....	142	47	23	13	9	6	6	17	38	48
20	198	.....	181	42	20	15	8	6	6	119	112	42
21	269	.....	288	42	20	15	8	6	8	134	76	42
22	181	.....	215	76	81	15	8	8	27	84	61	40
23	126	.....	134	119	61	13	8	9	12	61	56	47
24	181	.....	157	119	47	11	9	8	9	112	52	47
25	134	.....	327	34	47	11	9	6	9	105	47	47
26	102	.....	410	34	47	15	9	6	9	108	42	42
27	116	.....	453	38	84	17	8	6	8	71	38	78
28	88	.....	250	68	78	15	8	6	8	61	34	58
29	68	.....	149	198	64	11	8	9	8	47	34	52
30	56	.....	119	34	43	11	8	8	8	47	34	52
31	66	.....	134	.....	32	.....	8	6	.....	47	.....	47

Monthly discharge of Orwell Brook near Altmar, N. Y., for 1913.

[Drainage area, 22.1 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	347	42	155	7.01	8.08	A.
February	.....	.....	40.0	1.81	1.88	D.
March	453	34	183	8.28	9.55	A.
April	198	34	80.5	3.64	4.06	A.
May	84	18	33.7	1.52	1.75	A.
June	56	11	20.7	.937	1.05	B.
July	20	8	10.0	.452	.52	C.
August	9	6	7.16	.324	.37	C.
September	27	6	7.67	.347	.39	C.
October	134	8	38.6	1.75	2.02	B.
November	112	23	44.0	1.99	2.22	A.
December	94	34	49.4	2.24	2.58	A.
The year	453	6	56.1	2.54	34.47	

NOTE.—Discharge Feb. 6-28, inclusive, estimated by comparison with records of Salmon River near Pulaski.

BLACK RIVER NEAR BOONVILLE, N. Y.

Location.—At highway bridge about 2 or 3 miles northeast of Boonville, an equal distance by river downstream from Hawkinsville, and about 1 mile above the mouth of Sugar River, a small tributary from the left.

Records available.—February 16, 1911, to December 31, 1913. Data also published in annual reports of State of New York Conservation Commission and New York State engineer and surveyor.

Drainage area.—303 square miles (measured on United States Geological Survey topographic sheets).

Gage.—Standard chain fastened to the downstream side of the bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.0, half-tenths from 4.0 to 5.5, and tenths above 5.5 feet. A staff gage, reading from 6 to 13 feet, fastened to the downstream right-hand abutment, is used for high-water readings.

Control.—Rough and bowldery; permanent.

Discharge measurements.—At high stages made from cable stretched across stream about half a mile above gage; at low stages made by wading at a section near cable.

Winter flow.—Discharge relation affected by ice.

Diversions.—Part of the flow of Black River is diverted past the gaging station through a feeder taking water at the State dam at Forestport and delivering it to the summit level of Black River canal at Boonville. Part of flow passes northward, supplying Black River canal from Boonville to head of slack-water navigation at foot of Lyon Falls; remainder is diverted from drainage basin and flows into Erie canal at Rome. To determine the amount diverted past the station and out of the drainage basin measurements are made in the Forestport feeder at a farm bridge near Speny Hill, 1 mile northeast of Boonville. Measurements of northward flow in the Black River canal are made at a farm bridge half a mile north of Boonville; measurements of the southward flow at a farm bridge about three-fourths mile southeast of Boonville. The results of these measurements are published in tables that follow. The Forestport feeder was opened for service on May 13, 1913, for the purpose of feeding Erie canal, but the Black River canal did not open until later. When navigation is closed on Erie canal the feeder gates are closed also and the surplus water runs over the dam into Black River. Some water leaks through feeder gates and flows through the feeder into Lansing Kill and Mohawk River. Feeder gates were closed November 30, 1913.

Storage.—A reservoir built by the State at Forest Brook, about 8 miles upstream, stores about 2,000,000,000 cubic feet. About a mile above the station is a site at which a dam 110 feet high would impound 3,300,000,000 cubic feet of water.

Floods.—Crest of flood of March 25–30, 1913, reached gage height about 12.5 feet during the night of March 27–28, as indicated by records of the gage observer and elevation of high-water mark determined by engineers of the Geological Survey. Corresponding discharge, approximately 10,000 second-feet, or 33 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well defined. Records do not represent total run-off from drainage area. See "Diversions."

Discharge measurements of Black River near Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 12	R. S. Barnes	5.44	636	July 29[a]	W. S. Easterly	3.47	70.5
13	do	5.65	622	Aug. 5[a]	do	3.21	40.6
Apr. 15	do	6.10	999	19[a]	do	3.11	33.0

[a] Measurement made by wading.

Discharge measurements of Forestport feeder at Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.[a]	Discharge.	Date.	Hydrographer.	Gage height.[a]	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 9	G. J. Lyon	0.60	289	Aug. 6	W. S. Easterly	0.92	244
July 24	W. S. Easterly	.95	259	7	do	.94	258
25	do	1.18	223	8	do	.97	241
26	do	1.16	252	9	do	1.03	234
28	do	.98	266	10	do	.96	244
29	do	1.06	246	17	do	1.14	247
30	do	1.04	255	18	do	1.05	232
31	do	1.05	242	19	do	.95	239
Aug. 1	do	1.04	251	Sept. 1	C. S. De Golyer	1.06	222
2	do	1.02	244	Oct. 2	W. S. Easterly	.88	262
4	do	1.02	245	28	G. H. Canfield	1.05	262
5	do	.98	246				

[a] Distance from reference point down to water surface.

Discharge measurements of Black River canal (flowing south) at Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 9	G. J. Lyon	1.09	204	Aug. 6	W. S. Easterly	1.16	194
July 24	W. S. Easterly	1.26	194	7	do	1.26	198
25	do	1.17	182	8	do	1.28	187
26	do	1.43	187	9	do	1.35	191
28	do	1.21	185	10	do	1.30	192
29	do	1.22	194	17	do	1.60	159
30	do	1.22	193	18	do	1.35	168
Aug. 1	do	1.24	198	19	do	1.25	177
2	do	1.26	192	Sept. 1	C. S. De Golyer	1.40	160
4	do	1.26	188	Oct. 2	W. S. Easterly	1.20	200
5	do	1.20	187	28	G. H. Canfield	1.17	222

Discharge measurements of Black River canal (flowing north) at Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 11	G. J. Lyon	4.23	59	Aug. 7	W. S. Easterly	6.00	11.8
July 24	W. S. Easterly	4.75	42.1	8	do	4.75	29.6
25	do	4.70	38.4	9	do	4.84	25.0
26	do	4.77	33.8	10	do	4.86	24.8
28	do	4.62	39.8	17	do	4.44	46.8
30	do	4.58	38.6	18	do	4.65	39.0
Aug. 1	do	4.90	29.9	Sept. 1	C. S. De Golyer	4.60	39.5
2	do	4.82	27.6	Oct. 2	W. S. Easterly	4.25	50.6
4	do	4.75	25.9	28	G. H. Canfield	1.94	14.8
6	do	4.82	25.1				

Daily gage height, in feet, of Black River near Boonville, N. Y., for 1913

[W. D. Charboneau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.7	5.9	5.6	7.6	5.1	7.6	4.1	3.16	3.18	3.18	3.95	4.9
2	5.45	5.7	5.5	7.4	5.3	7.6	3.80	3.22	3.02	3.34	3.80	5.15
3	6.4	5.8	5.35	7.4	5.3	7.3	3.40	3.22	3.10	3.45	4.3	5.3
4	7.0	5.9	5.2	7.2	5.6	5.7	3.25	3.22	3.20	4.05	3.38	5.5
5	7.2	5.6	5.15	7.6	5.3	4.95	3.05	3.19	3.24	4.2	3.50	5.6
6	7.3	5.5	5.3	8.0	5.4	4.4	3.10	3.23	3.24	3.95	3.32	5.3
7	7.8	5.45	5.25	7.0	5.35	4.05	3.08	3.16	3.12	3.38	3.10	5.3
8	7.9	5.6	5.15	6.8	5.1	4.05	3.22	3.29	3.28	3.26	3.50	5.4
9	7.6	5.3	5.0	6.6	5.0	3.80	3.22	3.18	3.25	3.08	5.2	5.15
10	7.1	5.15	5.15	6.4	4.9	3.60	3.06	3.28	3.08	8.12	8.2	5.1
11	7.0	5.25	5.35	6.6	4.7	3.60	3.30	3.24	3.02	3.23	8.0	5.25
12	7.0	5.5	5.6	6.6	4.75	3.50	3.55	3.18	3.12	3.38	7.6	5.4
13	6.6	5.35	5.6	6.7	4.7	3.55	3.45	3.15	3.10	3.24	7.3	5.3
14	6.2	5.45	7.4	6.4	4.4	3.60	3.50	3.16	3.18	3.28	5.9	5.1
15	6.1	5.5	8.2	6.3	4.45	3.48	3.60	3.26	3.12	3.22	5.4	5.05
16	6.3	5.4	8.4	6.2	4.8	3.36	3.38	3.16	3.18	3.22	5.4	4.85
17	6.6	5.6	6.9	6.6	4.8	3.60	3.48	3.22	3.10	3.20	5.05	5.0
18	7.8	5.3	6.6	6.7	4.55	3.70	3.18	3.14	3.19	3.13	4.95	5.0
19	8.4	5.35	6.6	6.1	4.8	3.85	3.30	3.12	3.12	3.12	4.9	4.6
20	8.4	5.2	6.6	6.2	4.7	4.05	3.09	3.08	3.24	4.15	5.8	4.75
21	8.8	5.3	6.7	6.1	4.75	4.7	3.14	3.11	3.38	5.6	6.4	4.6
22	8.4	5.4	7.4	6.0	4.9	4.9	3.25	3.15	3.55	6.3	6.0	4.65
23	7.8	5.3	7.6	6.0	6.2	4.85	3.38	3.28	3.90	5.4	5.8	4.4
24	7.5	5.25	7.7	5.8	5.8	4.7	3.32	3.20	3.75	5.35	5.8	4.6
25	7.1	5.3	8.4	6.0	5.8	4.4	3.22	3.18	3.40	5.25	5.7	4.7
26	6.8	5.6	10.6	6.0	5.6	4.6	3.20	3.14	3.60	5.1	5.3	4.8
27	6.4	5.6	10.6	5.7	5.7	4.65	3.15	3.22	3.60	4.85	5.05	4.55
28	6.1	5.4	10.8	5.7	6.4	4.6	3.20	3.22	3.29	4.8	4.8	4.7
29	5.9	.....	9.1	5.4	7.3	4.5	3.44	3.22	3.02	4.75	5.0	4.7
30	5.9	.....	7.8	5.4	7.7	4.4	3.28	3.16	3.12	4.9	4.8	4.6
31	6.0	.....	7.6	.....	7.6	.....	3.18	3.18	.....	4.7	.....	4.8

NOTE.—Discharge relation probably not materially affected by ice during the early part of the year, but affected by ice about Dec. 27–31.

Daily discharge, in second-feet, of Black River near Boonville, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	735	855	680	2,380	450	2,380	164	39	40	40	136	370
2	605	735	630	2,160	535	2,380	111	44	28	55	111	470
3	1,210	795	558	2,160	535	2,050	61	44	34	66	205	535
4	1,740	855	490	1,940	680	735	46	44	42	154	59	630
5	1,940	680	470	2,380	535	390	30	41	46	184	72	680
6	2,050	630	535	2,860	580	227	34	45	46	136	53	535
7	2,620	605	512	1,740	558	154	33	39	36	59	34	535
8	2,740	680	470	1,540	450	154	44	50	49	47	72	580
9	2,380	535	410	1,370	410	111	44	40	46	33	490	470
10	1,840	470	470	1,210	370	84	31	49	33	36	3,110	450
11	1,740	512	558	1,370	305	84	51	46	28	45	2,860	512
12	1,740	630	680	1,370	320	72	78	40	36	59	2,380	580
13	1,370	558	680	1,460	305	78	66	38	34	46	2,050	535
14	1,060	605	2,160	1,210	227	84	72	39	40	49	855	450
15	990	630	3,110	1,140	238	70	84	47	36	44	580	430
16	1,140	580	3,360	1,060	335	57	59	39	40	44	580	352
17	1,370	680	1,640	1,370	335	84	70	44	34	42	430	410
18	2,620	535	1,370	1,460	262	97	40	37	41	36	390	410
19	3,360	558	1,370	990	335	119	51	36	36	36	370	275
20	3,360	490	1,370	1,060	305	154	33	33	46	174	795	320
21	3,880	535	1,460	990	320	305	37	35	59	680	1,210	275
22	3,360	580	2,160	920	370	370	46	38	78	1,140	920	290
23	2,620	535	2,380	920	1,060	352	59	49	127	580	795	227
24	2,270	512	2,500	795	795	305	53	42	104	558	795	275
25	1,840	535	3,360	920	795	227	44	40	61	512	735	305
26	1,540	680	6,390	920	680	275	42	37	84	450	535	335
27	1,210	680	6,390	735	735	290	38	44	84	352	430	.....
28	990	580	6,680	735	1,210	275	42	44	50	335	335	.....
29	855	.....	4,280	580	2,050	250	65	44	28	320	410	.....
30	855	.....	2,620	580	2,500	227	49	39	36	370	335	.....
31	920	.....	2,380	.....	2,380	.....	40	40	.....	305	.....	.....

NOTE.—Open-water rating curve used Jan. 1 to Dec. 26. Discharge from about Feb. 8 to Mar. 8 may be slightly large for this reason.

Monthly discharge of Black River near Boonville, N. Y., for 1913.

[Drainage area, 303 square miles.]

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
January	3,880	605	1,840	A
February	855	470	616	C
March	6,680	410	2,000	B
April	2,860	580	1,340	A
May	2,500	227	676	A
June	2,380	57	415	A
July	164	30	55.4	B
August	50	33	41.5	B
September	127	28	49.4	B
October	1,140	33	225	B
November	3,110	34	738	A
December	680	227	403	A
The year	6,680	28	702	

NOTE.—Estimates do not indicate natural flow, as stream is regulated at Forestport reservoir and certain amounts of water are diverted out of the drainage area and around the station. See "Diversions" and "Storage" in station description.

BLACK RIVER AT FELTS MILLS, N. Y.

Location.—At dam of Lefevre Paper Co., formerly owned by Black River Traction Co., about 1½ miles above village of Felts Mills. Dam is 9 miles upstream from Watertown and 7 miles upstream from the old gaging station at Huntingtonville.

Records available.—February, 1897, to December, 1901, at Huntingtonville dam; August 29, 1902, to December 31, 1913, at Felts Mills. Data also in annual reports of the State of New York engineer and surveyor.

Drainage area.—1,851 square miles.

Gage.—Vertical staff attached to crib at left-hand side of stream above mill; gage readings corrected for velocity of approach during high water.

Determination of discharge.—Previous to August 16, 1910, records were kept of the flow over a dam about 100 feet upstream from the paper mill; dam was of sawed timber resting on a limestone foundation and its main crest was 380.6 feet long. New concrete dam was constructed in summer of 1910 about 100 feet downstream. Main crest of dam for low and medium stages, 300.45 feet long, 3.75 feet wide, and about 6 feet high; upstream face vertical; downstream, semi-ogee section. On right-hand side is an additional section of greater elevation, 48.2 feet long; on left-hand side, angling upstream, is a section 139.7 feet long, making total length of dam for high-water discharge approximately 488.4 feet. A wood-pulp mill constructed at the left-hand end of the dam has been in operation since 1907. The mill contains one 45-inch and four 72-inch Smith-McCormick turbines. Discharge over spillways is calculated by means of weir formula, using coefficients derived from experiments by the United States Geological Survey on a dam of similar cross section. Record is kept of hours run and of gate opening of each wheel as well as head under which turbines operate.

Winter flow.—Discharge relation affected by ice.

Regulation.—Power plants and storage above station.

Accuracy.—Results believed to be good for a station of this type.

Cooperation.—Data as published furnished by New York State engineer and surveyor.

Mean daily discharge, in second-feet, of Black River at Felts Mills, N. Y., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,308	15,234	3,267	a 2,634	1,399	923	467	537	2,840	2,671
2	a 1,996	13,907	3,187	3,290	1,309	923	923	1,115	a 1,666	2,671
3	2,795	13,695	2,762	3,197	1,309	a 527	923	537	2,431	2,589
4	2,657	14,346	a 2,243	2,754	254	955	923	1,399	1,776	2,509
5	2,840	13,907	2,476	2,589	1,381	955	521	a 1,491	2,509	2,671
6	2,528	a13,925	1,329	2,431	a 720	955	923	1,719	2,509	2,754
7	2,528	13,695	1,962	2,137	1,320	923	a 208	1,329	2,509	a 3,170
8	2,528	12,635	1,836	a 1,577	1,309	923	537	1,303	2,509	3,480
9	a 2,243	10,719	1,836	2,208	1,320	923	537	923	a 5,488	3,578
10	2,952	9,445	1,776	1,898	1,399	a 527	730	1,320	5,687	3,578
11	3,868	8,446	a 1,666	1,665	1,399	641	730	923	6,315	3,290
12	4,140	8,120	1,898	1,665	1,341	923	730	(a)	6,575	2,431
13	4,828	a 7,303	1,613	1,474	a 1,322	923	665	1,341	6,188	2,671
14	8,042	7,802	1,367	1,474	1,816	923	a 467	1,049	5,647	a 2,429
15	14,346	7,646	1,474	a 1,082	1,816	923	730	1,399	5,048	2,840
16	a18,590	6,779	1,435	1,341	1,506	923	537	1,116	a 3,060	2,754
17	17,362	5,967	1,517	1,435	955	a 653	665	923	3,578	2,509
18	15,989	5,143	a 1,240	1,320	923	923	730	955	3,290	2,509
19	13,482	4,504	1,776	1,399	923	923	730	a 859	2,926	2,589
20	11,166	a 4,335	1,836	1,341	a 720	923	537	955	4,369	1,836
21	10,454	4,605	1,962	1,435	923	923	a 467	5,444	5,048	a 1,666
22	10,641	3,914	1,776	a 1,160	923	923	537	5,811	5,166	2,208
23	a14,640	3,830	1,776	1,517	923	923	553	6,061	a 4,839	2,137
24	14,346	3,514	2,975	1,563	934	a 467	896	5,244	4,932	1,719
25	14,786	3,348	a 2,634	1,435	1,204	955	1,116	4,969	4,261	1,322
26	17,362	3,107	3,157	1,517	923	923	923	a 4,095	3,538	2,280
27	27,260	a 2,831	2,714	1,309	a 254	923	923	4,301	3,065	1,653
28	32,166	3,107	2,631	1,341	1,013	923	a 720	4,231	3,105	a 1,666
29	31,176	3,107	4,193	a 788	923	923	923	4,231	2,886	1,876
30	a24,373	3,267	4,857	1,309	923	923	923	3,422	a 1,848	1,563
31	16,933	.....	4,857	.....	923	a 527	.....	3,197	.....	1,816

a Sunday.

Monthly discharge of Black River at Felts Mills, N. Y., for 1913.

[Drainage area, 1,851 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
March	32,166	1,996	11,365	6.14	7.08
April	15,234	2,831	7,739	4.18	4.66
May	4,857	1,240	2,323	1.25	1.44
June	3,290	788	1,743	0.942	1.05
July	1,816	254	1,107	0.598	0.689
August	955	467	856	0.462	0.533
September	1,116	208	706	0.381	0.425
October	6,061	537	2,329	1.25	1.44
November	6,575	1,666	3,854	2.08	2.32
December	3,578	1,322	2,433	1.31	1.51

MOOSE RIVER AT MOOSE RIVER, N. Y.

Location.—In the village of Moose River, about 3 miles downstream from McKeever station on Adirondack division of New York Central & Hudson River Railroad, 5 miles below mouth of South Branch of Moose River, and nearly 20 miles above junction of Black and Moose rivers at Lyons Falls.

Records available.—June 5, 1900, to December 31, 1913. Data also in annual reports of the New York State engineer and surveyor and State of New York Conservation Commission.

Drainage area.—370 square miles (measured on United States Geological Survey topographic sheets).

Gage.—Staff, in two sections, fastened to left bank a short distance above cable; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 5.5, half-tenths from 5.5 to 6.5, and tenths above 6.5 feet. Gage datum was lowered 0.17 foot February 28, 1903, and again 5.00 feet January 1, 1913.

Control.—Composed of cobble and bowlders; fairly permanent.

Discharge measurements.—Made from a cable a short distance below gage.

Regulation.—Flow regulated for power and log driving by a timber dam at McKeever. During parts of year, therefore, two gage readings a day may not give a representative mean.

Winter flow.—Discharge relation affected by ice.

Floods.—Crest of flood of March 25–30, 1913, reached gage height 16.3 feet on afternoon of March 27, as indicated by gage-height hydrograph and verified by engineers of the Geological Survey. Corresponding discharge, approximately 15,500 second-feet, or 42 second-feet per square mile of drainage area.

Accuracy.—Open-channel rating curve fairly accurate. Discharge data for periods of open water considered good.

Discharge measurements of Moose River at Moose River, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 15	C. S. De Golyer	[a] 5.54	153
15	W. S. Easterly	[a] 5.46	145
Oct. 27	G. H. Canfield	8.37	1,380
27	.....do.....	8.34	1,360

[a] Measurement made by wading.

Daily gage height, in feet, of Moose River at Moose River, N. Y., for 1913.

[Chris Hannan, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.6	6.7	6.8	9.9	6.6	8.0	6.1	5.55	5.18	5.8	6.8	7.2
2	7.8	6.9	6.7	9.7	6.7	8.2	6.0	5.44	5.34	5.95	6.0	7.0
3	8.1	7.0	6.8	9.8	6.6	8.3	6.15	5.55	5.46	6.5	6.7	6.8
4	8.4	7.2	6.6	9.8	6.5	7.8	6.1	5.44	5.41	6.8	6.7	6.4
5	8.2	7.6	6.8	10.4	6.45	7.5	6.2	5.55	5.5	6.3	7.1	6.5
6	8.2	7.5	6.6	10.4	6.35	7.0	5.9	5.65	5.41	6.1	7.0	6.4
7	8.8	7.2	6.8	10.1	6.4	6.7	5.6	5.8	5.12	6.1	6.8	5.9
8	9.8	6.9	6.9	9.5	6.35	6.5	5.55	5.09	5.20	6.0	6.7	6.8
19	9.6	6.9	7.0	8.7	6.4	6.5	5.45	6.15	5.11	5.85	7.2	7.8
10	9.2	6.8	7.3	8.0	6.4	6.45	5.55	5.9	5.20	5.6	11.2	7.2
11	8.7	6.8	7.8	7.9	6.2	6.5	5.85	5.6	5.25	5.5	9.4	6.8
12	8.6	6.7	8.1	7.9	6.25	6.25	6.1	5.6	5.31	5.18	8.4	6.8
13	8.6	6.8	8.6	8.2	6.1	6.25	6.0	5.55	5.29	5.44	8.4	7.0
14	8.6	6.9	9.1	8.2	5.9	6.35	6.1	5.55	5.21	5.8	8.1	6.8
15	8.1	6.9	10.4	8.3	5.7	6.25	5.95	5.42	5.28	6.0	8.2	6.8
16	7.8	7.0	10.7	7.8	5.6	6.2	5.8	5.6	5.30	6.2	8.1	6.5
17	8.6	7.0	10.2	7.7	5.5	6.2	5.95	5.12	5.36	6.1	7.7	6.6
18	9.6	6.8	10.0	7.7	5.4	6.15	5.65	5.6	5.39	6.3	7.5	6.8
19	10.4	6.8	9.8	7.9	5.9	6.1	5.55	5.41	5.65	5.8	7.6	6.6
20	9.8	6.8	9.6	7.7	6.3	6.15	5.44	5.11	5.55	6.6	8.2	6.6
21	10.8	6.8	9.8	7.5	6.5	6.05	4.94	5.30	5.39	8.8	9.2	5.7
22	10.4	6.6	10.0	7.2	6.6	5.95	5.19	5.48	5.55	8.8	8.6	6.1
23	9.9	6.9	10.2	7.2	6.7	6.0	4.94	5.44	5.42	8.1	8.9	5.85
24	9.7	7.2	11.3	7.1	6.9	5.9	5.44	5.06	5.5	7.8	8.3	5.25
25	9.2	7.6	12.2	7.2	7.0	5.7	4.94	5.21	5.6	7.4	8.0	5.29
26	8.8	7.8	14.2	7.2	7.0	5.5	4.94	5.34	5.7	7.7	7.8	5.6
27	8.0	7.3	15.5	7.1	7.1	6.4	4.94	5.6	5.8	8.4	7.8	6.25
28	7.6	7.0	13.8	6.8	8.0	6.5	5.49	5.44	5.6	8.1	8.0	6.05
29	7.2	.....	12.8	6.6	9.3	6.4	5.55	5.31	5.8	7.8	7.7	6.3
30	7.1	.....	11.8	6.5	8.8	6.3	5.65	5.19	5.6	7.5	7.6	6.6
31	6.8	.....	10.2	.....	8.4	.....	5.55	5.14	.....	7.0	.....	6.35

NOTE.—Discharge relation not materially affected by ice during winter of 1912–13.

Daily discharge, in second-feet, of Moose River at Moose River, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	910	510	545	2,760	476	1,150	316	164	79	229	545	710
2	1,020	585	510	2,570	510	1,290	286	136	112	272	286	625
3	1,220	625	545	2,660	476	1,360	331	164	141	442	510	545
4	1,430	710	476	2,660	442	1,020	316	136	128	545	510	409
5	1,290	910	545	3,280	426	855	346	164	151	377	665	442
6	1,290	855	476	3,280	393	625	257	189	128	316	625	409
7	1,760	710	545	2,960	409	510	176	229	69	316	545	257
8	2,660	585	585	2,390	393	442	164	64	83	286	510	545
9	2,480	585	625	1,670	409	442	138	331	67	243	710	1,020
10	2,120	545	755	1,150	409	426	164	257	83	176	4,230	710
11	1,670	545	1,020	1,090	346	442	243	176	93	151	2,300	545
12	1,590	510	1,220	1,090	362	362	316	176	105	79	1,430	545
13	1,590	545	1,590	1,290	316	362	286	164	101	136	1,430	625
14	1,590	585	2,030	1,290	257	393	316	164	85	229	1,220	545
15	1,220	585	3,280	1,360	202	362	272	131	99	286	1,290	545
16	1,020	625	3,620	1,020	176	346	229	176	103	346	1,220	442
17	1,590	625	3,060	965	151	346	272	69	117	316	965	476
18	2,480	545	2,860	965	126	331	189	176	124	377	855	545
19	3,280	545	2,660	1,080	257	316	164	128	189	229	910	476
20	2,660	545	2,480	965	377	331	136	67	164	476	1,290	476
21	3,740	545	2,660	855	442	301	42	103	124	1,760	2,120	202
22	3,280	476	2,860	710	476	272	81	146	164	1,760	1,590	316
23	2,760	585	3,060	710	510	286	42	136	131	1,220	1,850	243
24	2,570	710	4,360	665	585	257	136	59	151	1,020	1,360	93
25	2,120	910	5,630	710	625	202	42	85	176	805	1,150	101
26	1,760	1,020	9,400	710	625	151	42	112	202	965	1,020	176
27	1,150	755	12,900	665	665	409	42	176	229	1,430	1,020	362
28	910	625	8,800	545	1,150	442	148	136	176	1,220	1,150	301
29	710	.....	6,680	476	2,210	409	164	105	229	1,020	965	377
30	665	.....	5,030	442	1,760	377	189	81	176	855	910	476
31	545	.....	3,060	.....	1,430	.....	164	72	.....	625	.....	393

NOTE.—Discharge throughout year may be determined from open-water rating curve; values somewhat excessive for short period in February.

Monthly discharge of Moose River at Moose River, N. Y., for 1913.

[Drainage area, 370 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,740	545	1,780	4.81	5.54	B.
February	1,020	476	639	1.73	1.80	C.
March	12,900	476	3,030	8.19	9.44	B.
April	3,280	442	1,430	3.86	4.31	B.
May	2,210	126	561	1.51	1.74	B.
June	1,360	151	494	1.32	1.47	B.
July	331	42	194	.524	.60	B.
August	331	59	144	.390	.45	B.
September	229	67	134	.362	.40	B.
October	1,760	79	597	1.61	1.86	B.
November	4,230	286	1,170	3.16	3.53	B.
December	1,020	93	449	1.21	1.40	
The year	12,900	42	888	2.40	32.54	

NOTE.—See footnote to table of daily discharge.

MIDDLE BRANCH OF MOOSE RIVER AT OLD FORGE, N. Y.

Location.—About 300 feet below the highway bridge in Old Forge and about 400 feet below the dam.

Records available.—November 9, 1911, to December 31, 1913; published also in annual reports of New York State engineer and surveyor and State of New York Conservation Commission.

Drainage area.—51.5 square miles.

Gage.—Vertical staff, graduated to feet and tenths, reading from 1 foot to 7 feet, spiked to birch tree on left bank of stream 300 feet below highway bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 2.0, until April 17, and below 1.5 after that date, half-tenths from these limits to 3.0, and tenths above 3.0 feet.

Control.—Rock reef about 200 feet below the gage. Channel fairly straight and uniform from dam to reef. Right bank high and wooded; left bank from highway bridge to within about 50 feet of gage defined by stone wall about 3 feet above ordinary low water.

Discharge measurements.—Made by wading at low and medium stages and from highway bridge at high stages.

Regulation.—Flow controlled at the dam.

Winter flow.—Discharge relation is not affected by ice.

Flood.—Maximum stage of flood of March 25–30, 1913, reached on March 28; computations of discharge through the gates and over the dam at Old Forge indicate mean discharge of 760 second-feet, or 14.8 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well defined; estimates good.

Discharge measurements of Middle Branch of Moose River at Old Forge, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Aug. 15	C. S. De Golyer	1.92	60.3	Sept. 24	O. W. Hartwell	1.70	47.9
16	do	1.92	63.0	25	W. S. Easterly	1.48	56.0
Sept. 23	W. S. Easterly	1.92	61.7	25	do	.99	21.6
23	do	1.15	17.6	26	do	1.70	75.5
24	do	1.56	38.5	26	do	2.12	130
24	do	2.32	116	26	do	1.86	93.5
24	do	2.72	187	26	do	2.54	199

NOTE.—All measurements made by wading. Measurements on Sept. 25 and 26 were made after the control had been cleared of logs and brush.

Daily gage height, in feet, of Middle Branch of Moose River at Old Forge, N. Y., for 1913.

[Vernon S. Ervin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	1.99	1.92	4.8	1.85	1.85	1.15	1.95	1.84	1.55	2.22	2.05
2	1.86	1.98	1.92	4.6	1.85	1.85	1.15	1.95	1.85	1.55	2.22	2.05
3	1.35	1.98	1.92	4.3	1.85	1.85	1.15	1.95	1.85	1.55	2.2	1.40
4	1.35	1.98	1.92	4.1	1.85	1.85	1.15	1.95	1.85	1.55	2.2	.75
5	1.35	1.98	1.92	4.1	1.85	1.85	1.15	1.95	1.85	1.55	2.2	.75
6	1.35	1.98	1.98	4.61	1.85	1.85	1.15	1.95	1.85	1.55	2.2	.75
7	1.35	1.95	1.92	4.0	1.85	2.0	1.15	1.95	1.85	1.55	2.32	.75
8	1.00	1.92	1.92	3.4	1.85	2.15	1.15	1.95	1.85	1.55	2.45	.75
9	1.00	1.90	1.92	2.9	1.58	2.0	1.15	1.95	1.85	1.55	2.45	.75
10	1.00	1.90	1.92	2.85	1.3	1.75	1.15	1.95	1.85	1.55	2.45	.75
11	1.00	1.90	1.92	2.95	1.3	1.38	1.15	1.95	1.85	1.90	2.45	.70
12	1.00	1.90	1.92	3.0	1.3	1.10	1.15	1.95	1.85	2.25	2.45	.70
13	1.00	1.90	1.90	3.0	1.3	1.10	1.15	1.95	1.85	2.25	2.45	.70
14	1.00	1.90	1.98	2.9	1.3	1.10	1.15	1.95	1.85	2.25	2.65	.70
15	1.00	1.90	2.2	2.75	1.3	1.10	1.15	1.95	1.88	2.25	2.85	.70
16	1.00	1.90	3.0	2.6	1.3	1.48	1.15	1.95	1.92	2.25	2.8	.70
17	1.00	1.90	3.0	2.35	1.48	1.48	1.15	1.95	1.92	2.25	2.75	.70
18	1.00	1.88	3.2	2.0	1.65	1.10	1.15	1.95	1.92	2.25	2.7	.70
19	1.20	1.88	3.3	1.85	1.75	1.10	1.15	1.95	1.92	2.25	2.7	.70
20	1.40	1.88	3.2	1.85	1.85	1.10	1.15	1.92	1.92	2.25	2.65	.70
21	1.59	1.88	3.2	2.0	1.85	1.10	1.15	1.95	1.92	2.25	2.72	.70
22	1.71	1.89	3.4	2.2	2.2	1.10	1.15	1.95	1.92	2.25	2.7	.70
23	1.78	1.92	3.5	2.3	2.55	1.10	1.15	1.95	1.92	2.25	2.65	.70
24	1.85	1.92	3.6	2.45	2.4	1.10	1.15	1.95	1.92	2.25	2.65	.70
25	1.88	1.92	4.0	2.45	2.15	1.10	1.15	1.95	.....	2.25	2.61	.70
26	1.91	1.92	4.8	2.3	1.92	1.10	1.15	1.95	1.55	2.2	2.6	.70
27	1.95	1.92	5.5	2.0	1.85	1.10	1.55	1.85	1.55	2.25	2.6	.70
28	1.95	1.92	6.3	1.85	2.3	1.75	1.95	1.85	1.55	2.2	2.1	.70
29	1.95	.....	6.2	2.0	2.75	1.78	1.95	1.85	1.55	2.2	2.9	.70
30	1.95	.....	5.5	2.0	2.45	1.15	1.95	1.85	1.55	2.2	2.1	.70
31	1.95	.....	5.0	.....	2.0	.....	1.92	1.82	.....	2.2	.....	.70

NOTE.—Gage heights affected by back water from North Branch of Moose River Mar. 26 to Apr. 7. Gage heights affected by brush lodged on control from Apr. 18 to Sept. 25. Control cleared of all brush and logs Sept. 25.

Daily discharge, in second-feet, of Middle Branch of Moose River at Old Forge, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	143	83	74	641	58	58	18	67	57	60	142	120
2	68	82	74	617	58	58	18	67	58	60	142	120
3	24	82	74	583	58	58	18	67	58	60	142	48
4	24	82	74	562	58	58	18	67	58	60	142	11
5	24	82	74	549	58	58	18	67	58	60	142	11
6	24	82	82	539	58	58	18	67	58	60	142	11
7	24	78	74	529	58	72	18	67	58	60	158	11
8	10	74	74	328	58	91	18	67	58	60	184	11
9	10	72	74	232	40	72	18	67	58	60	184	11
10	10	72	74	223	25	50	18	67	58	60	184	11
11	10	72	74	242	25	29	18	67	58	99	184	9.0
12	10	72	74	251	25	16	18	67	58	150	184	9.0
13	10	72	72	251	25	16	18	67	58	150	184	9.0
14	10	72	82	232	25	16	18	67	58	150	220	9.0
15	10	72	112	184	25	16	18	67	60	150	262	9.0
16	10	72	251	177	25	34	18	67	64	150	251	9.0
17	10	72	251	135	34	34	18	67	64	150	240	9.0
18	10	70	289	72	44	16	18	67	64	150	230	9.0
19	17	70	308	58	50	16	18	67	64	150	230	9.0
20	27	70	289	58	58	16	18	67	64	150	220	9.0
21	41	70	289	72	58	16	18	67	64	150	230	9.0
22	52	71	328	98	98	16	18	67	64	150	230	9.0
23	59	74	348	113	155	16	18	67	64	150	220	9.0
24	66	74	368	138	129	16	18	67	64	150	220	9.0
25	70	74	451	138	91	16	18	67	62	150	210	9.0
26	73	74	517	113	64	16	18	67	60	142	210	9.0
27	78	74	600	72	58	16	38	58	60	150	210	9.0
28	78	74	760	58	113	50	67	58	60	142	127	9.0
29	78	.....	746	72	194	53	67	58	60	142	274	9.0
30	78	.....	707	72	138	18	67	58	60	142	127	9.0
31	78	.....	665	.....	72	.....	64	56	.....	142	.....	9.0

NOTE.—Discharge determined as follows: Mar. 26 to Apr. 7, inclusive, computed from gate openings and lake elevations at Old Forge dam; Apr. 18 to Sept. 25, from a rating curve well defined by six measurements made with the brush lodged on the control. New curve applicable for remainder of the year defined by six measurements made after control was cleared. Final rating curve does not coincide with curve used before Apr. 17.

Monthly discharge of Middle Branch of Moose River at Old Forge, N. Y., for 1913.

[Drainage area, 51.5 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	143	10	39.9	0.775	0.89	B.
February	83	70	74.6	1.45	1.51	B.
March	760	72	269	5.22	6.02	B.
April	641	58	247	4.80	5.36	B.
May	194	25	65.6	1.27	1.46	A.
June	91	16	35.8	.695	.78	B.
July	67	18	24.9	.483	.56	B.
August	67	56	65.5	1.27	1.46	A.
September	64	57	60.3	1.17	1.30	A.
October	150	60	118	2.29	2.64	A.
November	279	127	194	3.77	4.21	A.
December	120	9.0	17.9	.348	.40	B.
The year	760	9.0	101	1.96	26.59	

NOTE.—Estimates indicate flow as regulated by Old Forge dam at the outlet of Fulton Chain lakes.

STREAMS TRIBUTARY TO ST. LAWRENCE RIVER.

EAST BRANCH OF OSWEGATCHIE RIVER AT NEWTON FALLS, N. Y.

Location.—600 feet below lower dam of the Newton Falls Paper Co., in village of Newton Falls, 4 miles above the mouth of Little River, and 10 miles below the outlet of Cranberry Lake.

Records available.—October 6, 1912, to December 31, 1913.

Drainage area.—166 square miles.[1]

Gage.—Vertical staff, read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 0.5, half-tenths from 0.5 to 2.5, and tenths above 2.5 feet.

Control.—River bed consists of small bowlders and gravel covered with waste from pulp mill.

Discharge measurements.—At low stages made by wading; high-water measurements made from cable 30 feet above gage.

Winter flow.—Effect of ice on discharge relation is diminished by operation of the paper mill.

Regulation.—Some daily fluctuation—probably not enough to affect accuracy of records—caused by dams of the paper mill. Seasonal flow largely controlled by dam at Cranberry Lake. Range of gage heights probably not more than 5 feet.

Floods.—Crest of flood of March, 1913, as recorded by gage observer and later verified from high-water marks by engineers of the Geological Survey, occurred on afternoon of March 28; crest gage height, 6.1 feet; corresponding discharge approximately 2,000 second-feet, or 12 second-feet per square mile of drainage area. Mean discharge for the five days, March 27–31, 1,820 second-feet, or 10 second-feet per square mile of drainage area.

Accuracy.—Discharge curve well defined for ordinary stages. No high-water measurements yet made. Estimates good.

Cooperation.—Gage readings furnished by Newton Falls Paper Co.

Discharge measurements of East Branch of Oswegatchie River at Newton Falls, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 14	R. S. Barnes	1.99	342
Apr. 16	.....do	2.90	565

[1] Computed by engineers of the State of New York Conservation Commission from forestry, highway, and county maps. Probably more accurate than estimate previously published.

Daily gage height, in feet, of East Branch of Oswegatchie River at Newton Falls, N. Y., for 1913.

[Chas. H. Corp, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	3.3	2.0	5.6	1.95	1.5	1.6	2.0	1.6	1.9	2.3	2.3
2	2.1	3.1	.48	5.2	1.95	2.4	1.75	2.0	1.9	1.9	1.15	2.25
3	1.95	3.0	2.35	5.0	1.95	2.35	1.5	.6	1.9	1.9	2.2	2.15
4	2.4	2.9	2.3	5.2	.8	2.35	.10	1.70	1.9	1.9	2.2	1.9
5	2.2	2.8	2.05	5.2	2.0	2.3	.....	2.15	1.9	.45	2.15	2.05
6	3.1	2.8	1.95	5.2	1.95	1.95	.....	2.1	2.1	2.0	2.0	2.25
7	2.9	2.7	1.95	5.2	1.95	2.1	.....	2.1	.85	1.9	1.9	.95
8	2.8	2.6	1.75	4.9	1.95	1.75	.....	2.1	1.9	1.95	1.9	2.3
9	2.8	.....	.7	4.6	2.1	2.45	2.3	2.1	2.2	1.9	.7	2.3
10	2.8	.....	2.1	4.5	1.95	2.1	2.15	.45	2.2	1.9	2.5	2.05
11	3.0	.....	2.15	4.2	.28	2.1	2.15	1.5	2.2	1.85	2.3	2.05
12	3.2	.....	2.3	3.8	1.7	2.0	2.15	1.85	2.2	.42	2.3	2.3
13	3.4	.....	2.1	3.4	1.75	2.0	1.5	1.85	2.0	1.6	2.3	2.3
14	3.1	.....	2.1	3.0	1.75	1.9	2.0	1.9	.48	2.1	2.35	.8
15	3.1	.....	2.45	2.6	1.65	1.75	2.15	1.9	1.5	1.95	2.35	2.3
16	3.1	.....	3.0	2.6	1.65	2.2	1.85	1.9	1.9	1.9	1.1	2.3
17	3.4	.....	3.4	2.5	1.65	2.0	1.85	.42	1.9	1.85	2.25	2.3
18	3.7	.....	3.4	2.5	.22	2.0	1.9	1.6	1.9	1.85	2.2	2.3
19	3.8	2.3	3.3	2.45	1.7	2.5	2.1	1.95	1.9	.30	2.3	2.3
20	3.8	2.3	3.4	1.8	1.65	2.35	.55	1.95	1.9	1.9	2.6	2.05
21	4.4	2.4	3.6	2.4	1.65	1.9	2.4	1.95	.8	2.05	2.7	.10
22	4.4	2.6	4.0	2.35	1.7	.6	2.5	1.95	1.8	2.25	2.3	1.8
23	4.4	1.3	4.0	2.4	1.7	1.65	2.3	1.95	2.1	2.4	2.1	2.05
24	4.4	2.3	4.2	2.35	1.9	1.6	2.05	.8	2.15	2.6	2.3	1.9
25	4.3	2.3	4.6	2.6	.12	1.6	1.85	.7	2.25	2.8	2.2	.8
26	4.1	2.3	5.3	2.8	1.8	1.6	1.85	1.9	2.1	2.8	2.2	1.45
27	4.0	2.3	5.6	1.0	1.95	1.7	.20	1.95	1.9	3.0	2.1	1.7
28	3.8	2.2	6.0	2.4	2.5	1.7	1.5	1.9	.45	2.9	2.0	1.7
29	3.6	.....	6.0	2.35	2.4	.30	1.95	1.9	1.55	2.8	2.0	1.7
30	3.5	.....	5.8	2.15	2.3	1.65	1.95	1.9	2.0	2.8	2.0	1.7
31	3.4	.....	6.0	.....	2.3	.....	2.00	.40	.....	2.3	.....	1.85

NOTE.—Observations suspended because of ice Feb. 9–18, inclusive, and because of brush lodged on control July 5–8, inclusive. Gage height determined from two observations per day weighted from records of time of changing wheels and gates at paper mill.

Daily discharge, in second-feet, of East Branch of Oswegatchie River at Newton Falls, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	394	678	290	1,680	278	183	202	290	202	266	366	366
2	314	610	55	1,480	278	394	233	290	266	266	127	353
3	278	576	380	1,380	278	380	183	65	266	266	340	327
4	394	544	366	1,480	84	380	30	222	266	266	340	266
5	340	512	302	1,480	290	366	180	327	266	53	327	302
6	610	512	278	1,480	278	278	80	314	314	290	290	353
7	544	482	278	1,480	278	314	220	314	90	266	266	101
8	512	452	233	1,330	278	233	300	314	266	278	266	366
9	512	440	74	1,200	314	408	366	314	340	266	74	366
10	512	423	314	1,150	278	314	327	53	340	266	422	302
11	576	410	327	1,020	41	314	327	183	340	255	366	302
12	644	400	366	862	222	290	327	255	340	51	366	366
13	714	390	314	714	233	290	183	255	290	202	366	366
14	610	385	314	576	233	266	290	266	55	314	380	84
15	610	380	408	452	212	233	327	266	183	278	380	366
16	610	377	576	452	212	340	255	266	266	266	120	366
17	714	373	714	422	212	290	255	51	266	255	353	366
18	824	370	714	422	37	290	266	202	266	255	340	366
19	862	366	678	408	222	422	314	278	266	42	366	366
20	862	366	714	244	212	380	61	278	266	266	452	302
21	1,100	394	786	394	212	266	394	278	84	302	482	30
22	1,100	452	940	380	222	65	422	278	244	353	366	244
23	1,100	149	940	394	222	212	366	278	314	394	314	302
24	1,100	366	1,020	380	266	202	302	84	327	452	366	266
25	1,060	366	1,200	452	31	202	255	74	353	512	340	84
26	980	366	1,530	512	244	202	255	266	314	512	340	174
27	940	366	1,680	107	278	222	36	278	266	576	314	222
28	862	340	1,890	394	422	222	183	266	53	544	290	222
29	786	.....	1,890	380	394	42	278	266	192	512	290	222
30	750	.....	1,780	327	366	212	278	266	290	512	290	222
31	714	.....	1,890	.....	366	.....	290	49	.....	366	.....	255

NOTE.—Discharge Feb. 9–18, inclusive, estimated by interpolation, due consideration being given to temperature and precipitation. Discharge July 5–8 estimated.

Monthly discharge of East Branch of Oswegatchie River at Newton Falls, N. Y., for 1913.

[Drainage area, 166 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,100	278	707	4.26	4.91	A.
February	678	149	423	2.55	2.66	B.
March	1,890	55	750	4.52	5.21	B.
April	1,680	107	781	4.70	5.24	B.
May	422	31	242	1.46	1.68	A.
June	422	42	274	1.65	1.84	A.
July	422	30	251	1.51	1.74	A.
August	327	49	232	1.40	1.61	A.
September	353	53	253	1.52	1.70	A.
October	576	42	313	1.89	2.18	A.
November	482	74	323	1.95	2.18	A.
December	366	30	277	1.67	1.92	A.
The year	1,890	30	402	2.42	32.87	

NOTE.—Estimates indicate flow as regulated by Cranberry Lake Dam and paper mills above station.

OSWEGATCHIE RIVER NEAR OGDENSBURG, N. Y.

Location.—At steel highway bridge known locally as Eel Weir Bridge, about 1 mile below mouth of outlet of Black Lake, and 5½ miles above city of Ogdensburg and mouth of river.

Records available.—April 22,1903, to December 31, 1913. Data published also in annual reports of the State of New York Conservation Commission and New York State engineer and surveyor.

Drainage area.—1,580 square miles.

Gage.—Chain, fastened to upstream side of the bridge; read daily, morning and evening, to tenths. Limits of use: Half-tenths below 6.0 and tenths above 6.0 feet.

Control.—Practically permanent. Channel rocky and partly artificial, the rock having been removed underneath the bridge by blasting to increase the bridge opening.

Discharge measurements.—Usually made from the bridge.

Regulation.—Two dams in vicinity of gage; one at Heuvelton, about 5 miles above, and one at Rensselaer Fall, 10 miles above. Seasonal distribution of flow somewhat affected by operation of dam at Cranberry Lake.

Winter flow.—Discharge relation not affected by ice.

Floods.—Highest recorded stage of flood of March, 1913, occurred on afternoon of March 31, the gage height being 9.9 feet, and the corresponding discharge approximately 18,000 second-feet, or 11.4 second-feet per square mile of drainage area.

Accuracy.—Rating curve fairly well defined; open-water curve used throughout year.

Discharge measurements of Oswegatchie River near Ogdensburg, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Aug. 23[a]	C. S. De Golyer	4.66	454	Oct. 31	G. H. Canfield	6.46	3,530
23[a]	do	4.63	411	Dec. 6	C. S. De Golyer	5.89	2,380
Oct. 29	G. H. Canfield	6.52	3,760	6	do	5.89	2,320

[a] Measurement made by wading.

Daily gage height, in feet, of Oswegatchie River near Ogdensburg, N. Y., for 1913.

[Joseph H. La Rue, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.1	7.5	5.5	9.7	5.5	5.85	5.0	4.8	4.5	4.6	6.6	6.1
2	6.2	7.4	5.5	9.4	5.5	5.7	4.9	4.7	4.5	4.75	6.1	6.0
3	6.2	7.2	5.5	9.2	5.4	5.7	4.9	4.7	4.6	4.8	6.1	6.0
4	6.6	7.1	5.5	9.2	4.4	5.7	4.9	4.75	4.6	4.8	6.1	6.1
5	7.0	7.0	5.4	9.4	5.35	5.65	4.9	4.7	4.6	4.8	6.1	6.0
6	7.0	6.7	5.4	9.2	5.3	5.5	4.85	4.7	4.6	4.8	6.0	5.9
7	7.0	6.5	5.4	9.2	5.1	5.5	4.8	4.7	4.6	4.8	5.9	5.95
8	7.1	6.2	5.3	9.2	5.0	5.45	4.8	4.7	4.6	4.8	5.9	6.0
9	7.0	6.2	5.3	9.0	5.0	5.5	4.7	4.7	4.5	4.9	5.6	5.9
10	7.0	6.1	5.3	8.8	5.0	5.5	4.7	4.6	4.55	4.9	6.0	5.9
11	7.0	6.0	5.3	8.5	5.0	5.5	4.7	4.6	4.6	4.9	6.2	5.9
12	7.0	6.0	5.4	8.2	5.0	5.5	4.7	4.7	4.6	4.9	6.2	5.9
13	7.0	5.9	5.4	8.0	5.0	5.5	4.7	4.7	4.6	4.8	6.4	5.8
14	7.2	5.8	6.5	7.9	5.0	5.3	4.7	4.65	4.6	4.8	6.5	5.9
15	7.2	5.7	7.7	7.6	4.9	5.3	4.7	4.6	4.6	4.8	6.5	5.9
16	7.2	5.6	8.3	7.4	4.9	5.3	4.7	4.7	4.6	4.8	6.5	5.9
17	7.2	5.6	8.7	7.0	4.9	5.25	4.7	4.6	4.6	4.8	6.5	6.0
18	7.5	5.6	8.8	6.8	4.9	5.2	4.7	4.6	4.6	4.8	6.2	5.95
19	8.2	5.4	8.8	6.6	4.9	5.2	4.7	4.6	4.6	4.8	6.1	5.8
20	8.7	5.4	8.8	6.4	4.9	5.1	4.7	4.6	4.6	5.0	6.2	5.9
21	9.2	5.4	8.5	6.4	4.9	5.0	4.75	4.6	4.6	5.3	6.2	6.0
22	9.4	5.4	8.4	6.2	4.9	5.0	4.8	4.6	4.7	5.4	6.5	5.95
23	9.4	5.5	8.2	6.2	4.9	5.0	4.8	4.6	4.7	5.9	6.6	5.85
24	9.4	5.6	8.2	6.0	4.9	5.0	4.8	4.6	4.7	6.0	6.6	5.8
25	9.2	5.6	7.9	5.8	4.9	5.0	4.8	4.6	4.7	6.1	6.4	5.8
26	9.1	5.5	8.0	5.7	4.9	5.0	4.8	4.6	4.7	6.1	6.4	5.6
27	8.7	5.5	8.4	5.7	4.9	4.9	4.8	4.6	4.7	6.4	6.4	5.75
28	8.5	5.5	8.8	5.6	5.05	4.85	4.8	4.6	4.7	6.6	6.4	5.65
29	8.2	.....	9.2	5.6	5.25	4.9	4.8	4.6	4.7	6.6	6.4	5.6
30	7.9	.....	9.4	5.5	5.5	4.9	4.8	4.6	4.65	6.6	6.2	5.55
31	7.6	.....	9.8	.....	5.65	.....	4.8	4.6	.....	6.5	.....	5.5

NOTE.—Discharge relation not affected by ice.

Daily discharge, in second-feet, of Oswegatchie River near Ogdensburg, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,730	7,850	2,180	16,500	1,620	2,260	850	600	300	390	3,930	2,770
2	4,020	7,550	2,180	14,800	1,620	1,970	720	490	300	545	2,770	2,560
3	4,020	6,960	2,180	13,800	1,450	1,970	720	490	390	600	2,770	2,560
4	5,180	6,660	2,180	13,800	1,450	1,970	720	545	390	600	2,770	2,770
5	6,360	6,360	1,970	14,800	1,370	1,880	720	490	390	600	2,770	2,560
6	6,360	5,480	1,970	13,800	1,290	1,620	660	490	390	600	2,560	2,360
7	6,360	4,890	1,970	13,800	990	1,620	600	490	390	600	2,360	2,460
8	6,660	4,020	1,770	13,800	850	1,540	600	490	390	600	2,360	2,560
9	6,360	4,020	1,770	12,800	850	1,620	490	490	300	720	1,790	2,360
10	6,360	3,730	1,770	11,800	850	1,620	490	390	345	720	2,560	2,360
11	6,360	3,440	1,770	10,500	850	1,620	490	390	390	720	2,990	2,360
12	6,360	3,440	1,970	9,210	850	1,620	490	490	390	720	2,990	2,360
13	6,360	3,160	1,970	8,400	850	1,620	490	490	390	600	3,440	2,160
14	6,960	2,890	4,890	8,020	850	1,290	490	440	390	600	3,680	2,360
15	6,960	2,640	8,450	6,940	720	1,290	490	390	390	600	3,680	2,360
16	6,960	2,400	10,300	6,250	720	1,290	490	490	390	600	3,680	2,360
17	6,960	2,400	11,500	5,010	720	1,220	490	390	390	600	3,680	2,560
18	7,850	2,400	11,800	4,460	720	1,140	490	390	390	600	2,990	2,460
19	9,960	1,970	11,800	3,930	720	1,140	490	390	390	600	2,770	2,160
20	11,500	1,970	11,800	3,440	720	990	490	390	390	850	2,990	2,360
21	13,000	1,970	10,900	3,440	720	850	545	390	390	1,290	2,990	2,560
22	13,600	1,970	10,600	2,990	720	850	600	390	490	1,450	3,680	2,460
23	13,600	2,180	9,960	2,990	720	850	600	390	490	2,360	3,930	2,260
24	13,600	2,400	9,960	2,560	720	850	600	390	490	2,560	3,930	2,160
25	13,000	2,400	9,050	2,160	720	850	600	390	490	2,770	3,440	2,160
26	12,700	2,180	9,350	1,970	720	850	600	390	490	2,770	3,440	1,790
27	11,500	2,180	10,600	1,970	720	720	600	390	490	3,440	3,440	2,060
28	10,900	2,180	11,800	1,790	920	660	600	390	490	3,930	3,440	1,880
29	9,960	.....	13,000	1,790	1,220	720	600	390	490	3,930	3,440	1,790
30	9,050	.....	13,600	1,620	1,620	720	600	390	440	3,930	2,990	1,700
31	8,150	.....	14,900	.....	1,880	.....	600	390	.....	3,680	.....	1,620

NOTE.—Discharge measurements made during 1913 indicate a change in rating curve; new curve is used beginning Apr. 1, 1913.

Monthly discharge of Oswegatchie River near Ogdensburg, N. Y., for 1913.

[Drainage area, 1,580 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	13,600	3,730	8,410	5.32	6.13	B.
February	7,850	1,970	3,630	2.30	2.40	C.
March	14,900	1,770	7,090	4.49	5.18	B.
April	16,500	1,620	7,640	4.84	5.40	B.
May	1,880	720	992	.628	.72	C.
June	2,260	660	1,310	.829	.92	B.
July	850	490	581	.368	.42	B.
August	600	390	436	.276	.32	B.
September	490	300	408	.258	.29	B.
October	3,930	390	1,440	.911	1.05	B.
November	3,930	1,790	3,140	1.99	2.22	B.
December	2,770	1,620	2,300	1.46	1.68	B.
The year	16,500	300	3,110	1.97	26.73	

RAQUETTE RIVER AT PIERCEFIELD, N. Y.

Location.—About three-fourths of a mile above head of Black Rapids and half a mile below dam of International Paper Co. at Piercefield.

Records available.—August 20, 1908, to December 31, 1913. Data also in annual reports of the State of New York Conservation Commission and the New York State engineer and surveyor.

Drainage area.—723 square miles.[1]

Gage.—Stevens automatic gage installed in 1912. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 7.5, and tenths above 7.5 feet. August 20, 1908, to September 3, 1910, vertical staff fastened to a large pine stump; September 4 to December 31, 1912, chain gage fastened to same stump. Datum of chain gage lowered 2 feet January 1, 1911. Automatic gage is in galvanized sheet-iron house, 4 feet by 6 feet (inside dimensions), and is set over a concrete well 3½ feet square (inside dimensions) and 15 feet deep. Well connected with river by a 4-inch cast-iron pipe 60 feet long. A shear gate valve is set at inner end of pipe for use in cleaning well. Outer end of pipe terminates in a concrete box 1 foot square (inside dimensions), connected with river by three small intake pipes 2 inches in diameter, with outer ends screened. The special construction was considered necessary to keep wood pulp out of intake pipe.

Control.—Head of Black Rapids. Channel opposite gage is a deep pond in which velocity is imperceptible.

Discharge measurements.—Made from cable just above Black Rapids at section formerly used for boat measurements.

Winter flow.—Rapids controlling stream at gage rarely freeze; measurements indicate that discharge relation is little, if any, affected by ice. Open-water rating curve usually applicable throughout year.

Regulation.—Low-water flow controlled by dam of International Paper Co., but mill is usually run for 24 hours each day, except Sundays. Numerous lakes in upper part of drainage basin afford considerable storage, most of which is controlled.

Floods.—Spring flood of 1913 rached maximum stage of 11.68 feet at 3 a. m. April 1, as indicated by the recording gage; corresponding discharge, 7,100 second-feet, or 9.8 second-feet per square mile of drainage area.

[1] All but 16 square miles measured on United States Geological Survey topographic atlas sheets.

Accuracy.—Rating curve well defined. With fluctuations due to regulation recorded by automatic gage, estimates are good.

Cooperation.—Recording gage is attended by an employee of the International Paper Co.

Discharge measurements of Raquette River at Piercefield, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 27[a]	C. S. DeGolyer	5.50	1,110	Dec. 10	C. S. DeGolyer	6.23	1,460
Apr. 8	R. S. Barnes	11.07	6,380	11	do	6.38	1,560
12	O. W. Hartwell	10.10	5,300	30	W. S. Easterly	5.36	989
Oct. 1	W. S. Easterly	3.34	252				

[a] Complete ice cover at gage; control open.

Daily gage height, in feet, of Raquette River at Piercefield, N. Y., for 1913.

[W. B. Graves, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.9	7.7	5.35	11.6	7.4	6.0	4.95	3.6	1.00	.....	.....	.....
2	5.85	7.4	4.1	11.6	7.3	5.95	4.95	2.95	.88	.....	.....	.....
3	5.9	7.45	5.35	11.5	7.15	5.8	5.0	2.64	.90	.....	.....	.....
4	5.8	7.15	5.55	.....	6.95	5.9	5.0	3.55	.94	.....	.....	.....
5	5.15	6.95	5.05	.....	6.85	6.05	4.9	2.36	1.08	.....	.....	.....
6	5.7	6.6	5.0	.....	6.75	5.85	4.9	4.1	1.28	.....	.....	.....
7	5.7	6.75	5.05	.....	6.6	6.2	3.37	4.1	1.76	.....	5.5	.....
8	6.1	6.5	5.05	11.0	6.6	6.15	4.75	3.7	2.79	.....	.....	.....
9	6.2	6.5	4.15	10.8	6.5	6.15	5.0	2.75	2.91	.....	.....	.....
10	6.2	6.4	4.2	10.5	6.25	6.25	4.75	3.85	2.37	.....	.....	6.2
11	6.3	6.4	5.25	10.3	6.0	5.65	4.2	4.05	2.14	.....	.....	6.2
12	6.2	6.0	5.0	10.1	6.05	6.20	4.15	2.82	1.83	.....	.....	6.3
13	6.7	.....	5.05	9.9	5.85	6.1	2.57	4.15	1.79	.....	.....	6.25
14	6.7	.....	5.0	9.3	4.8	5.85	3.7	3.18	1.83	.....	.....	5.9
15	6.8	.....	5.1	9.2	4.8	6.10	3.85	2.34	1.88	.....	.....	6.05
16	6.8	.....	.....	9.2	5.2	6.0	3.65	2.20	2.06	.....	.....	6.1
17	6.95	.....	.....	9.0	5.15	6.0	4.15	1.93	1.98	.....	.....	6.2
18	7.2	.....	.....	8.9	3.8	5.8	4.2	3.95	1.98	.....	.....	6.2
19	7.1	.....	6.75	8.7	4.55	5.8	4.2	3.9	2.17	.....	.....	6.1
20	7.6	.....	6.9	8.3	5.15	5.35	4.2	3.12	2.23	.....	.....	5.75
21	7.8	.....	7.15	8.4	5.15	5.8	4.15	3.27	2.23	.....	7.0	4.55
22	8.0	.....	7.45	8.2	5.2	5.6	3.75	2.59	2.17	.....	.....	5.45
23	8.0	.....	7.5	8.1	5.0	5.55	4.0	1.91	2.29	.....	.....	5.75
24	8.1	.....	8.0	8.0	5.3	5.55	4.0	3.09	2.33	4.5	.....	5.6
25	8.1	.....	8.5	8.0	4.2	5.55	2.59	3.12	3.02	.....	.....	3.25
26	8.0	.....	9.0	7.8	4.2	5.6	2.93	2.78	3.45	.....	.....	5.4
27	8.1	5.2	9.4	7.6	5.85	5.25	2.70	2.62	3.5	.....	.....	5.95
28	8.0	5.05	9.9	7.6	5.75	4.2	3.04	2.21	3.46	.....	.....	4.4
29	7.9	.....	10.4	7.5	5.65	5.2	4.1	2.49	2.93	.....	.....	5.45
30	7.8	.....	10.8	7.5	5.55	5.4	4.1	2.40	3.07	.....	.....	5.45
31	7.7	.....	11.2	.....	5.8	.....	3.9	1.82	.....	.....	.....	5.35

NOTE.—Discharge relation not affected by ice. Gage height computed from mean of 24 hourly gage heights for each day.

Daily discharge, in second-feet, of Raquette River at Piercefield, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,350	2,840	1,020	6,970	2,420	1,320	770	313	15	.....	.....	.....
2	1,320	2,560	515	6,970	2,320	1,290	770	176	11	.....	.....	.....
3	1,350	2,600	1,020	6,910	2,180	1,200	790	132	12	.....	.....	.....
4	1,280	2,340	1,130	6,810	2,010	1,260	790	300	13	.....	.....	.....
5	918	2,160	872	6,700	1,930	1,350	750	101	18	.....	.....	.....
6	1,220	1,860	850	6,590	1,850	1,230	750	455	27	.....	.....	.....
7	1,220	1,980	872	6,460	1,740	1,450	258	455	53	.....	1,030	.....
8	1,490	1,780	872	6,310	1,740	1,420	690	339	151	.....	.....	.....
9	1,560	1,780	530	6,080	1,660	1,420	790	146	169	.....	.....	.....
10	1,560	1,700	545	5,740	1,480	1,480	690	381	102	.....	.....	1,450
11	1,630	1,700	965	5,500	1,320	1,110	485	440	81	.....	.....	1,450
12	1,560	1,420	850	5,280	1,350	1,450	470	155	57	.....	.....	1,520
13	1,940	.....	872	5,040	1,230	1,380	124	470	54	.....	.....	1,480
14	1,940	.....	850	4,380	710	1,230	339	218	57	.....	.....	1,260
15	2,020	.....	895	4,270	710	1,380	381	99	61	.....	.....	1,350
16	2,020	.....	1,090	4,270	880	1,320	326	86	74	.....	.....	1,380
17	2,160	.....	1,400	4,050	858	1,320	470	64	68	.....	.....	1,450
18	2,380	.....	1,650	3,940	367	1,200	485	410	68	.....	.....	1,450
19	2,290	.....	1,980	3,730	610	1,200	485	395	83	.....	.....	1,380
20	2,740	.....	2,110	3,310	858	955	485	206	89	.....	.....	1,170
21	2,940	.....	2,340	3,420	858	1,200	470	237	89	.....	2,060	610
22	3,140	.....	2,600	3,210	880	1,080	353	126	83	.....	.....	1,000
23	3,140	.....	2,650	3,110	790	1,060	425	63	94	.....	.....	1,170
24	3,240	.....	3,140	3,010	930	1,060	425	200	98	590	.....	1,080
25	3,240	.....	3,640	3,010	485	1,060	126	206	188	.....	.....	232
26	3,140	.....	4,140	2,810	485	1,080	172	149	276	.....	.....	980
27	3,240	940	4,540	2,610	1,230	905	139	129	288	.....	.....	1,290
28	3,140	872	5,080	2,610	1,170	485	191	87	279	.....	.....	555
29	3,040	.....	5,630	2,510	1,110	880	455	115	172	.....	.....	1,000
30	2,940	.....	6,070	2,510	1,060	980	455	105	197	.....	.....	1,000
31	2,840	.....	6,510	.....	1,200	.....	395	56	.....	.....	.....	955

NOTE.—Discharge Mar. 16–18 and Apr. 4–7, estimated. Discharge Feb. 13–26 and Oct. 1 to Dec. 9, estimated by comparison with records of flow at Massena Springs.

Monthly discharge of Raquette River at Piercefield, N. Y., for 1913.

[Dainarge area, 723 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,240	918	2,190	3.03	3.49	A.
February	2,840	872	1,540	2.13	2.22	B.
March	6,510	515	2,170	3.00	3.46	A.
April	6,970	2,510	4,600	6.36	7.10	A.
May	2,420	485	1,240	1.72	1.98	A.
June	1,480	485	1,190	1.65	1.84	A.
July	790	124	474	.656	.76	B.
August	470	56	220	.304	.35	B.
September	288	11	101	.140	.16	C.
October	.....	.....	411	.569	.66	D.
November	.....	.....	1,260	1.74	1.94	D.
December	.....	.....	1,220	1.69	1.95	B.
The year	6,970	11	1,380	1.91	25.99	

NOTE.—Estimates indicate flow as regulated by paper-mill dam and numerous lakes immediately above the station. See footnote to table of daily discharge.

RAQUETTE RIVER AT MASSENA SPRINGS, N. Y.

Location.—At highway bridge at Massena Springs, N. Y., 1,000 feet above New York Central & Hudson River Railroad bridge used for freight transfer from railroad station to Massena power plant, 8 miles below Raymondville, and 10 miles above mouth of stream.

Records available.—September 21, 1903, to October 17, 1903; April 9, 1904, to December 31, 1913. Data also in annual reports of the State of New York Conservation Commission and the New York State engineer and surveyor.

Drainage area.—1,170 square miles.

Gage.—Chain gage on concrete bridge. Original gage, a vertical staff on stone wall on left bank about 50 feet upstream from present bridge, was replaced by standard chain gage August 16, 1906, fastened to an old highway bridge just above present bridge. Chain gage was set at datum 1.00 lower than that of the staff gage to avoid negative readings. Chain gage reset in present position February 2, 1912, at such a datum that readings should be comparable with those at the old highway bridge. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 1.5, half-tenths from 1.5 to 2.5, and tenths above 2.5 feet.

Control.—Fairly permanent. Bed of river of coarse gravel and small bowlders.

Discharge measurements.—Made from new bridge to which gage is attached; formerly made from old highway bridge.

Regulation.—Operation of a number of power plants—usually run for 24-hour power but closed on Sundays—above station has marked effect on low-water discharge. Effect of Sunday closing is apparent in the stream for several days.

Winter flow.—Discharge relation not seriously affected by ice during the very mild winter of 1912–13.

Floods.—Maximum stage of spring flood of 1913, as determined from high-water marks by engineers of the Geological Survey, was at gage height 14.2 feet and noted by the gage observer between 9 and 11 a. m. March 31. Corresponding discharge, approximately 16,500 second-feet, or 14.1 second-feet per square mile of drainage area.

Accuracy.—Conditions are fair at the new bridge, but the rating curve has changed somewhat. Determinations of monthly discharge for low-water periods considered erroneous because of artificial regulation of flow.

Discharge measurements of Raquette River at Massena Springs, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 5	R. S. Barnes	13.30	14,900	Aug. 29[a]	C. S. De Golyer	1.66	306
5	do	13.26	14,900	Dec. 8	do	3.85	1,910
17	do	7.38	5,740	9	do	4.39	2,270
Aug. 22[a]	C. S. De Golyer	1.64	294				

[a] Measurement made by wading.

Daily gage height, in feet, of Raquette River at Massena Springs, N. Y., for 1913.

[F. L. Babcock, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.2	8.0	5.5	11.1	5.0	.....	.....	.....	1.40	1.65	3.9	4.8
2	6.2	8.0	5.4	11.3	4.9	.....	.....	.....	1.30	1.65	3.2	4.8
3	6.8	7.8	5.4	11.6	4.6	.....	.....	.....	1.45	1.70	3.5	4.9
4	7.0	7.8	5.4	12.6	4.6	.....	.....	.....	1.25	1.65	3.7	4.2
5	7.0	7.6	5.6	13.5	4.4	.....	.....	.....	1.20	1.45	3.6	4.4
6	6.8	7.4	5.4	12.8	4.2	.....	.....	.....	1.15	1.50	3.4	4.4
7	6.8	7.4	5.4	11.7	4.2	.....	.....	.....	1.00	1.60	3.6	4.6
8	6.7	7.2	5.2	10.6	4.0	.....	.....	.....	1.05	1.35	3.6	4.0
9	6.6	7.0	5.4	9.6	4.0	.....	.....	.....	1.10	1.35	3.2	3.6
10	6.8	6.8	5.4	9.2	3.8	.....	.....	.....	1.20	1.10	3.6	4.4
11	6.8	6.8	5.5	9.1	3.6	.....	.....	.....	1.30	1.10	4.0	4.5
12	7.0	6.5	5.6	8.8	3.6	.....	.....	.....	1.50	1.10	3.8	4.4
13	7.3	6.2	5.6	8.2	3.6	.....	1.85	.....	1.60	.85	3.8	4.6
14	7.7	6.2	5.8	7.8	3.4	.....	1.85	.....	1.45	1.80	3.6	4.7
15	7.4	6.0	6.2	7.1	3.4	.....	1.85	.....	1.40	1.60	3.4	4.5
16	7.6	6.0	7.2	7.0	3.3	.....	1.95	.....	.....	.85	4.2	4.5
17	7.9	5.8	8.6	6.8	3.3	.....	2.05	.....	1.40	1.05	4.3	5.5
18	8.0	6.0	9.0	6.6	3.2	.....	2.15	.....	1.35	1.00	4.3	4.6
19	8.3	6.0	9.0	6.7	3.1	.....	2.0	.....	1.50	2.00	4.2	6.0
20	9.8	5.9	9.2	6.6	3.0	.....	2.1	.....	1.20	.80	4.3	5.8
21	10.2	5.8	9.6	6.4	2.8	.....	2.2	.....	.90	1.45	4.6	5.6
22	10.3	5.8	9.8	6.2	2.8	.....	2.1	1.75	1.15	2.00	4.7	6.4
23	10.2	5.7	9.9	6.2	2.6	.....	2.2	1.55	1.45	3.5	4.5	5.7
24	10.1	5.6	10.0	6.1	2.6	.....	2.05	1.05	1.55	2.9	4.9	6.8
25	9.8	5.3	10.0	6.0	2.8	.....	2.0	1.05	1.55	3.4	4.8	5.8
26	9.6	5.4	9.9	5.7	3.0	.....	2.05	1.55	1.50	4.2	4.8	6.0
27	9.0	5.4	10.0	5.6	3.0	.....	1.8	1.7	1.55	4.0	5.0	6.4
28	8.8	5.4	10.0	5.4	3.0	.....	1.7	1.55	1.25	3.8	4.7	5.4
29	8.7	.....	10.1	5.4	3.0	.....	.....	1.65	1.15	3.8	4.8	5.9
30	8.4	.....	10.8	5.2	3.0	.....	.....	1.85	1.35	3.8	5.0	5.8
31	8.2	.....	12.8	.....	3.0	.....	.....	1.6	.....	4.7	.....	.....

NOTE.—This discharge relation probably affected by ice Dec. 17–31. Gage heights June 1 to July 12 and July 28 to Aug. 21, inclusive, omitted because of errors of observation discovered by comparison with records from automatic gage at Piercefield. New gage reader employed beginning Sept. 17, 1913. Records prior to July 1, 1913, compare well with records from automatic gage at Piercefield and are probably reliable. See accuracy column in table of monthly discharge.

Daily discharge, in second-feet, of Raquette River at Massena Springs, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,290	6,590	3,520	11,400	2,890	.....	.....	.....	200	300	1,840	2,690
2	4,290	6,590	3,410	11,700	2,790	.....	.....	.....	170	300	1,260	2,690
3	5,020	6,310	3,410	12,200	2,490	.....	.....	.....	220	320	1,500	2,790
4	5,270	6,310	3,410	13,800	2,490	.....	.....	.....	155	300	1,660	2,110
5	5,270	6,040	3,630	15,300	2,290	.....	.....	.....	140	220	1,580	2,290
6	5,020	5,780	3,410	14,100	2,110	.....	.....	.....	125	240	1,420	2,290
7	5,020	5,780	3,410	12,300	2,110	.....	.....	.....	85	280	1,580	2,490
8	4,900	5,520	3,210	10,600	1,930	.....	.....	.....	98	185	1,580	1,930
9	4,770	5,270	3,410	8,960	1,930	.....	.....	.....	100	185	1,260	1,580
10	5,020	5,020	3,410	8,350	1,750	.....	.....	.....	140	110	1,580	2,290
11	5,020	5,020	3,520	8,200	1,580	.....	.....	.....	170	110	1,930	2,390
12	5,270	4,630	3,630	7,750	1,580	.....	.....	.....	240	110	1,750	2,290
13	5,640	4,290	3,630	6,870	1,580	.....	395	.....	280	52	1,750	2,490
14	6,180	4,290	3,850	6,310	1,420	.....	395	.....	220	370	1,580	2,590
15	5,780	4,070	4,290	5,370	1,420	.....	395	.....	200	280	1,420	2,390
16	6,040	4,070	5,520	5,240	1,340	.....	445	.....	200	52	2,110	2,390
17	6,450	3,850	7,450	4,980	1,340	.....	495	.....	200	98	2,200	.....
18	6,590	4,070	8,050	4,720	1,260	.....	550	.....	185	85	2,200	.....
19	7,020	4,070	8,050	4,850	1,180	.....	470	.....	240	470	2,110	.....
20	9,270	3,960	8,350	4,720	1,110	.....	520	.....	140	45	2,200	.....
21	9,910	3,850	8,960	4,470	970	.....	580	.....	63	220	2,490	.....
22	10,100	3,850	9,270	4,230	970	.....	520	345	125	470	2,590	.....
23	9,910	3,740	9,430	4,230	830	.....	580	260	220	1,500	2,390	.....
24	9,750	3,630	9,590	4,110	830	.....	495	98	260	1,040	2,790	.....
25	9,270	3,310	9,590	3,990	970	.....	470	98	260	1,420	2,690	.....
26	8,960	3,410	9,430	3,650	1,110	.....	495	260	240	2,110	2,690	.....
27	8,050	3,410	9,590	3,540	1,110	.....	370	320	260	1,930	2,890	.....
28	7,750	3,410	9,590	3,320	1,110	.....	320	260	155	1,750	2,590	.....
29	7,600	.....	9,750	3,320	1,110	.....	.....	300	125	1,750	2,690	.....
30	7,160	.....	10,900	3,100	1,110	.....	.....	395	185	1,750	2,890	.....
31	6,870	.....	14,100	.....	1,110	.....	.....	280	.....	2,590	.....	.....

NOTE.—Discharge curve slightly changed by flood of March, 1913. New rating table used beginning Apr. 1, 1913. Discharge during February may be slightly large on account of ice. Discharge Dec. 17-31 estimated at 1,660 second-feet by comparison with records of Raquette River at Piercefield. See footnote to table of daily gage heights.

Monthly discharge of Raquette River at Massena Springs, N. Y., for 1913.

[Drainage area, 1,170 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	10,100	4,290	6,690	5.72	6.60	B
February	6,590	3,310	4,650	3.97	4.13	C
March	14,100	3,210	6,480	5.54	6.39	B
April	15,300	3,100	7,190	6.15	6.86	A
May	2,890	830	1,540	1.32	1.52	B
June	.....	.....	1,480	1.26	1.41	C
July	.....	.....	659	.563	.65	C
August	.....	.....	359	.307	.35	C
September	260	63	180	.154	.17	B
October	2,590	52	666	.569	.66	B
November	2,890	1,260	2,040	1.74	1.94	B
December	.....	.....	2,020	1.73	1.99	C
The year	15,300	52	2,820	2.41	32.67	

NOTE.—Discharge for periods for which estimates of daily discharge are not published estimated from records of flow at Piercefield, N. Y.

ST. REGIS RIVER AT BRASHER CENTER, N. Y.

Location.—At steel highway bridge in village of Brasher Center, 5 miles downstream from Brasher Falls, 6½ miles below junction of East and West branches of St. Regis River, and about 12 miles above mouth.

Records available.—August 22, 1910, to December 31, 1913.

Drainage area.—621 square miles (measured on post-route map).

Gage.—Chain, fastened to downstream side of bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 4.5, half-tenths from 4.5 to 6.0, and tenths above 6.0 feet.

Control.—Probably permanent. Channel very rough; composed of gravel and large bowlders.

Discharge measurements.—At low stages made by wading at section about 500 feet above bridge; at high stages made from bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—Spring flood of 1913 reached gage height 7.3 feet March 27, as recorded by the morning and afternoon readings of observer. Corresponding discharge, approximately 9,000 second-feet, or 14.5 second-feet per square mile of drainage area.

Accuracy.—Rating curve well defined. Estimates good.

Discharge measurements of St. Regis River at Brasher Center, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 25[a]	C. S. De Golyer	7.24	906	Apr. 18	R. S. Barnes	5.20	1,550
Mar. 17	R. S. Barnes	9.60	3,900	Aug. 21[b]	C. S. De Golyer	3.86	170
Apr. 4	do	6.89	6,440	21[b]	do	3.86	171

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Daily gage height, in feet, of St. Regis River at Brasher Center, N. Y., for 1913.

[Joseph Vanier, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.7	5.65	6.8	6.5	5.0	4.95	4.26	4.12	3.82	4.05	4.9	4.65
2	5.45	5.75	6.6	6.3	4.85	4.8	4.20	4.08	3.84	4.12	4.75	4.45
3	5.35	5.9	6.7	5.8	4.55	4.7	4.18	3.98	3.90	4.50	4.65	4.75
4	5.9	5.95	7.0	6.8	4.40	4.7	4.14	4.10	3.90	4.8	4.55	4.9
5	5.6	6.0	7.2	7.1	4.42	4.7	4.10	4.08	3.82	4.85	4.42	4.85
6	5.65	6.3	6.9	6.8	4.45	4.65	4.12	4.20	3.84	4.7	4.42	4.7
7	6.1	6.6	6.8	6.4	4.5	4.65	4.14	4.22	3.81	4.5	4.5	4.8
8	6.6	6.5	6.9	5.9	4.5	4.9	4.18	4.20	3.81	4.38	4.55	4.9
9	7.0	6.6	6.9	5.75	4.5	4.9	4.15	4.12	3.84	4.31	4.6	4.85
10	7.5	6.8	7.1	5.55	4.5	4.8	4.18	4.05	3.85	4.22	4.8	4.7
11	8.0	7.0	7.2	5.65	4.5	4.75	4.10	4.08	3.84	4.18	5.1	4.7
12	7.3	7.3	7.6	5.65	4.45	4.8	4.15	4.08	3.82	4.20	5.05	4.6
13	7.8	7.2	8.4	5.55	4.55	4.7	4.18	4.02	3.90	4.28	4.9	4.55
14	8.3	7.2	10.0	5.4	4.42	4.6	4.12	4.02	3.90	4.28	4.85	4.7
15	8.0	7.3	11.1	5.25	4.40	4.42	4.12	4.01	3.89	4.32	4.8	4.95
16	7.6	7.3	10.8	5.3	4.45	4.40	4.15	4.02	3.86	4.38	4.7	5.15
17	8.1	7.3	9.6	5.2	4.55	4.29	4.15	4.01	3.82	4.30	4.7	4.75
18	9.3	7.4	9.1	5.2	4.55	4.19	4.10	3.95	3.92	4.25	4.6	4.8
19	8.6	7.4	9.0	5.2	4.6	4.32	4.12	3.95	3.92	4.30	4.5	5.25
20	8.4	7.4	8.6	5.15	4.5	4.32	4.08	3.92	3.96	4.38	5.1	4.9
21	8.6	7.8	8.4	5.2	4.6	4.30	4.08	3.90	4.00	5.15	5.4	4.7
22	8.0	7.2	7.2	5.15	4.6	4.31	4.10	3.84	4.15	5.3	5.3	4.6
23	7.5	7.2	6.2	5.2	4.7	4.24	4.02	3.86	4.3	5.3	5.2	4.7
24	7.3	7.4	6.1	5.2	4.8	4.22	4.02	3.85	4.32	5.2	5.1	4.7
25	6.6	7.2	6.3	5.1	4.8	4.22	4.08	3.81	4.32	5.1	5.1	4.6
26	6.3	7.2	6.6	5.05	4.7	4.24	4.08	3.89	4.22	5.1	5.2	4.5
27	5.95	7.1	7.3	4.95	4.7	4.26	4.02	3.95	4.12	5.3	4.95	5.15
28	5.9	6.8	7.2	4.9	4.8	4.26	4.08	4.04	4.06	5.25	4.9	6.0
29	6.0	.....	7.1	4.9	5.15	4.30	4.10	4.04	4.05	5.2	4.85	5.7
30	6.0	.....	7.1	5.0	5.35	4.30	4.18	4.01	4.02	5.1	4.75	5.3
31	5.95	.....	7.0	.....	5.25	.....	4.15	3.99	.....	4.9	.....	5.35

NOTE.—Discharge relation affected by ice during a large part of January and February, Mar. 1–22, and Dec. 27–31, inclusive.

Daily discharge, in second-feet, of St. Regis River at Brasher Center, N. Y., for 1913.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			4,700	1,270	1,200	423	322	153	277	1,130	801
2			4,040	1,060	990	376	296	162	322	925	590
3			2,740	690	860	362	235	191	638	801	925
4			5,830	542	860	335	308	191	990	690	1,130
5			7,030	561	860	308	296	153	1,060	561	1,060
6			5,830	590	801	322	376	162	860	561	860
7			4,360	638	801	335	392	148	638	638	990
8			2,960	638	1,130	362	376	148	524	690	1,130
9			2,640	638	1,130	342	322	162	463	742	1,060
10			2,230	638	990	362	277	167	392	990	860
11			2,430	638	925	308	296	162	362	1,430	860
12			2,430	590	990	342	296	153	376	1,350	742
13			2,230	690	860	362	258	191	438	1,130	690
14			1,940	561	742	322	258	191	438	1,060	860
15			1,680	542	561	322	252	186	472	990	1,200
16			1,760	590	542	342	258	172	524	860	1,510
17		a3,900	1,590	690	446	342	252	153	454	860	925
18			1,590	690	369	308	218	202	415	742	990
19			1,590	742	472	322	218	202	454	638	1,680
20			1,510	638	472	296	202	224	524	1,430	1,130
21			1,590	742	454	296	191	246	1,510	1,940	860
22			1,510	742	463	308	162	342	1,760	1,760	742
23		3,740	1,590	860	407	258	172	454	1,760	1,590	860
24		3,460	1,590	990	392	258	167	472	1,590	1,430	860
25	a906	4,040	1,430	990	392	296	148	472	1,430	1,430	742
26		5,060	1,350	860	407	296	186	392	1,430	1,590	638
27		7,880	1,200	860	423	258	218	322	1,760	1,200	
28		7,450	1,130	990	423	296	271	283	1,680	1,130	
29		7,030	1,130	1,510	454	308	271	277	1,590	1,060	
30		7,030	1,270	1,850	454	362	252	258	1,430	925	
31		6,620		1,680		342	240		1,130		

a Current-meter measurement.

Monthly discharge of St. Regis River at Brasher Center, N. Y., for 1913.

[Drainage area, 621 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January			3,550	5.72	6.60	C.
February			2,460	3.96	4.12	C.
March			3,430	5.52	6.36	C.
April	7,030	1,130	2,500	4.03	4.50	A.
May	1,850	542	829	1.34	1.54	A.
June	1,200	369	676	1.09	1.22	A.
July	423	258	325	.523	.60	B.
August	392	148	258	.415	.48	B.
September	472	148	233	.375	.42	B.
October	1,760	277	893	1.44	1.66	A.
November	1,940	561	1,080	1.74	1.94	A.
December	1,680	590	919	1.48	1.71	A.
The year	7,880	148	1,420	2.29	31.15	

NOTE.—Discharge, Jan. 1 to Mar. 22, estimated from two discharge measurements by comparison with records of flow of near-by streams. Discharge Dec. 27–31, estimated at 760 second-feet.

DEER RIVER AT BRASHER IRON WORKS, N. Y.

Location.—About 1,000 feet below steel highway bridge in village of Brasher Iron Works (railroad station is Ironton) and 2 miles above confluence of Deer River with St. Regis River in Helena, N. Y. No important tributaries between gage and mouth of river. A small creek enters from left about 1 mile above station.

Records available.—July 25, 1912, to December 31, 1913. (Records from July 25 to December 31, 1912, published in Water-Supply Paper 324 under "Deer River at Ironton, N. Y.")

Drainage area.—206 square miles (measured on post-route map).

Gage.—Wooden sloping gage, 32 feet long, reading from 0.5 foot to 11.0 feet, about 1,000 feet below bridge and 500 feet below remains of an old wooden dam. An auxiliary vertical staff gage, fastened on upstream side of right abutment, is to be used as a reference in making measurements and to determine effect of removal of the dam below. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0 feet.

Control.—Gravel about 300 feet below gage; probably permanent. The stream bed at the bridge is solid rock and is smooth.

Discharge measurements.—At medium and high stages made from bridge; at low stages by wading a short distance above bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—Spring flood of 1913 reached gage height 7.1 feet, as recorded by observer on morning of April 5. Corresponding discharge, approximately 4,500 second-feet, or 21.8 second-feet per square mile of drainage area.

Accuracy.—Rating curve fairly well defined.

Discharge measurements of Deer River at Brasher Iron Works, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 26[a]	C. S. De Golyer	2.78	134	Apr. 18	R. S. Barnes	2.40	297
Mar. 18	R. S. Barnes	2.90	537	Aug. 20[b]	C. S. De Golyer	0.86	21.8
Apr. 4	do	5.60	2,530	20[b]	do	0.88	24.0
4	do	5.65	2,640				

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Daily gage height, in feet, of Deer River at Brasher Iron Works, N. Y., for 1913.

[Alex. Barlow, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.4			4.2	1.86	1.20	1.18	1.15	1.06	0.95	1.75	1.88
2	2.9			3.8	1.78	1.96	1.01	1.14	.89	1.14	1.65	1.92
3	3.5			3.4	1.76	1.85	.98	1.08	1.06	1.86	1.64	2.0
4	4.7			5.2	1.67	1.72	.91	1.15	1.06	2.0	1.61	2.3
5				6.6	1.66	1.68	1.05	1.14	1.08	1.75	1.64	2.3
6				4.2	1.70	1.65	1.00	1.25	1.05	1.58	1.60	2.15
7		3.6	2.5	3.6	1.52	1.66	1.05	1.16	1.04	1.52	1.58	1.99
8				3.2	1.48	1.72	1.06	1.10	1.04	1.40	1.50	2.0
9				2.9	1.51	1.74	1.24	1.10	.92	1.35	1.70	2.0
10	3.6			2.7	1.50	1.73	1.12	1.09	.99	1.25	2.4	2.0
11				2.85	1.48	1.64	1.09	1.06	1.02	1.25	2.2	1.95
12				3.2	1.49	1.54	1.16	.95	.90	1.25	2.0	2.1
13				3.1	1.48	1.52	1.12	1.11	.85	1.34	1.91	1.95
14		3.5	8.0	2.75	1.46	1.42	1.18	1.08	.85	1.41	1.85	2.25
15			6.2	2.55	1.50	1.32	1.20	1.08	.98	1.30	1.79	2.6
16			4.5	2.4	1.52	1.36	1.19	1.08	1.02	1.30	1.70	2.4
17	6.8		3.3	2.3	1.56	1.41	1.12	1.04	1.01	1.35	1.60	1.98
18	6.0		2.9	2.25	1.64	1.32	1.08	.94	1.09	1.29	1.59	2.1
19			3.2	2.4	1.70	1.35	1.10	.80	1.14	1.30	1.58	2.05
20			3.2	2.5	1.72	1.29	1.04	.85	1.12	1.48	2.6	2.1
21		4.0	3.4	2.35	1.68	1.40	1.10	.96	1.12	2.65	2.5	1.80
22			3.6	2.15	1.78	1.31	1.12	.96	1.25	2.4	2.3	1.78
23			3.2	2.3	1.82	1.15	1.08	.95	1.30	2.1	2.65	1.90
24	4.0		3.2	2.35	1.74	1.20	1.06	1.10	1.28	1.92	2.35	2.1
25			4.6	2.2	1.75	1.28	1.14	1.12	1.25	2.15	2.2	1.95
26			4.6	2.15	1.68	1.27	1.21	1.02	1.15	2.05	2.0	1.75
27			5.4	2.2	1.68	1.20	1.19	1.15	1.11	2.3	1.90	1.95
28		2.8	5.1	2.1	1.90	1.24	1.18	1.16	1.10	2.1	1.85	2.00
29			4.2	2.0	2.4	1.26	1.25	1.15	1.04	2.0	1.72	2.2
30			5.2	1.92	2.25	1.24	1.22	1.16	.98	1.92	1.79	2.3
31	2.45		5.1		2.1		1.16	1.08		1.90		2.05

NOTE.—Discharge relation affected by ice Jan. 5 to Mar. 16 and Dec. 29–31, inclusive.

Daily discharge, in second-feet, of Deer River at Brasher Iron Works, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	704	.....	.....	1,190	166	58	56	52	42	30	143	171
2	484	.....	.....	920	149	189	36	51	24	51	124	180
3	754	.....	.....	704	145	164	33	44	42	166	122	199
4	1,590	.....	.....	2,090	128	137	26	52	42	199	117	279
5	.....	.....	.....	3,920	126	129	40	51	44	143	122	279
6	.....	.....	.....	1,190	133	124	35	64	40	112	115	238
7	.....	.....	.....	808	102	126	40	53	59	102	112	197
8	.....	.....	.....	610	96	137	42	46	39	85	99	199
9	.....	.....	.....	484	101	141	63	46	27	78	133	199
10	808	.....	.....	410	99	139	48	45	34	64	309	199
11	.....	.....	.....	465	96	122	45	42	37	64	251	187
12	.....	.....	.....	610	98	105	53	30	25	64	199	225
13	.....	.....	.....	566	96	102	48	47	21	77	177	187
14	.....	.....	.....	428	93	88	56	44	21	86	164	265
15	.....	.....	.....	358	99	74	58	44	33	71	151	375
16	.....	.....	.....	309	102	79	57	44	37	71	133	309
17	4.220	.....	656	279	109	86	48	39	36	78	115	194
18	3,070	.....	484	265	122	74	44	29	45	70	113	225
19	.....	.....	610	309	133	78	46	17	51	71	112	212
20	.....	.....	610	341	137	70	39	21	48	96	375	225
21	.....	.....	704	294	129	85	46	31	48	392	341	153
22	.....	.....	808	238	149	72	48	31	64	309	279	149
23	.....	.....	610	279	157	52	44	30	71	225	392	175
24	1,050	.....	610	294	141	58	42	46	68	180	294	225
25	.....	.....	1,500	251	143	68	51	48	64	239	251	187
26	.....	134	1,500	238	129	67	59	37	52	212	199	143
27	.....	.....	2,310	251	129	58	57	52	47	279	175	187
28	.....	.....	1,980	225	175	63	56	53	46	225	164	199
29	.....	.....	1,190	199	309	66	64	52	39	199	137	.....
30	.....	.....	2,090	180	265	63	61	53	33	180	151	.....
31	325	.....	1,980	.....	225	.....	53	44	.....	175	.....	.....

Monthly discharge of Deer River at Brasher Iron Works, N. Y., for 1913.

[Drainage area, 206 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	1,000	4.85	5.59	D.
February	.....	.....	693	3.36	3.50	D.
March	.....	.....	955	4.64	5.35	D.
April	3,920	180	624	3.03	3.38	B.
May	309	93	138	.670	.77	A.
June	189	52	95.8	.465	.52	A.
July	64	26	48.2	.234	.27	B.
August	64	17	43.2	.210	.24	B.
September	68	21	42.0	.204	.23	B.
October	392	30	142	.689	.79	A.
Novemebr	392	99	186	.903	1.01	A.
December	375	143	210	1.02	1.18	A.
The year	3,920	17	347	1.68	22.83	

NOTE.—Discharge Jan. 1 to Mar. 16 estimated from one discharge measurement by comparison with records of flow of near-by streams. Discharge Dec. 29–31 estimated.

LAKE CHAMPLAIN AND ITS TRIBUTARIES.

RICHELIEU RIVER AT FORT MONTGOMERY, ROUSES POINT, N. Y.

Location.—Inside the fort, 1 mile northeast of village of Rouses Point, three-eighths mile south of the international boundary, and about half a mile from head of Richelieu River, the outlet of Lake Champlain.

Records available.—1875 to 1913. Data published also in the reports of the Deep Waterways Survey and annual reports of New York State engineer and surveyor.

Drainage area.—7,870 square miles, including 436 square miles of water surface (from annual report of New York State engineer and surveyor).

Gage.—Staff, read once daily in the morning to half-tenths. Elevation of gage zero at Fort Montgomery, 92.50 feet above mean sea level; high-water level is at elevation 101.6 feet; probably lowest elevation recorded at Fort Montgomery is 91.9 feet, November 13, 1908.

Cooperation.—Gage heights observed under direction of Corps of Engineers, United States Army, and reported weekly to United States Geological Survey.

Daily gage height, in feet, of Richelieu River at Fort Montgomery, Rouses Point, N. Y., for 1913.

Day.	Jan.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.90	7.80	5.60	3.80	2.40	1.50	0.60	0.20	0.75	0.90
2	.....	2.90	7.50	5.50	3.70	2.30	1.40	.60	.25	.55	.80
3	.....	2.80	7.70	5.40	3.80	2.25	1.10	.65	.30	.75	.60
4	2.80	2.70	7.80	5.35	3.60	2.30	1.20	.50	.30	.60	.80
5	.....	2.75	7.80	5.30	3.70	2.15	1.30	.50	.35	.50	.85
6	.....	2.70	7.95	5.10	3.80	2.10	1.40	.55	.45	.70	.75
7	.....	2.65	7.90	4.90	3.40	2.00	1.10	.65	.45	.75	1.00
8	2.70	2.70	7.85	4.80	3.45	1.95	1.30	.45	.40	.80	.95
9	.....	2.65	7.80	4.70	3.40	2.20	1.20	.35	.35	.60	1.00
10	.....	2.60	7.75	4.50	3.40	1.90	1.20	.40	.30	1.20	1.20
11	.....	2.65	7.90	4.40	3.50	1.80	1.05	.30	.60	.70	.70
12	.....	2.60	7.50	4.30	3.30	1.90	1.10	.40	.35	.60	1.20
13	.....	2.75	7.45	4.40	3.50	1.95	1.00	.35	.30	.85	1.10
14	.....	2.85	7.40	4.10	3.20	1.75	1.10	.30	.10	.60	1.00
15	.....	3.25	7.30	4.05	3.15	1.65	1.10	.30	.25	.60	1.10
16	.....	3.60	7.20	4.10	3.05	1.65	1.05	.30	.10	.65	1.15
17	.....	4.00	7.00	4.00	3.00	1.70	.95	.55	.20	.75	1.20
18	.....	4.20	7.50	3.90	2.90	1.65	.80	.20	.50	.75	1.10
19	.....	4.20	6.70	3.80	2.95	1.60	.80	.25	.20	.65	1.10
20	.....	4.15	6.50	3.75	2.90	1.55	.75	.30	.40	.70	1.30
21	.....	4.30	6.70	3.70	2.80	1.50	.80	.40	.50	.70	1.10
22	.....	4.50	6.80	3.80	2.75	1.60	.85	.30	.40	.80	1.05
23	.....	4.70	6.50	3.60	2.70	1.70	.80	.40	1.10	.75	1.00
24	.....	5.30	6.40	3.50	2.70	1.50	.75	.35	.40	.80	1.10
25	.....	4.95	6.30	3.50	2.60	1.40	.70	.50	.30	.70	1.10
26	.....	5.80	6.15	3.50	2.80	1.30	1.00	.55	.35	.65	.....
27	.....	6.10	6.00	3.45	2.55	1.40	.70	.30	.50	.70	1.15
28	.....	6.90	5.90	3.50	2.45	1.35	.65	.50	.60	1.00	1.10
29	.....	7.70	5.75	3.35	2.50	1.40	.80	.30	.60	.75	1.05
30	.....	7.90	5.60	3.70	2.45	1.35	.65	.25	.50	.80	1.15
31	.....	7.60	.....	3.80	.....	1.30	.70	.....	.55	.....	1.05

SARANAC RIVER NEAR PLATTSBURG, N. Y.

Location.—At the Indian Rapids (Lozier) power plant of the Plattsburg Gas & Electric Co., near Plattsburg, N. Y., and about 6 miles above mouth of river.

Records available.—March 27, 1903, to December 31, 1913.

Drainage area.—607 square miles (measured on United States Geological Survey topographic sheets revised since last report).

Gages.—Crest gage a vertical staff at angle in wing wall at right-hand end of the racks; tailrace gage a vertical staff spiked to crib dike between tailrace and river, about 50 feet below power house.

Determination of discharge.—Discharge computed from flow over a spillway crest 171.25 feet long, through two 5-foot waste gates (when open), and from ratings of two 300 kilowatt alternating current generators. Coefficients for calculation of discharge over dam derived from experiments made at Cornell University hydraulic laboratory on model ogee section of dam. Ratings of waste gates and turbines not available. In 1913 a cable was erected a short distance below the plant and a number of discharge measurements were made with a view to rating the wheels, but it was impossible to operate the plant under all the conditions of load necessary for complete rating. Estimates withheld pending an opportunity to obtain the remainder of the measurements.

Cooperation.—Records furnished by Plattsburg Gas & Electric Co., Herbert A. Stutchbury, superintendent.

Discharge measurements of Saranac River near Plattsburg, N. Y., in 1913.

Date.	Hydrographer.	Gage height.[a]	Discharge.	Date.	Hydrographer.	Gage height.[a]	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
July 26[b]	G. J. Lyon	2.22	347	Aug. 4[d]	G. J. Lyon	2.93	961
27[b]	do	1.66	187	Sept. 2[f]	do	2.18	325
27[b]	do	1.58	168	2[f]	do	1.98	244
27[b]	do	1.62	182	3[f]	do	1.79	204
27[b]	do	1.85	255	3[f]	do	1.66	174
28[b]	do	2.24	353	22[e]	G. H. Canfield	2.20	344
29[b]	do	2.91	556	24[b]	do	2.22	341
29[c]	do	2.70	507	28[b]	do	.64	14.0
31[c]	do	2.78	523	28[b]	do	1.45	135
Aug. 2[d]	do	2.17	562	28[b]	do	.97	45.9
3[e]	do	2.01	415	28[b]	do	1.82	222

[a] Tailrace gage readings.
[b] Measurement made at lower tailrace section.
[c] Measurement made at upper tailrace section.
[d] Measurement made from cable.
[e] Measurement made by wading.
[f] Measurement made from boat.

AUSABLE RIVER AT AUSABLE FORKS, N. Y.

Location.—In village of Ausable Forks, immediately below junction of East and West branches and about 15 miles above mouth of river.

Records available.—August 17, 1910, to December 31, 1913. Data also in annual reports of the New York State Conservation Commission.

Drainage area.—444 square miles [1] (measured on United States Geological Survey topographic sheets).

Gage.—Chain, on the left bank about 100 feet below junction of East and West branches of Ausable River; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.5, half-tenths from 4.5 to 5.5, and tenths above 5.5 feet.

Control.—Sand and gravel; likely to shift. Channel divided by an island.

[1] Computed entirely from the topographic sheets, using two which have been newly published; supersedes value previously published.

Discharge measurements.—Made from cable about 1½ miles below gage. At this place the river flows in one channel.

Winter flow.—Ice may form on riffles below gage and either divert water or cause backwater.

Floods.—Crest of flood of March 25–30 reached gage height 10.2 feet in evening of March 27, as indicated by reading of the gage observer and later verified from high-water marks by engineers of the Geological Survey. Corresponding discharge approximately 25,000 second-feet, or 51 second-feet per squre mile of drainage area.

Accuracy.—Conditions at measuring section good. Rating curve well defined; estimates good.

Discharge measurements of Ausable River at A sable Forks, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 28[a]	C. S. De Golyer	3.67	226
Apr. 21	R. S. Barnes	4.27	950
Sept. 18[b]	G. H. Canfield	3.59	185

a Measurement made under complete ice cover. *b* Measurement made by wading.

Daily gage height, in feet, of Ausable River at Ausable Forks, N. Y., for 1913.

[A. S. Baker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.12	3.70	5.05	4.30	4.25	3.65	3.64	.....	3.55	3.88	3.76
2	.....	4.19	3.62	4.46	4.22	4.22	3.69	3.54	.....	3.89	3.78	3.82
3	.....	.....	4.00	4.55	4.20	4.10	3.62	3.50	.....	4.25	3.78	3.86
4	.....	.....	3.76	6.0	4.16	3.97	3.58	3.85	3.55	4.08	3.76	3.94
5	.....	.....	3.62	6.6	4.10	3.94	3.54	3.68	3.54	3.86	3.74	4.15
6	.....	.....	3.68	5.2	4.09	3.94	3.69	3.62	3.54	3.80	3.71	4.24
7	.....	.....	3.92	4.8	4.10	3.95	3.78	3.62	3.46	3.80	3.68	4.27
8	.....	.....	4.09	4.5	4.05	3.97	3.70	3.61	3.60	3.72	3.63	4.35
9	.....	.....	3.64	4.35	3.90	4.00	3.64	3.62	3.55	3.64	3.82	4.15
10	.....	.....	4.24	4.27	3.85	3.98	3.58	3.50	3.58	3.62	5.45	4.10
11	.....	.....	4.18	4.26	3.65	3.96	3.52	3.50	3.52	3.56	4.55	4.25
12	.....	.....	3.99	4.6	3.70	3.92	3.51	3.50	3.55	3.58	4.34	4.08
13	.....	.....	4.24	4.6	3.90	3.80	3.55	3.50	3.51	3.72	4.33	3.93
14	.....	.....	5.5	4.5	3.90	3.71	3.68	3.50	3.58	3.67	4.45	3.86
15	.....	.....	6.4	4.65	3.86	3.68	3.65	3.50	3.64	3.72	4.20	3.82
16	.....	.....	5.5	4.5	3.84	3.83	.....	3.50	3.56	3.71	3.94	3.77
17	.....	.....	4.45	4.35	3.92	3.82	.....	3.41	3.58	3.64	3.88	3.75
18	.....	.....	4.42	4.35	3.90	3.82	.....	3.44	3.58	3.64	3.86	3.72
19	.....	.....	4.32	4.5	3.86	3.80	3.61	3.44	3.56	3.62	3.82	3.66
20	.....	.....	4.20	4.40	3.82	3.80	3.56	3.48	3.58	3.92	4.35	3.66
21	.....	.....	5.25	4.29	3.88	3.75	3.62	3.50	3.49	4.7	4.62	3.68
22	.....	.....	5.9	4.22	4.65	3.69	3.71	3.57	4.15	4.50	4.45	3.68
23	.....	.....	4.5	4.75	4.40	3.66	3.68	3.56	4.22	4.45	4.18	3.75
24	.....	.....	4.7	4.8	3.98	3.66	3.64	3.54	3.92	4.00	4.10	3.68
25	.....	.....	7.1	4.7	3.96	3.66	3.62	3.78	3.82	4.25	4.65	3.74
26	.....	.....	6.8	4.7	4.00	3.64	3.60	3.76	3.70	4.35	4.5	3.68
27	4.35	.....	8.6	4.65	4.01	3.65	3.58	3.73	3.62	4.28	4.30	3.72
28	4.19	3.67	6.9	4.6	5.0	3.86	3.78	3.65	3.55	4.15	3.88	3.82
29	4.37	.....	5.15	4.6	5.2	3.78	4.05	3.58	3.66	4.50	3.81	3.72
30	4.15	.....	4.6	4.55	4.9	3.74	3.95	3.55	3.56	4.05	3.74	3.88
31	3.98	.....	4.6	.....	4.5	.....	3.80	3.55	.....	4.50	.....	3.82

NOTE.—Observations suspended Jan. 1–26, inclusive, and Feb. 3–27. Discharge relation affected by ice Dec. 27–31.

Daily discharge, in second-feet, of Ausable River at Ausable Forks, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	748	273	2,450	1,000	932	234	226	160	160	452	329
2	.....	846	210	1,260	889	889	265	154	160	462	348	388
3	.....	.....	590	1,420	860	720	210	127	160	932	348	431
4	.....	.....	329	5,200	804	555	181	420	160	694	331	520
5	.....	.....	210	7,270	720	520	154	257	154	431	311	790
6	.....	.....	257	2,820	707	520	265	210	154	367	282	918
7	.....	.....	496	1,900	720	532	348	210	107	367	257	962
8	.....	.....	707	1,330	655	555	273	202	194	292	218	1,080
9	.....	.....	226	1,080	473	590	226	210	160	226	388	790
10	.....	.....	918	962	420	567	181	127	181	210	3,500	720
11	.....	.....	832	947	234	543	140	127	140	167	1,420	932
12	.....	.....	578	1,510	273	496	134	127	160	181	1,070	694
13	.....	.....	918	1,510	473	367	160	127	134	292	1,050	508
14	.....	.....	3,640	1,330	473	282	257	127	181	249	1,250	431
15	.....	.....	6,560	1,600	431	257	234	127	226	292	860	388
16	.....	.....	3,640	1,330	409	399	230	127	167	282	520	339
17	.....	.....	1,250	1,080	496	388	220	82	181	226	452	320
18	.....	.....	1,200	1,080	473	388	210	97	181	226	431	292
19	.....	.....	1,040	1,330	431	367	202	97	167	210	388	241
20	.....	.....	860	1,160	388	367	167	117	181	496	1,080	241
21	.....	.....	2,940	990	452	320	210	127	122	1,700	1,550	257
22	.....	.....	4,880	889	1,600	265	282	174	790	1,330	1,250	257
23	.....	.....	1,330	1,800	1,160	241	257	167	889	1,250	832	320
24	.....	.....	1,700	1,900	567	241	226	154	496	590	720	257
25	.....	.....	9,130	1,700	543	241	210	348	388	932	1,600	311
26	.....	.....	8,000	1,700	590	226	194	329	273	1,080	1,330	257
27	1,080	.....	15,000	1,600	603	234	181	301	210	976	1,000	249
28	846	226	8,370	1,510	2,340	431	348	234	160	790	452	339
29	1,120	.....	2,690	1,510	2,820	348	655	181	241	1,330	378	249
30	790	.....	1,510	1,420	2,110	311	532	160	167	655	311	399
31	567	.....	1,510	.....	1,330	.....	367	160	.....	1,330	.....	339

NOTE.—Discharge July 16, 18, and Sept. 1-3 interpolated. Discharge Dec. 27-31 estimated from discharge measurement made Jan. 1, 1914.

Monthly discharge of Ausable River at Ausable Forks, N. Y., for 1913.

[Drainage area, 444 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
March	15,000	210	2,640	5.95	6.86	B.
April	7,270	889	1,790	4.03	4.50	A.
May	2,820	234	821	1.85	2.13	A.
June	932	226	406	.914	1.02	B.
July	655	134	250	.563	.65	B.
August	420	82	182	.410	.47	B.
September	889	107	229	.516	.58	B.
October	1,700	160	604	1.36	1.57	A.
November	3,500	218	813	1.83	2.04	A.
December	1,080	241	469	1.06	1.22	B.

NOTE.—See footnote to table of daily discharge.

LAKE GEORGE.

For the purpose of determining the rate of change and the range in elevation of the water surface of the lake, gages were established on Lake George in July, 1913, at three points—Lake George, Sagamore (Bolton Landing), and Rogers Rock.

The gage at Lake George was fastened to the concrete wall underneath the east side of the pagoda at Fort William Henry Hotel, near the landing used for motor boats. The observer is G. L. Martin.

At Sagamore the gage was fastened to the south side of the coal dock for Sagamore Hotel, on the west side of Green Island, about 200 feet north of the eastern end of the highway bridge that joins the island and the mainland. The observer is S. G. Finkle.

At Rogers Rock the gage is fastened to a pile in the back end of a covered boat house. The boat house is in a bay on the north side of the steamboat landing. The observer is George O. Cook.

All gages are of the vertical-staff type, made up of standard bronze section graduated to feet, tenths, and half-tenths. The sections are securely fastened to bed planks which in turn are fastened to the piles or concrete support. They were not set to any particular datum, but each gage was referred to a substantial bench mark by the use of an engineer's level. The gages are read once each day to the nearest half-tenth, and the force and direction of the wind are recorded. The results of the observations are presented in the following tables:

Daily gage height, in feet, of Lake George, N. Y., in 1913.

Day.	July.									August.								
	Lake George.			Sagamore.			Rogers Rock.			Lake George.			Sagamore.			Rogers Rock.		
	Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.	
		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]
1	.....	.....	...	.....	.....	...	.....	.....	...	4.3	S	H	4.5	S	H	3.05	S	H
2	.....	.....	...	.....	.....	...	.....	.....	...	4.3	.....	...	4.5	W	L	3.0	S	L
3	.....	.....	...	.....	.....	...	.....	.....	...	4.35	.....	...	4.45	W	L	3.0	S	M
4	.....	.....	...	.....	.....	...	.....	.....	...	4.4	N	L	4.45	N	L	2.95	N	M
5	.....	.....	...	.....	.....	...	.....	.....	...	4.35	.....	...	4.45	S	L	2.92	N	L
6	.....	.....	...	.....	.....	...	.....	.....	...	4.35	.....	...	4.45	Calm.		2.95	S	H
7	.....	.....	...	.....	.....	...	.....	.....	...	4.3	.....	...	4.45	Calm.		2.8	N	H
8	.....	.....	...	.....	.....	...	.....	.....	...	4.25	.....	...	4.4	S	H	2.85	S	L
9	.....	.....	...	4.9	S	H	.....	.....	...	4.25	.....	...	4.35	Calm.		2.8	S	M
10	.....	.....	...	4.9	W	L	3.4	SW	M	4.2	.....	...	4.35	NE	H	2.85	S	M
11	.....	.....	...	4.8	N	L	3.4	SW	M	4.2	.....	...	4.35	NE	H	2.8	N	H
12	.....	.....	...	4.8	S	L	3.35	S	M	4.2	.....	...	4.3	Calm.		2.75	Calm.	
13	.....	.....	...	4.8	Calm.		3.3	S	H	4.1	.....	...	4.25	Calm.		2.72	S	M
14	.....	.....	...	4.75	Calm.		3.35	SW	...	4.1	.....	...	4.2	S	L	2.72	S	L
15	.....	.....	...	4.75	Calm.		3.3	N	L	4.1	.....	...	4.15	Calm.		2.7	S	L
16	.....	.....	...	4.75	NE	H	3.25	N	M	4.1	.....	...	4.15	Calm.		2.7	S	L
17	.....	.....	...	4.7	Calm.		3.25	SW	M	4.1	.....	...	4.1	Calm.		2.65	Calm.	
18	.....	.....	...	4.7	N	L	3.2	S	M	4.1	.....	...	4.1	NE	...	2.62	N	H
19	.....	.....	...	4.7	Calm.		3.2	N	L	4.1	N	H	4.1	NE	...	2.5	N	H
20	.....	.....	...	4.65	Calm.		3.2	Calm.		4.1	N	H	4.05	NE	...	2.55	N	L
21	.....	.....	...	4.65	Calm.		3.2	Calm.		3.9	.....	...	4.05	S	H	2.58	S	M
22	.....	.....	...	4.65	Calm.		3.18	S	H	3.8	S	H	4.0	S	H	2.55	S	H
23	.....	.....	...	4.65	S	H	3.2	S	H	3.8	S	H	4.0	SW	L	2.5	S	H
24	4.45	N	...	4.65	Calm.		3.18	S	M	3.8	.....	...	3.9	SW	L	2.5	S	M
25	4.5	.....	...	4.6	N	L	3.1	N	L	3.8	.....	...	3.9	Calm.		2.48	N.	L
26	4.45	.....	...	4.6	S	L	3.1	S	M	3.8	.....	...	3.9	S	L	2.5	S	H
27	4.45	.....	...	4.6	S	L	3.08	S	M	3.8	.....	...	3.85	N	L	2.48	S	M
28	4.45	.....	...	4.6	Calm.		3.1	S	M	3.8	.....	...	3.85	Calm.		2.4	N	L
29	4.45	.....	...	4.6	Calm.		3.08	S	M	3.75	S	...	3.85	Calm.		2.4	S	M
30	4.5	.....	...	4.55	Calm.		3.08	N	L	3.75	.....	...	3.8	Calm.		2.4	S	H
31	4.45	N	H	4.5	Calm.		3.0	N	L	3.7	.....	...	3.8	Calm.		2.38	S	L

[a] L, light; M, medium; H, heavy.

Daily gage height, in feet, of Lake George, N. Y., in 1913—Continued.

Day.	September.									October.								
	Lake George.			Sagamore.			Rogers Rock.			Lake George.			Sagamore.			Rogers Rock.		
	Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.	
		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]
1	3.75	....	...	3.8	Calm.		2.35	Calm.		3.35	N	...	3.45	Calm.		1.9	S	M
2	3.7	....	...	3.8	S	L	2.35	S	M	3.35	N	...	3.5	Calm.		1.9	N	H
3	3.7	....	...	3.8	NE	H	2.35	S	H	3.35	N	...	3.5	NE	L	2.0	N	M
4	3.65	....	...	3.75	NE	L	2.3	N	H	3.35	N	...	3.5	NE	H	1.9	N	H
5	3.65	....	...	3.75	NE	L	2.2	N	M	3.3	S	...	3.5	NE	L	1.95	Calm.	
6	3.6	....	...	3.75	NE	L	2.2	N	L	3.3	S	...	3.45	Calm.		1.98	SW	H
7	3.6	....	...	3.7	Calm.		2.25	S	M	3.25	S	...	3.45	S	L	1.95	S	L
8	3.55	....	...	3.7	NE	H	2.25	N	L	3.25	N	...	3.4	Calm.		1.92	SW	L
9	3.55	....	...	3.7	NE	H	2.0	N	H	3.25	N	...	3.4	Calm.		1.92	Calm.	
10	3.5	....	...	3.65	NE	H	2.1	N	M	3.25	N	...	3.4	Calm.		1.92	S	M
11	3.5	....	...	3.6	Calm.		2.1	Calm.		3.25	N	...	3.4	S	H	1.9	SW	M
12	3.45	....	...	3.6	W	H	2.1	N	L	3.25	S	...	3.35	N	L	1.9	SW	L
13	3.45	....	...	3.55	W	H	2.08	S	L	3.25	S	...	3.35	NE	H	1.9	N	L
14	3.4	....	...	3.55	NE	H	2.05	N	H	3.25	NE	...	3.35	NE	H	1.85	N	H
15	3.35	....	...	3.5	NE	H	2.0	N	M	3.25	NE	...	3.3	NE	H	1.9	N	M
16	3.3	....	...	3.5	S	L	2.02	S	M	3.25	NE	...	3.3	NE	H	1.8	N	H
17	3.3	....	...	3.5	S	L	2.0	S	M	3.25	NE	...	3.3	NE	H	1.8	N	M
18	3.3	....	...	3.45	NE	...	2.0	S	...	3.25	NE	...	3.3	NE	H	1.8	S	M
19	3.25	....	...	3.45	S	L	1.98	N	L	3.2	S	...	3.3	NE	H	1.7	N	H
20	3.25	....	...	3.45	S	L	1.95	Calm.		3.15	S	...	3.35	S	H	1.9	S	L
21	3.25	S	...	3.4	S	H	1.92	S	L	3.15	S	...	3.4	S	H	2.1	S	H
22	3.35	S	...	3.55	S	L	2.1	S	M	3.15	N	...	3.4	S	H	1.88	SE	...
23	3.35	N	...	3.55	S	L	2.1	N	L	3.15	SE	...	3.4	S	H	1.98	S	H
24	3.35	N	...	3.55	Calm.		2.08	Calm.		3.15	S	...	3.45	S	H	1.88	S	L
25	3.35	W	...	3.5	S	H	2.08	S	H	3.15	S	...	3.5	S	H	1.9	Calm.	
26	3.35	S	...	3.5	Calm.		2.05	S	M	3.2	N	...	3.55	NE	H	1.95	N	L
27	3.35	N	H	3.5	W	H	2.0	SW	M	3.2	N	...	3.6	S	L	2.05	Calm.	
28	3.35	N	...	3.5	W	H	2.02	SE	H	3.2	N	...	3.6	S	L	2.1	S	M
29	3.35	N	...	3.5	S	L	2.0	S	H	3.2	N	...	3.6	S	L	2.1	S	M
30	3.35	S	...	3.45	NE	L	1.9	N	H	3.2	N	...	3.55	Calm.		2.05	N	M
31	.....	...	...	.....	...	...	.....	...	...	3.2	N	...	3.55	N	L	2.1	SW	H

Daily gage height, in feet, of Lake George, N. Y., in 1913—Continued.

Day.	November.									December.								
	Lake George.			Sagamore.			Rogers Rock.			Lake George.			Sagamore.			Rogers Rock.		
	Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.	
		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]
1	3.2	SW	...	3.5	NW	M	2.08	SW	H	3.15	S	...	3.3	S	L	1.82	S	M
2	3.2	S	...	3.5	S	L	2.0	N	M	3.15	S	...	3.25	Calm.		1.8	Calm.	
3	3.2	N	...	3.5	N	L	2.0	S	M	3.15	N	...	3.25	W	L	1.8	N	M
4	3.2	S	...	3.45	N	L	2.05	SW	H	3.15	N	...	3.25	N	L	1.78	Calm.	
5	3.2	NW	...	3.45	Calm.		2.0	SE	L	3.1	NE	...	3.2	Calm.		1.7	N	M
6	3.2	N	...	3.45	S	L	1.98	S	H	3.1	W	...	3.2	NE	L	1.75	S	M
7	3.2	SE	...	3.4	S	L	1.95	S	L	3.1	S	...	3.2	S	M	1.78	S	L
8	3.2	S	...	3.4	S	L	1.92	S	L	3.1	S	...	3.2	Calm.		1.9	S	H
9	3.2	S	...	3.4	S	H	1.9	NE	L	3.1	SE	...	3.25	S	M	1.95	S	M
10	3.2	S	...	3.4	S	H	2.1	S	H	3.1	S	...	3.25	S	M	1.95	S	H
11	3.25	NE	...	3.4	S	H	2.02	S	H	3.1	N	...	3.3	Calm.		1.85	N	H
12	3.25	N	...	3.4	S	H	2.0	S	L	3.1	N	...	3.3	Calm.		1.95	S	M
13	3.25	W	...	3.4	S	M	2.0	S	M	3.1	W	...	3.3	Calm.		1.85	Calm.	
14	3.25	N	...	3.4	W	L	1.98	Calm.		3.1	S	...	3.3	NE	M	1.9	S	M
15	3.25	N	...	3.4	S	L	1.9	NW	L	3.1	S	...	3.3	Calm.		1.85	S	H
16	3.25	N	...	3.4	N	L	1.9	N	M	3.1	N	...	3.3	S	H	1.8	N	L
17	3.25	S	...	3.35	S	H	1.9	Calm.		3.1	N	...	3.25	S	H	1.85	S	H
18	3.2	S	...	3.35	S	L	1.9	S	H	3.1	SW	...	3.25	S	L	1.8	Calm.	
19	3.2	S	...	3.35	S	H	1.88	S	L	3.1	S	...	3.25	S	L	1.8	S	M
20	3.2	S	...	3.35	Calm.		1.9	S	M	3.1	S	...	3.25	S	L	1.78	S	M
21	3.2	W	...	3.35	Calm.		1.85	Calm.		3.1	SW	...	3.25	Calm.		1.75	Calm.	
22	3.2	S	...	3.35	S	H	1.8	S	M	3.1	NE	...	3.25	N	L	1.7	N	H
23	3.2	SW	...	3.35	SW	H	1.85	SW	H	3.1	N	...	3.25	Calm.		1.75	Calm.	
24	3.2	W	...	3.35	N	L	1.85	S	H	3.1	N	...	3.3	Calm.		1.75	N	L
25	3.2	N	...	3.3	S	L	1.85	SW	M	3.1	N	...	3.3	NE	L	1.78	N	L
26	3.2	N	...	3.3	NE	H	1.8	N	H	3.1	N	...	3.3	NE	H	1.9	N	H
27	3.2	N	...	3.3	N	L	1.8	N	M	3.1	N	...	3.3	Calm.		1.9	N	M
28	3.15	N	...	3.3	Calm.		1.8	SW	L	3.1	S	...	3.3	S	L	1.9	N	L
29	3.15	S	...	3.3	N	L	1.78	N	M	3.1	S	...	3.3	S	L	1.85	NE	M
30	3.15	S	...	3.3	Calm.		1.8	S	M	3.1	N	...	3.3	W.	M	1.8	S	M
31	.....	.....	...	.....	.....	...	.....	.....	...	3.1	N	...	3.3	NE	M	1.8	S	M

EAST CREEK NEAR RUTLAND, VT.

Location.—At Lester Bridge, on road from Rutland to Brandon, Vt., about 3 miles north of Rutland, 2½ miles below the union of the two branches that drain Blue Ridge Mountain, and 3½ miles above confluence with Otter River.

Records available.—August 9, 1911, to December 31, 1913.

Drainage area.—47 square miles.

Gage.—Vertical staff fastened to the left-hand downstream side of the bridge; read daily, morning and evening, to quarter-tenths. All gage heights used to quarter-tenths.

Control.—Probably permanent.

Discharge measurements.—Made from the bridge or by wading.

Regulation.—Flow regulated by two dams near headwaters and one dam about a mile below station. The upper dams store considerable water. Discharge relation is not affected by backwater from dam below.

Winter flow.—Discharge relation affected by ice.

Floods.—Flood of March, 1913, reached gage height about 8.3, as determined from high-water marks by an engineer of the Geological Survey. Observer's records indicate that this extreme stage occurred about midnight on March 26.

Accuracy.—Discharge rating curve not complete. Artificial regulation of this stream makes mean daily gage height computed from semidaily observations doubtful.

Discharge measurements of East Creek near Rutland, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 24	R. S. Barnes	4.24	144
May 2	....do	4.09	115
Sept. 17[a]	G. H. Canfield	4.16	118
Nov. 1[a]	C. S. DeGolyer	4.18	118

[a] Measurement made by wading.

Gage height, in feet, of East Creek near Rutland, Vt., for 1913.

[M. Lester, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	6.20	3.8	5.40	3.5	6.20	3.95	6.00	3.72	6.30	3.45	5.40	3.8
2	6.15	3.5	5.50	3.98	6.15	3.7	5.30	3.9	6.30	3.4	5.40	3.4
3	6.10	3.7	5.45	4.5	6.20	3.92	5.40	3.85	6.30	3.8	5.50	3.82
4	6.15	4.0	5.40	3.95	6.30	3.7	5.50	3.72	6.30	3.4	5.45	3.7
5	6.15	3.7	5.40	3.5	6.25	3.7	5.45	3.7	6.30	3.45	6.00	3.55
6	6.20	3.65	5.50	4.05	6.20	3.68	5.40	3.82	6.20	3.4	5.50	3.6
7	6.20	4.5	5.40	4.3	6.20	3.95	5.40	5.65	6.20	3.8	5.45	3.6
8	6.30	4.15	5.45	4.25	6.30	3.6	5.30	3.6	6.30	3.8	5.40	3.72
9	6.20	3.9	5.40	3.9	6.30	3.45	5.30	3.4	6.30	3.5	5.30	3.4
10	6.15	3.85	5.50	4.15	.....	.....	.....	.....	6.20	3.72	6.00	4.2
11	6.20	4.0	5.30	4.1	.....	.....	.....	.....	6.15	3.7	6.10	3.85
12	6.20	4.15	6.15	4.0	.....	.....	.....	.....	6.30	3.5	6.15	4.1
13	6.20	3.88	5.40	3.85	.....	.....	.....	.....	6.20	3.65	6.15	3.75
14	6.15	3.7	5.50	4.1	.....	.....	.....	.....	6.20	4.2	5.45	4.9
15	6.20	3.85	5.40	4.0	.....	.....	.....	.....	6.20	4.65	6.00	4.75
16	6.15	3.95	5.45	4.1	.....	.....	.....	.....	6.30	4.4	6.15	4.0
17	6.20	4.3	5.40	4.5	.....	.....	.....	.....	6.30	3.75	6.00	3.92
18	6.20	4.5	5.30	4.72	.....	.....	.....	.....	6.20	3.7	6.10	3.9
19	6.15	4.4	5.30	4.25	.....	.....	.....	.....	6.35	3.65	6.00	3.95
20	6.20	4.1	5.40	4.3	.....	.....	5.40	3.8	6.15	3.7	6.20	4.4
21	6.15	4.68	5.50	4.6	6.20	3.92	5.45	3.9	6.20	4.4	6.00	4.55
22	6.15	4.45	5.45	4.45	6.30	3.75	5.40	4.6	6.15	4.62	5.40	4.1
23	6.10	4.3	5.40	4.4	6.30	4.3	5.40	3.62	6.30	3.78	5.40	4.0
24	6.20	4.6	5.45	4.3	6.20	3.7	5.50	3.6	6.15	4.25	5.40	4.2
25	6.30	4.15	5.35	4.22	6.30	3.65	5.45	3.65	6.20	4.45	5.45	6.38
26	6.20	3.15	5.30	4.08	6.20	3.6	5.50	3.7	6.20	5.92	5.50	6.42
27	6.15	4.0	5.40	4.15	6.30	3.45	5.50	3.75	6.30	6.2	7.00	6.6
28	6.20	4.1	5.45	4.0	6.30	3.4	5.45	3.68	6.20	6.25	6.00	5.35
29	6.20	3.92	5.50	3.95	.....	.....	.....	.....	6.30	5.2	5.35	5.2
30	6.15	3.8	5.45	3.9	.....	.....	.....	.....	6.25	5.2	5.55	4.95
31	6.20	3.8	5.40	3.85	.....	.....	.....	.....	6.30	4.78	6.00	4.95

Gage height, in feet, of East Creek near Rutland, Vt., for 1913—Continued.

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	5.40	4.6	6.10	4.65	6.00	3.9	6.00	3.98	5.45	3.7	5.40	3.75
2	5.30	4.4	6.00	4.6	5.50	3.6	6.10	3.9	5.50	3.98	5.40	3.9
3	5.40	4.3	6.00	4.4	5.45	3.7	6.20	3.92	5.45	3.9	5.30	3.8
4	6.00	4.35	6.10	4.4	6.10	3.6	5.40	3.32	5.40	3.9	5.00	3.92
5	6.00	4.38	5.50	4.45	6.00	3.4	5.45	3.6	5.45	3.88	5.50	3.9
6	5.50	4.25	5.45	4.2	5.50	3.6	6.00	3.5	5.50	3.6	6.00	3.78
7	6.00	4.2	6.00	4.38	6.00	3.42	6.10	3.62	5.40	3.5	5.40	3.85
8	5.50	4.02	6.00	4.15	6.00	3.4	5.45	3.6	6.00	3.58	5.45	3.5
9	6.00	3.95	6.10	4.2	6.10	3.42	5.50	3.72	5.40	3.42	5.50	3.7
10	5.50	3.55	6.00	3.95	6.00	3.4	6.00	3.7	5.40	3.4	6.00	3.68
11	6.00	3.5	6.10	3.8	6.15	3.45	5.40	3.62	5.45	3.45	6.00	4.0
12	6.10	3.75	5.40	3.9	6.00	3.4	6.00	3.88	5.30	3.38	5.40	3.9
13	6.00	3.82	5.35	3.8	6.00	3.35	5.50	3.6	5.30	3.3	6.00	3.85
14	5.50	3.85	5.50	3.78	6.10	3.4	6.15	3.92	5.40	3.3	6.00	3.85
15	6.00	3.8	6.20	3.8	6.15	3.35	5.50	3.9	5.40	3.5	6.00	3.5
16	6.00	3.7	5.40	3.75	6.10	3.42	6.00	3.65	5.35	4.0	3.00	3.98
17	6.10	3.62	5.50	4.02	6.10	3.42	6.00	3.65	5.10	3.55	6.00	4.0
18	5.50	3.6	6.10	3.95	6.00	3.3	5.45	3.9	5.15	3.5	5.45	3.85
19	5.50	3.6	6.20	3.88	6.00	3.55	5.30	3.85	5.30	3.28	5.50	3.8
20	6.00	3.6	5.40	3.72	5.45	3.52	5.45	3.75	5.30	3.25	6.00	3.98
21	6.00	3.5	6.00	3.9	5.50	3.3	6.00	3.7	5.30	3.3	5.45	3.85
22	5.45	3.52	6.10	3.7	6.00	3.45	6.10	4,2	5.40	3.45	7.10	3.6
23	5.50	3.6	6.15	3.7	6.00	4.4	5.45	4.45	5.40	3.5	6.00	3.88
24	5.45	3.62	6.20	3.88	6.00	4.48	5.40	4.4	5.30	3.5	5.50	3.9
25	5.50	3.6	5.50	3.8	6.15	4.08	5.40	4.0	5.20	3.4	5.50	3.95
26	5.50	3.65	5.45	3.6	6.10	3.9	6.00	3.88	5.30	3.5	5.45	3.88
27	5.50	3.65	5.40	3.52	6.00	3.9	6.10	3.8	5.30	3.5	7.30	3.6
28	5.50	3.5	5.40	3.6	6.00	3.78	6.00	4.3	5.35	3.55	5.40	3.82
29	5.50	3.92	6.00	4.0	5.50	4.5	5.50	4.42	5.40	3.9	5.50	3.65
30	6.00	3.62	5.50	4.02	5.50	4.2	5.45	4.1	5.35	3.42	5.50	3.4
31					5.50	4.0	5.50	3.8				

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	5.50	3.4	5.40	3.95	5.30	3.9	5.50	4.1	5.30	4.12	5.50	4.15
2	6.00	3.45	6.00	3.98	5.35	3.5	6.00	3.9	5.40	3.72	6.00	3.85
3	6.00	3.4	5.50	3.9	5.40	3.52	5.40	3.9	5.40	3.5	7.30	4.1
4	6.00	3.55	5.40	3.8	5.35	4.15	6.00	4.1	5.50	3.5	6.15	4.08
5	5.30	3.5	5.40	3.88	5.30	3.98	6.00	3.9	5.40	3.98	6.00	4.1
6	6.00	3.55	5.40	3.7	5.35	4.0	6.10	3.88	6.00	3.55	6.10	4.1
7	5.40	3.48	6.00	4.18	5.30	4.0	5.50	4.1	5.50	3.52	6.00	3.8
8	5.35	3.98	6.00	4.2	5.35	4.0	6.00	4.0	5.45	3.6	5.50	4.15
9	5.30	3.55	5.30	4.0	5.30	3.5	5.40	3.8	5.40	4.1	6.00	4.2
10	5.40	4.12	6.00	4.1	5.45	3.4	5.40	3.8	5.50	4.15	6.00	4.15
11	5.50	4.15	6.00	3.98	5.40	4.1	5.50	4.0	5.40	3.6	6.15	4.15
12	5.50	3.6	6.00	3.9	5.35	4.15	5.45	4.0	5.30	4.15	6.20	4.1
13	5.30	3.9	5.40	3.6	5.30	4.1	5.50	4.18	5.40	3.55	6.15	4.15
14	5.45	3.65	6.10	4.0	5.45	4.0	5.40	4.1	5.50	3.45	5.50	3.8
15	5.30	4.0	6.00	4.0	5.40	3.98	5.50	4.0	5.35	3.6	6.15	4.0
16	5.30	4.08	6.15	3.85	5.45	3.5	5.45	4.0	5.30	3.6	6.20	4.1
17	5.35	4.0	6.00	4.0	5.50	3.38	5.45	3.75	5.40	3.6	6.10	4.12
18	5.30	3.6	6.00	4.0	5.40	3.40	5.50	4.0	5.50	3.65	6.20	4.0
19	5.40	3.7	6.10	4.0	5.40	4.12	6.00	4.15	5.45	3.5	6.10	4.0
20	5.40	3.5	5.40	3.68	5.50	4.1	6.00	4.2	5.40	3.5	6.00	4.0
21	5.45	4.05	6.00	4.0	5.50	4.05	5.50	3.85	5.50	3.48	5.40	3.78
22	5.30	4.08	6.00	3.98	5.30	3.6	5.00	3.98	5.50	3.78	5.50	4.5
23	5.40	4.05	6.30	4.0	7.30	3.85	5.00	3.9	5.45	4.2	6.00	4.15
24	5.45	4.1	4.50	4.2	5.40	3.42	5.40	3.75	5.50	3.6	5.00	4.1
25	5.40	4.1	6.00	4.1	7.20	3.8	4.50	4.0	5.50	3.65	6.00	4.15
26	5.30	3.6	5.50	3.95	7.30	3.9	4.55	4.0	5.45	3.62	6.10	4.2
27	5.40	3.6	5.40	3.8	7.20	4.0	4.50	4.4	5.50	3.58	5.40	4.1
28	5.30	3.98	6.00	4.2	7.40	4.2	4.35	4.2	6.00	3.4	5.40	3.8
29	5.40	3.75	6.00	3.9	7.35	4.2	5.50	3.92	5.50	3.5	6.10	3.9
30	5.40	3.7	5.50	4.2	7.40	4.0	5.50	3.8	2.45	3.55	6.00	4.18
31	5.30	3.5	6.00	4.18	5.40	3.32	5.40	3.82				

Gage height, in feet, of East Creek near Rutland, Vt., for 1913—Continued.

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	5.40	3.5	6.00	3.95	5.50	3.62	5.50	4.0	6.20	3.7	5.50	4.2
2	5.45	3.5	5.45	4.2	6.00	3.65	5.40	3.8	6.30	3.45	5.45	4.25
3	5.50	3.8	5.50	4.2	5.50	3.4	6.00	4.0	6.25	3.6	5.40	4.3
4	5.45	3.8	6.00	4.0	6.00	3.6	6.00	4.15	6.30	3.68	5.50	4.2
5	5.50	3.6	5.40	3.88	6.10	3.4	5.45	4.0	6.35	3.55	6.00	4.2
6	5.45	3.6	6.00	4.2	6.00	3.5	6.00	4.2	6.30	3.4	5.45	4.18
7	5.50	3.7	6.10	4.15	6.10	3.6	6.00	4.25	6.35	3.48	5.40	4.0
8	5.45	3.6	5.50	4.1	5.50	3.65	5.50	4.0	6.40	3.7	5.50	4.15
9	6.00	3.7	5.40	4.15	6.10	3.5	5.40	4.4	6.30	3.75	5.45	4.2
10	5.50	3.65	6.00	4.2	6.00	4.2	6.00	4.3	6.35	3.7	5.40	4.25
11	6.00	3.62	6.00	4.2	5.50	3.9	6.00	4.2	6.30	3.72	5.50	4.2
12	6.10	3.4	6.00	3.9	6.00	3.78	5.50	4.0	6.35	3.8	5.45	4.2
13	6.00	3.65	6.00	4.3	5.50	3.72	6.00	4.0	6.30	3.7	5.40	4.12
14	6.10	3.8	5.50	4.2	5.50	3.65	6.00	4.1	6.30	3.4	5.00	3.82
15	6.20	3.8	6.00	4.18	6.00	3.6	5.40	3.92	6.20	3.6	6.30	3.7
16	6.15	3.78	6.00	4.25	6.00	3.58	5.40	4.0	6.40	3.48	5.50	3.72
17	6.00	3.7	6.00	4.3	5.50	3.5	5.50	4.25	6.40	3.4	5.50	4.2
18	6.10	3.7	5.40	4.3	5.45	3.55	6.00	4.3	6.45	3.6	6.00	4.18
19	6.00	3.7	5.45	3.98	6.00	3.5	5.50	4.28	6.40	3.5	6.00	4.2
20	6.15	3.7	5.50	4.4	5.50	3.8	5.45	4.3	6.50	3.55	5.50	4.15
21	6.10	4.1	6.00	4.25	6.00	3.68	5.50	4.25	6.40	3.55	5.40	3.98
22	6.00	3.9	6.00	4.32	6.00	3.65	5.40	4.3	6.40	3.5	6.00	4.15
23	6.15	3.85	5.50	4.3	6.00	3.5	5.40	3.98	6.50	3.5	5.45	4.2
24	5.50	3.8	6.00	4.3	6.00	3.55	5.50	4.3	6.40	3.45	5.40	4.2
25	5.50	3.78	6.00	4.7	5.45	3.62	6.00	4.2	6.30	3.6	5.40	3.95
26	6.00	4.2	5.45	4.3	6.00	3.58	6.00	4.3	6.35	3.9	5.45	4.1
27	6.00	4.15	6.00	4.3	6.15	3.4	5.45	4.0	.....	.....	.....	.....
28	5.50	4.0	5.50	4.2	6.30	3.4	6.00	3.95	.....	.....	.....	.....
29	5.45	3.8	6.00	4.15	6.25	3.6	6.00	4.2	.....	.....	.....	.....
30	5.50	3.7	5.45	4.1	6.30	3.48	5.40	3.92	.....	.....	.....	.....
31	5.50	3.7	5.45	4.1	.....	.....	.....	.....	.....	.....	.....	.....

LAKE CHAMPLAIN AT BURLINGTON, VT.

Location.—On south side of roadway leading to dock of Champlain Transportation Co., at foot of King Street, Burlington, Vt.

Records available.—May, 1907, to December 31, 1913.

Gage.—Staff; read once daily. Comparisons of gage readings indicate that zero of gage at Burlington is at practically the same elevation as that of gage at Fort Montgomery—92.50 feet above mean sea level.

Cooperation.—Gage heights furnished through the courtesy of Mr. D. A. Loomis, general manager of the Champlain Transportation Co.

Daily gage height, in feet, of Lake Champlain at Burlington, Vt., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.35	.....	7.80	5.62	.....	2.52	1.48	0.83	0.50	0.80	1.05
2	3.00	.....	.....	7.85	5.59	3.87	2.43	1.48	.72	.50	.....	1.05
3	3.10	4.28	.....	7.90	5.55	3.82	2.40	.....	.70	.55	.80	1.08
4	3.12	4.20	.....	8.00	.....	3.82	2.38	1.43	.70	.....	.80	1.10
5	.....	.....	.....	8.10	5.35	3.80	2.38	1.40	.68	.60	.78	1.10
6	3.25	.....	.....	.....	5.25	3.80	.....	1.38	.65	.63	.78	1.15
7	3.25	4.00	.....	8.20	5.08	3.80	2.35	1.28	.....	.65	.80	.....
8	3.20	3.95	.....	8.10	4.98	.....	2.32	1.28	.65	.65	.80	1.15
9	3.20	.....	.....	8.05	4.85	3.78	2.32	1.23	.60	.65	.....	1.18
10	3.20	3.90	.....	7.90	4.72	3.65	2.28	.....	.60	.63	.80	1.20
11	3.20	.....	.....	7.70	.....	3.58	2.25	1.23	.58	.62	.82	1.20
12	.....	.....	.....	7.65	4.54	3.54	2.22	1.20	.55	.....	.82	1.20
13	3.33	.....	.....	.....	4.48	3.52	.....	1.20	.50	.60	.85	1.20
14	3.40	.....	.....	7.52	4.43	3.47	2.20	1.18	.....	.60	.85	.....
15	3.40	.....	3.50	7.40	4.38	.....	2.10	1.15	.50	.60	.85	1.20
16	3.42	.....	.....	7.20	4.26	3.39	2.07	1.11	.50	.62	.....	1.20
17	3.50	.....	4.10	7.20	4.20	3.18	2.04	.....	.50	.62	.87	1.22
18	3.60	.....	4.15	7.13	.....	3.10	1.98	1.09	.50	.63	.87	1.22
19	.....	.....	4.25	7.00	4.00	3.02	1.90	1.28	.50	.....	.90	1.25
20	4.10	.....	4.40	.....	3.88	2.95	.....	1.23	.50	.65	.90	1.25
21	4.25	.....	4.45	6.80	3.88	2.90	1.82	1.22	.....	.65	.92	.....
22	4.35	.....	4.63	6.70	3.83	.....	1.80	1.18	.50	.65	.92	1.25
23	4.40	.....	.....	6.52	3.78	2.86	1.70	1.10	.50	.65	.....	1.28
24	4.60	.....	4.85	6.48	3.75	2.75	1.70	.....	.50	.65	.92	1.30
25	.....	.....	5.15	6.38	.....	2.75	1.65	1.08	.50	.65	.....	.....
26	.....	.....	5.65	6.28	3.72	2.75	1.62	1.05	.50	.....	.95	1.30
27	.....	.....	6.48	.....	3.72	2.75	.....	1.00	.50	.70	.95	1.30
28	.....	.....	7.20	6.05	3.75	2.68	1.60	1.00	.....	.75	.98	.....
29	4.60	.....	7.56	5.95	3.85	.....	1.54	.98	.50	.80	1.00	1.32
30	4.50	.....	.....	5.78	.....	2.56	1.54	.90	.50	.80	.....	1.32
31	4.40	.....	7.64	.....	3.90	.....	1.52	.....	.....	.80	.....	1.32

NOTE.—The lake was frozen during portions of February and March. The thickest ice recorded was 15½ inches, on March 10.

WINOOSKI RIVER ABOVE STEVENS BRANCH, NEAR MONTPELIER, VT.

Location.—At plant of Corry-Deavitt & Frost Co., 3 miles above Montpelier, Vt., and above the several large tributaries that enter in the vicinity of Montpelier.

Records available.—May 18, 1909, to November 15, 1913.

Drainage area.—Not measured.

Gage.—Staff, bolted to a bowlder on right bank about 100 feet below the power plant.

Control.—Shifting.

Discharge measurements.—Made from lower railroad bridge, about half a mile below gage.

Regulation.—As power plant is operated on 24-hour schedule, daily fluctuations in stage of river are usually not great.

Winter flow.—Discharge relation considerably affected by anchor ice.

Accuracy.—Owing to shifts of channel, a complete discharge rating curve has not been developed. Mean daily gage height, computed from semidaily observations, should be used with caution because of artificial control during low water.

The following discharge measurement was made by G. H. Canfield:

September 16, 1913: Gage height, 2.56; discharge, 88 second-feet.

Gage height, in feet, of Winooski River above Stevens Branch, near Montpelier, Vt., for 1913.

[P. J. Burke, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	8.35	3.55	.....	.....	7.00	3.9	1.00	3.9	.....	.....	.....	.....
2	.....	.....	3.00	3.2	8.00	3.7	.....	.....	.....	.....	.....	.....
3	.....	.....	5.00	3.0	10.00	3.0	.....	.....	.....	.....	.....	.....
4	7.00	4.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	10.00	3.5	1.00	3.5	.....	.....	.....	.....	.....	.....	.....	.....
6	.....	.....	5.00	3.4	.....	.....	.....	.....	.....	.....	.....	.....
7	7.00	3.7	4.00	3.7	.....	.....	.....	.....	.....	.....	.....	.....
8	10.00	3.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	10.00	3.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	9.00	3.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	9.00	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	8.00	3.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17	10.00	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	7.00	4.5	5.00	4.4	.....	.....	.....	.....	.....	.....	.....	.....
19	8.00	4.8	4.00	5.0	.....	.....	.....	.....	.....	.....	.....	.....
20	9.00	4.0	.....	.....	.....	.....	.....	.....	11.00	2.4	2.00	2.5
21	.....	.....	2.00	4.5	.....	.....	.....	.....	7.00	3.2	3.00	2.9
22	8.00	4.2	2.30	4.0	.....	.....	.....	.....	7.00	4.3	5.00	3.1
23	9.00	3.7	.....	.....	.....	.....	.....	.....	10.00	2.1	.....	.....
24	7.00	3.6	.....	.....	.....	.....	.....	.....	.....	.....	3.00	1.9
25	.....	.....	.....	.....	.....	.....	.....	.....	9.00	2.6	2.00	3.8
26	8.00	3.4	4.00	3.35	.....	.....	.....	.....	7.00	4.0	2.00	4.2
27	8.00	3.7	1.00	3.7	.....	.....	.....	.....	8.00	3.9	2.30	4.5
28	.....	.....	12.00	3.0	.....	.....	.....	.....	8.00	4.0	4.00	3.3
29	7.30	3.2	3.30	2.8	.....	.....	.....	.....	10.30	2.6	.....	.....
30	11.00	3.35	.....	.....	.....	.....	.....	.....	5.00	2.5	4.00	2.3
31	.....	.....	.....	.....	.....	.....	.....	.....	8.00	2.2	2.00	2.2

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	7.00	2.5	6.00	2.5	7.00	1.25	.....	.....	10.00	1.4	.....	.....
2	.....	.....	.....	.....	7.00	1.25	.....	.....	7.00	1.4	.....	.....
3	9.00	1.9	.....	.....	.....	.....	4.00	1.2	.....	.....	4.00	1.3
4	.....	.....	.....	.....	8.00	1.0	.....	.....	7.00	1.3	4.00	1.3
5	7.00	2.6	5.00	3.0	7.00	.9	.....	.....	7.00	1.2	4.00	1.2
6	8.00	2.4	5.00	2.4	.....	.....	.....	.....	8.00	1.2	.....	.....
7	7.00	2.3	1.00	2.3	7.00	.95	12.10	.8	8.00	1.3	4.00	1.2
8	10.00	1.9	2.00	1.8	7.00	.9	.....	.....	9.00	1.0	3.00	.95
9	8.00	1.8	4.00	1.8	7.30	1.0	2.00	.9	8.00	1.2	1.00	1.0
10	11.00	1.7	5.00	1.6	.....	.....	.....	.....	.....	.....	.....	.....
11	7.00	1.6	6.00	1.6	7.00	.8	5.00	.8	.....	.....	4.00	1.2
12	8.00	1.9	.....	.....	.....	.....	4.00	1.0	6.30	.8	4.00	1.2
13	9.00	1.8	4.00	1.8	7.00	1.0	4.00	1.0	7.00	.9	4.00	1.2
14	7.00	1.8	.....	.....	7.00	1.0	6.00	.9	7.00	.8	4.00	1.2
15	8.00	1.75	4.00	1.75	7.00	1.0	6.00	.9	8.00	.8	6.00	.95
16	8.00	1.7	2.00	1.7	6.30	1.0	6.00	.8	8.00	.8	5.00	.8
17	8.00	1.65	4.00	1.6	7.00	1.0	6.00	1.0	11.00	1.0	4.00	1.0
18	8.00	1.6	4.00	1.6	9.00	.9	4.00	.9	11.00	1.0	.....	.....
19	8.00	1.8	5.00	1.75	.....	.....	3.00	1.0	7.00	1.0	.....	.....
20	8.00	1.8	4.00	1.8	8.00	1.0	4.00	1.0	6.30	.5	.....	.....
21	9.00	1.6	4.00	1.55	7.00	1.0	4.00	1.0	7.00	.5	.....	.....
22	8.00	1.5	3.00	1.45	7.00	1.0	4.00	1.0	9.00	.5	.....	.....
23	7.00	1.45	1.00	1.45	.....	.....	.....	.....	8.00	.8	.....	.....
24	7.00	1.4	2.00	1.4	7.00	2.3	4.00	2.2	8.00	.8	5.00	.0
25	7.00	1.4	6.00	1.4	8.00	1.8	.....	.....	8.00	.8	5.00	.0
26	10.00	1.35	2.00	1.35	7.00	1.6	3.00	1.5	8.00	.8	2.00	.8
27	11.00	1.3	.....	.....	8.00	1.3	2.00	1.3	8.00	.8	5.00	.0
28	7.00	1.3	.....	.....	7.00	1.4	.....	.....	8.00	.8	1.00	.8
29	8.00	1.3	5.00	1.3	7.00	2.7	.....	.....	8.00	.7	5.00	.8
30	11.00	1.3	.....	.....	8.00	2.3	1.00	2.0	8.00	.8	5.00	.0
31	.....	.....	.....	.....	8.00	1.7	4.00	1.6	.....	.....	.....	.....

Gage height, in feet, of Winooski River above Stevens Branch, near Montpelier, Vt., for 1913—Continued.

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	6.30	0.0			10.00	1.0						
2	7.00	.7									5.00	0.0
3	8.00	.7	4.00	0.5					8.00	0.9	5.00	.0
4	8.00	.7			8.00	.9	5.00	0.0	8.00	.9	5.00	.0
5	11.00	.0	3.00	0.5	8.00	.7	4.00	.0	8.00	.9	5.00	.0
6	8.00	.6	6.00	.7	8.00	.7	4.00	.0	8.00	.9	4.00	.0
7	10.00	.9	5.00	.0	8.00	.7	4.00	.0				
8	8.00	.9	5.00	.0	8.00	.7						
9	8.00	.9	5.00	.0	8.00	.7	4.00	.3				
10	8.00	.9	5.00	.0	8.00	.0	6.00	.0				
11	8.00	.9			8.00	.7	4.00	.0				
12					8.00	.7						
13	8.00	.7	5.00	.0	8.00	.7	5.00	.0				
14	8.00	.7	5.00	.0	8.00	.7	5.00	.0				
15	8.00	.7	5.00	.0	8.00	.7	5.00	.0				
16					8.00	.7	5.00	.0				
17	8.00	.7	5.00	.0	8.00	.0	6.30	.0				
18	8.00	.7	5.00	.0	9.00	.4	5.00	.0				
19	7.00	.9	5.00	.7	9.00	.7	5.00	.0				
20	8.00	.7	5.00	.7	8.00	.7	5.00	.0			5.00	.0
21	9.00	.7	5.00	.0	8.00	.7	5.00	.0	10.00	.0	1.00	.0
22	7.00	.9	5.00	.0	8.00	.7	5.00	.0	8.00	.5	5.00	.0
23	7.00	.9	5.00	.7	9.00	.6	8.00	.3			2.30	1.1
24	8.00	1.0	5.00	.7			2.00	.0	8.00	.5	5.00	.0
25	8.00	.7	5.00	.0	8.00	.7	4.00	.0	8.00	.9	2.00	.5
26	8.00	.7	5.00	.7	8.00	.7	5.00	.0	8.00	.5	4.00	.5
27	8.00	.9	5.00	.8	8.00	.7	5.00	.0	8.00	.5	4.00	.0
28	8.00	.7			8.00	.7	5.00	.0	9.00	.5	4.00	.3
29	10.00	1.8			8.00	.8	5.00	.0	8.00	.6	4.00	.0
30	8.00	1.8							8.00	.6	5.00	.0
31	8.00	1.4										

Day.	October.				November.			
	A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	9.00	0.5	5.00	0.0				
2	9.00	.5						
3	9.00	.5			9.00	0.9		
4	9.00	.5	5.00	.3				
5					11.00	1.0		
6	9.00	.5	5.30	.1				
7	9.00	.5	5.00	.0	9.00	.9		
8	9.00	.5	5.00	.0				
9	9.00	.5	5.00	.0				
10	9.00	.5	5.00	.0				
11	9.00	.5	5.00	.0			4.00	1.0
12			4.00	.4				
13	9.00	1.0						
14	7.00	.9	4.00	.2				
15	7.00	.6			7.00	1.0		
16	9.00	.5						
17	9.00	.5						
18	9.00	.5						
19	9.00	.6	5.00	.3				
20	9.00	.5						
21	7.00	1.6						
22			5.00	.75				
23			5.00	.55				
24			5.00	.6				
25	8.00	.9						
26								
27	9.00	1.4						
28	9.00	1.1						
29	10.00	1.0						
30								
31								

WINOOSKI RIVER AT MONTPELIER, VT.

Location.—At covered wooden highway bridge near Central Vermont Railway station in Montpelier, just above mouth of Dog River and just below mouth of Worcester Branch of Winooski River.

Records available.—May 19, 1909, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Chain, attached to the highway bridge; read daily, morning and evening, to half-tenths. Limits of use: Half-tenths below and tenths above 5.5 feet.

Control.—Probably permanent.

Discharge measurements.—Formerly made from a footbridge about half a mile below the highway bridge at high stages and by wading at low stages. Recent high-water measurements made from the highway bridge.

Regulation.—The operation of the plant of the Colton Manufacturing Co. causes decided diurnal fluctuation in discharge at low stages. Fluctuations in the discharge of Worcester Branch are also apparent at this station.

Winter flow.—Discharge relation sometimes affected by ice.

Floods.—Flood of March, 1913, reached a maximum stage of 14.6 as determined with a level by an engineer of the Survey. Corresponding discharge approximately 15,500 second-feet.

Accuracy.—Rating curve well defined. Accuracy of estimates depends on the accuracy of mean daily gage heights.

Discharge measurements of Winooski River at Montpelier, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Mar. 8[a]	C. S. De Golyer	4.33	203	Apr. 26	R. S. Barnes	5.40	895
25	R. S. Barnes	8.41	4,140	Sept. 15[b]	G. H. Canfield	3.87	93
26	do	9.54	5,850	16[b]	do	3.97	105

[a] Measurement made under complete ice cover.

[b] Measurement made by wading.

Gage height, in feet, and discharge, in second-feet, of Winooski River at Montpelier, Vt., for 1913.

[Raymond Colton, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	4.85	563	4.8	535	5.45	945	5.5	980	.....	.....	.....	.....
2	4.85	563	4.85	563	4.75	508	4.55	406	4.3	289	4.2	246
3	4.75	508	4.75	508	4.85	563	4.95	620	4.3	289	4.3	289
4	4.85	563	5.25	808	4.85	563	4.9	590	4.4	334	4.4	334
5	6.2	1,560	6.2	1,560	4.8	535	4.7	480	4.3	289	4.3	289
6	5.8	1,210	5.8	1,210	4.5	381	4.5	381	4.4	334	4.5	381
7	5.6	1,060	5.5	980	4.5	381	4.55	406	4.3	289	4.3	289
8	5.45	945	5.35	875	4.4	334	4.3	289	4.3	289	4.4	334
9	5.25	808	4.85	563	4.3	289	4.5	381	4.45	358	4.9	590
10	4.85	563	4.85	563	4.5	381	4.5	381	5.7	1,130	5.8	1210
11	4.85	563	5.15	742	.....	.....	.....	.....	5.2	775	5.2	775
12	5.35	875	5.45	945	.....	.....	.....	.....	5.1	710	5.15	742
13	5.15	742	5.2	775	.....	.....	.....	.....	5.1	710	5.1	710
14	4.85	563	4.85	563	.....	.....	.....	.....	10.0	.....	11.2	.....
15	4.85	563	4.95	620	.....	.....	.....	.....	10.7	6,540	10.0	5700
16	4.85	563	4.85	563	.....	.....	.....	.....	9.1	4,620	9.0	4500
17	4.85	563	4.85	563	.....	.....	.....	.....	8.3	3,680	8.3	3680
18	5.15	742	5.6	1,060	.....	.....	.....	.....	5.6	960	5.5	890
19	7.8	3,400	7.6	3,140	.....	.....	.....	.....	5.5	890	5.3	755
20	6.0	1,380	5.8	1,210	.....	.....	.....	.....	5.4	820	5.4	820
21	7.8	3,400	8.4	4,180	.....	.....	.....	.....	8.6	4,020	8.8	4260
22	6.8	2,190	5.45	945	.....	.....	.....	.....	10.0	5,700	10.0	5700
23	5.6	1,060	5.45	945	.....	.....	.....	.....	6.4	1,660	6.5	1760
24	5.6	1,060	5.6	1,060	.....	.....	.....	.....	6.5	1,760	6.5	1760
25	5.25	808	5.35	875	.....	.....	.....	.....	8.5	3,900	12.0	8100
26	5.15	742	5.15	742	.....	.....	.....	.....	9.7	5,340	12.2	8340
27	5.6	1,060	5.6	1,060	.....	.....	.....	.....	10.5	6,300	13.0	9300
28	5.35	875	5.45	945	.....	.....	.....	.....	8.1	3,460	6.9	2160
29	5.35	875	5.35	875	.....	.....	.....	.....	6.6	1,860	6.5	1760
30	5.25	808	5.35	875	.....	.....	.....	.....	6.4	1,660	6.5	1760
31	5.25	808	5.15	742	.....	.....	.....	.....	6.5	1,760	6.5	1760

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	6.0	1,300	6.1	1,390	4.55	348	4.55	348	5.3	755	4.9	505
2	5.6	960	5.5	890	4.45	309	4.45	309	5.4	820	5.2	690
3	5.5	890	5.35	788	4.45	309	4.45	309	4.9	505	4.9	505
4	5.4	820	5.5	890	4.35	272	4.4	290	4.95	535	4.9	505
5	5.6	960	5.5	890	4.45	309	4.45	309	4.8	455	4.75	432
6	6.0	1,300	6.3	1,570	4.45	309	4.45	309	4.6	368	4.6	368
7	6.0	1,300	6.0	1,300	4.4	290	4.35	272	4.9	505	5.0	565
8	6.1	1,390	6.4	1,660	4.35	272	4.45	309	4.6	368	4.5	328
9	6.4	1,660	6.8	2,060	4.45	309	4.45	309	4.4	290	4.5	328
10	6.4	1,660	6.1	1,390	4.35	272	4.35	272	4.5	328	4.5	328
11	6.0	1,300	6.0	1,300	4.3	254	4.3	254	4.5	328	4.5	328
12	6.0	1,300	6.0	1,300	4.35	272	4.45	309	4.4	290	4.3	254
13	6.0	1,300	6.0	1,300	4.45	309	4.45	309	4.4	290	4.4	290
14	6.0	1,300	6.0	1,300	4.45	309	4.45	309	4.5	328	4.45	309
15	6.0	1,300	6.0	1,300	4.35	272	4.4	290	4.4	290	4.4	290
16	6.0	1,300	6.0	1,300	4.4	290	4.4	290	4.4	290	4.4	290
17	5.8	1,120	5.8	1,120	4.45	309	4.45	309	4.0	160	4.5	328
18	5.45	855	5.45	855	4.4	290	4.35	272	4.5	328	4.45	309
19	5.45	855	5.5	890	4.35	272	4.35	272	4.5	328	4.5	328
20	5.35	788	5.45	855	4.35	272	4.45	309	4.3	254	4.3	254
21	5.35	788	5.35	788	4.45	309	4.75	309	4.2	220	4.3	254
22	5.35	788	5.35	788	4.85	480	5.05	595	4.1	189	4.1	189
23	5.2	690	5.25	722	5.8	1,120	6.4	1,660	3.9	133	3.95	146
24	5.15	658	5.15	658	6.7	1,960	6.8	2,060	3.9	133	3.9	133
25	4.95	535	5.05	595	6.9	2,160	7.3	2,580	4.0	160	3.9	133
26	4.95	535	4.95	535	7.3	2,580	7.2	2,470	4.1	189	4.15	204
27	4.95	535	5.0	565	6.8	2,060	6.9	2,160	4.2	220	4.3	254
28	4.95	535	4.95	535	6.9	2,160	7.0	2,260	3.7	87	3.7	87
29	5.0	565	4.95	535	6.9	2,160	6.6	1,860	3.7	87	3.7	87
30	4.95	535	4.85	480	6.3	1,570	6.2	1,480	3.8	109	3.85	121
31	.....	.....	.....	.....	5.7	1,040	5.5	890	.....	.....	.....	.....

Gage height, in feet, and discharge, in second-feet, of Winooski River at Montpelier, Vt., for 1913—Continued.

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.9	133	3.9	133	3.85	121	3.95	146	4.0	160	4.05	174
2	3.9	133	3.9	133	4.35	272	4.15	204	4.0	160	3.9	133
3	3.8	109	3.85	121	4.15	204	4.25	237	3.8	109	3.75	98
4	3.9	133	3.8	109	4.15	204	4.15	204	3.6	68	3.7	87
5	3.8	109	3.75	98	4.15	204	4.2	220	3.7	87	4.0	160
6	3.65	78	3.65	78	4.15	204	4.15	204	3.9	133	3.8	109
7	3.7	87	3.65	78	4.05	174	4.05	174	3.8	109	3.85	121
8	3.65	78	3.65	78	3.85	121	3.95	146	4.0	160	3.8	109
9	3.7	87	3.65	78	3.95	146	4.0	160	3.9	133	3.8	109
10	3.85	121	4.15	204	4.15	204	4.0	160	3.85	121	3.9	133
11	4.05	174	4.1	189	3.95	146	4.0	160	3.8	109	3.9	133
12	4.1	189	4.1	189	4.05	174	4.05	174	3.85	121	3.9	133
13	3.95	146	3.95	146	4.05	174	4.05	174	3.9	133	3.9	133
14	3.9	133	3.95	146	3.95	146	4.0	160	3.8	109	3.85	121
15	4.05	174	4.05	174	4.0	160	4.05	174	3.7	87	3.5	51
16	3.85	121	3.95	146	4.05	174	4.05	174	3.45	44	3.25	20
17	3.85	121	3.85	121	3.95	146	4.0	160	3.65	78	3.75	98
18	3.85	121	3.95	146	4.05	174	4.15	204	3.9	133	4.05	174
19	4.05	174	3.85	121	4.1	189	4.1	189	3.8	109	3.75	98
20	3.75	98	3.65	78	4.05	174	4.1	189	3.95	146	4.0	160
21	3.85	121	3.95	146	4.0	160	.....	.....	3.95	146	3.95	146
22	3.95	146	3.85	121	3.75	98	3.8	109	3.9	133	4.1	189
23	3.85	121	3.65	78	4.2	220	4.4	290	4.6	368	4.5	328
24	3.85	121	3.85	121	4.8	455	4.95	535	4.4	290	4.2	220
25	3.75	98	3.85	121	5.3	755	5.2	690	4.1	189	3.95	146
26	3.85	121	3.9	133	4.7	410	4.9	505	3.9	133	4.05	174
27	3.85	121	3.85	121	5.1	625	4.8	455	3.95	146	3.9	133
28	4.05	174	4.65	389	4.3	254	4.1	189	3.8	109	3.5	51
29	4.25	237	4.0	160	4.0	160	4.1	189	3.3	25	3.4	37
30	4.15	204	3.85	121	4.1	189	4.1	189	3.6	68	3.7	87
31	3.65	78	3.85	121	4.0	160	4.1	189	.....	.....	.....	.....

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.8	109	3.85	121	4.4	290	4.3	254	4.35	272	4.45	309
2	3.9	133	4.0	160	4.1	189	4.0	160	4.35	272	4.35	272
3	3.4	37	3.3	25	4.3	254	4.4	290	4.35	272	4.4	290
4	4.1	189	4.2	220	4.2	220	4.3	254	4.45	309	4.55	348
5	4.0	160	3.9	133	4.3	254	4.35	272	4.5	328	4.45	309
6	3.6	68	3.7	87	4.3	254	4.3	254	4.35	272	4.25	237
7	3.7	87	3.65	78	4.3	254	4.2	220	4.15	204	4.25	237
8	3.7	87	3.8	109	4.15	204	4.3	254	4.65	389	5.05	595
9	3.8	109	3.9	133	4.2	220	4.3	254	4.75	432	4.6	368
10	3.85	121	4.0	160	4.3	254	4.3	254	4.45	309	4.45	309
11	4.0	160	4.0	160	4.15	204	4.05	174	4.4	290	4.45	309
12	3.95	146	4.0	160	4.05	174	4.1	189	4.45	309	4.45	309
13	4.0	160	4.0	160	4.15	204	4.15	174	4.45	309	4.45	309
14	4.3	254	4.4	290	4.25	237	4.45	309	4.4	290	4.45	309
15	4.3	254	4.3	254	4.75	432	4.35	272	4.45	309	4.4	290
16	4.2	220	4.3	254	4.15	204	4.05	174	4.35	272	4.35	272
17	4.1	189	4.0	160	4.15	204	4.25	237	4.25	237	4.3	254
18	3.8	109	3.9	133	4.25	237	4.25	237	4.25	237	4.4	290
19	3.5	51	3.6	68	4.35	272	4.55	348	4.35	272	4.45	309
20	4.3	254	4.4	290	5.05	595	5.6	960	4.35	272	4.35	272
21	5.0	565	5.2	690	5.15	688	4.75	432	4.15	204	4.0	160
22	4.75	432	4.7	410	4.55	348	4.45	309	4.45	309	4.55	348
23	4.8	455	4.9	505	4.15	204	4.25	237	4.35	272	4.3	254
24	4.9	505	5.0	565	4.35	272	4.45	309	4.25	237	4.35	272
25	5.0	565	5.05	595	4.35	272	4.4	290	4.25	237	4.25	237
26	5.1	625	5.1	625	4.25	237	4.25	237	4.25	237	4.3	254
27	5.0	565	5.1	625	4.1	189	4.05	174	4.45	309	4.55	348
28	4.8	455	4.7	410	4.05	174	4.25	237	4.55	348	4.6	368
29	4.6	368	4.65	389	4.25	237	4.35	272	4.45	309	4.45	309
30	4.6	368	4.55	348	4.15	204	4.05	174	4.55	348	4.55	348
31	4.4	290	4.5	328	.....	.....	.....	.....	.....	.....	.....	.....

WORCESTER BRANCH OF WINOOSKI RIVER AT MONTPELIER, VT.

Location.—A short distance below plant of Lane Manufacturing Co., at Montpelier, near junction of Worcester Branch with main stream.

Records available.—May 15, 1909, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff, fastened to a stone wall and tree about 100 feet below power plant; read daily, morning and evening, to half-tenths. Limits of use: Half-tenths below and tenths above 3.0 feet.

Control.—Fairly permanent.

Discharge measurements.—Made from steel highway bridge about 300 feet below gage.

Regulation.—Flow affected by operation of power plant just above station.

Winter flow.—Discharge relation materially affected by ice.

Floods.—Flood of March, 1913, reached a maximum stage of 9.8 feet at 4.30 p. m. March 25, and a second peak stage of 9.7 feet at 4.30 p. m. March 27. Records of maximum stage verified by engineer of Geological Survey from high-water marks. Maximum discharge approximately 3,420 second-feet.

Accuracy.—Rating curve fairly well defined. Accuracy of estimates depends on the accuracy of mean daily gage heights.

Discharge measurements of Worcester Branch of Winooski River at Montpelier, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.ft.*
Mar. 26	R. S. Barnes	7.20	2,030
26	do	6.50	1,700
Apr. 28	do	1.87	126

Gage height, in feet, and discharge, in second-feet, of Worcester Branch of Winooski River at Montpelier, Vt., for 1913.

[S. A. Luke, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.4	54	1.35	48	2.0	145	1.8	110				
2	1.35	48	1.3	43			a1.5	66				
3	1.3	43	1.8	110	1.5	66	1.5	66				
4	3.0	390	2.5	258	1.4	54	1.5	66				
5			a2.1	165	1.5	66	1.5	66				
6	1.7	94	1.8	110	1.6	79	1.5	66				
7	2.1	165	2.0	145	1.55	72	1.5	66				
8	1.8	110	1.9	127	1.4	54	1.4	54				
9	2.0	145	1.6	79			a1.5					
10	1.7	94	1.6	79	1.6		1.7					
11	1.7	94	1.6	79	1.6		1.8					
12			a2.6	283	1.7		1.8					
13	2.3	210	2.4	234	1.7		1.7					
14	2.2	187	2.1	165	1.8		1.9					
15	1.9	127	1.8	110	2.2		2.3					
16	1.6	79	1.7	94			a2.4					
17	1.6	79	2.05	155					2.9	362	2.7	309
18	2.9	362	3.1	418					2.3	210	2.4	234
19	a5.0	1,070	a3.9	666					2.9	362	3.3	476
20	3.0	390	2.6	283					3.6	568	4.1	734
21	4.7	954	4.1	734					4.4	842	5.8	1,400
22	3.0	390	2.7	309					6.3	1,620	4.2	770
23	2.2	187	2.2	187							a3.0	390
24	2.3	210	2.2	187					2.8	335	3.3	476
25	1.9	127	2.0	145					5.1	1,110	9.8	3,420
26			a1.9	127					5.2	1,150	6.6	1,760
27	2.0	145	2.0	145					5.4	1,230	9.7	3,360
28	1.7	94	1.7	94					5.2	1,150	3.8	632
29	1.7	94	1.5	66					3.6	568	3.0	390
30	1.6	79	1.5	66							a2.6	283
31	1.5	66	1.5	66					2.7	309	4.6	916

a On Sunday usually one gage reading between 2 and 5 p. m.

Gage height, in feet, and discharge, in second-feet, of Worcester Branch of Winooski River at Montpelier, Vt., for 1913—Continued.

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.9	666	3.3	476	1.4	54	1.5	66	.....	.....	a 1.8	110
2	2.7	309	2.7	309	1.4	54	1.5	66	1.9	127	1.7	94
3	2.4	234	2.4	234	1.3	43	1.4	54	1.6	79	1.6	79
4	3.0	390	3.7	600	.....	.....	a 1.2	32	1.5	66	1.6	79
5	4.8	992	4.5	878	1.25	38	1.3	43	1.4	54	1.5	66
6	.....	.....	a 2.9	362	1.1	22	1.4	54	1.3	43	1.45	60
7	2.5	258	2.6	283	1.2	32	1.05	18	1.3	43	1.5	66
8	2.2	187	2.5	258	1.1	22	1.05	18	.....	.....	a 1.4	54
9	2.2	187	2.3	210	1.2	32	1.4	54	1.3	43	1.5	66
10	2.0	145	2.2	187	1.2	32	1.4	54	1.2	32	1.3	43
11	2.4	234	2.7	309	.....	.....	a 1.0	14	1.2	32	1.4	54
12	2.5	258	2.7	309	1.1	22	1.4	54	1.15	27	1.3	43
13	.....	.....	a 2.7	309	1.1	22	1.4	54	1.2	32	1.4	54
14	2.6	283	2.4	234	1.1	22	1.4	54	1.15	27	1.4	54
15	2.7	309	2.35	222	1.15	27	1.3	43	.....	.....	a 1.1	22
16	2.6	283	2.4	234	1.2	32	1.3	43	1.1	22	1.4	54
17	2.4	234	2.2	187	1.2	32	1.3	43	1.25	38	1.5	66
18	1.9	127	2.0	145	.....	.....	a 1.2	32	1.2	32	1.3	43
19	2.2	187	3.1	418	1.25	38	1.3	43	1.1	22	1.2	32
20	.....	.....	a 2.4	234	1.15	27	1.4	54	1.1	22	1.2	32
21	2.1	165	2.2	187	1.1	22	1.4	54	1.0	14	1.15	27
22	2.0	145	1.9	127	1.2	32	1.9	127	.....	.....	a 1.0	14
23	1.9	127	2.0	145	2.4	234	2.6	283	1.0	14	1.1	22
24	2.0	145	1.9	127	3.0	390	2.8	335	1.0	14	1.1	22
25	1.9	127	1.9	127	.....	.....	a 2.4	234	1.0	14	1.2	32
26	1.8	110	1.8	110	1.8	110	1.8	110	.8	2.5	1.3	43
27	.....	.....	a 1.65	86	1.6	79	1.6	79	1.0	14	1.1	22
28	1.6	79	1.7	94	1.9	127	2.2	187	1.0	14	1.1	22
29	1.6	79	1.6	79	4.6	916	4.4	842	.....	.....	a .9	7.5
30	1.4	54	1.6	79	2.6	283	2.4	234	.9	7.5	1.0	14
31	.....	.....	.....	.....	2.2	187	2.1	165	.....	.....	.....	.....

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.0	14	1.1	22	0.9	7.5	1.1	22	0.8	2.5	0.8	2.5
2	1.0	14	1.05	18	.9	7.5	.8	2.5	.9	7.5	1.0	14
3	.8	2.5	.8	2.5	.....	.....	a .9	7.5	.9	7.5	1.0	14
4	.....	.....	.8	2.5	.8	2.5	.7	.5	.8	2.5	.9	7.5
5	.8	2.5	.8	2.5	.8	2.5	1.2	32	.8	2.5	.9	7.5
6	.....	.....	a .9	7.5	.8	2.5	.9	7.5	.8	2.5	.9	7.5
7	.9	7.5	1.1	22	.8	2.5	.8	2.5	.....	.....	a .9	7.5
8	.9	7.5	.8	2.5	.7	.5	.8	2.5	.8	2.5	.9	7.5
9	.8	2.5	.8	2.5	.7	.5	.8	2.5	.8	2.5	.8	2.5
10	.8	2.5	1.1	22	.....	.....	a .8	2.5	.8	2.5	.8	2.5
11	1.05	18	1.1	22	.8	2.5	.8	2.5	.8	2.5	.8	2.5
12	.9	7.5	1.1	22	.7	.5	.8	2.5	.8	2.5	.8	2.5
13	.....	.....	a .9	7.5	.7	.5	.7	.5	.8	2.5	1.0	14
14	1.05	18	1.1	22	.6	.0	.8	2.5	.....	.....	a .9	7.5
15	1.1	22	1.1	22	.7	.5	.8	2.5	.9	7.5	.9	7.5
16	.9	7.5	1.05	18	.7	.5	.8	2.5	.9	7.5	.85	5.0
17	.9	7.5	1.1	22	.....	.....	a .7	.5	.8	2.5	.85	5.0
18	.8	2.5	1.0	14	.7	.5	.8	2.5	.8	2.5	.8	2.5
19	1.4	54	1.1	22	.8	2.5	1.0	14	.8	2.5	.8	2.5
20	.....	.....	a .9	7.5	.9	7.5	.9	7.5	.8	2.5	.8	2.5
21	.8	2.5	.9	7.5	.8	2.5	.8	2.5	.....	.....	a .8	2.5
22	.9	7.5	.9	7.5	.8	2.5	.8	2.5	.8	2.5	1.1	22
23	.9	7.5	.9	7.5	.9	7.5	.8	2.5	.9	7.5	1.5	66
24	.8	2.5	.8	2.5	.....	.....	a .8	2.5	.9	7.5	1.35	48
25	.8	2.5	.8	2.5	.8	2.5	1.0	14	.9	7.5	1.2	32
26	1.05	18	1.3	43	.8	2.5	.9	7.5	.8	2.5	.95	11
27	.....	.....	a 1.0	14	.8	2.5	1.0	14	.9	7.5	.9	7.5
28	1.0	14	1.3	43	.8	2.5	1.0	14	.....	.....	a .8	2.5
29	1.3	43	1.5	66	.8	2.5	1.0	14	.8	2.5	1.0	14
30	1.15	27	1.4	54	.9	7.5	1.0	14	.85	5.0	1.0	14
31	1.0	14	.9	7.5	.....	.....	a .8	2.5	.....	.....	.....	.....

a On Sunday one gage reading between 2 and 5 p. m.

Gage height, in feet, and discharge, in second-feet, of Worcester Branch of Winooski River at Montpelier, Vt., for 1913—Continued.

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	0.8	2.5	1.1	22	1.2	32	1.4	54	1.1	22	1.5	66
2	.8	2.5	.8	2.5	.....	.....	a 1.1	22	1.3	43	1.6	79
3	.8	2.5	.9	7.5	1.2	32	1.2	32	1.5	66	1.9	127
4	.8	2.5	.9	7.5	1.1	22	1.4	54	1.7	94	1.7	94
5	.....	.....	a.9	7.5	1.1	22	1.3	43	1.6	79	1.6	79
6	1.0	14	1.1	22	1.1	22	1.25	38	1.4	54	1.5	66
7	.8	2.5	1.1	22	1.1	22	1.2	32	.....	.....	a 1.3	43
8	.8	2.5	1.0	14	1.1	22	1.25	38	2.2	187	2.3	210
9	.8	2.5	1.0	14	1.1	22	1.3	43	1.7	94	1.75	102
10	.8	2.5	1.0	14	1.8	110	1.9	127	1.4	54	1.7	94
11	.8	2.5	.9	7.5	1.3	43	1.5	66	1.35	48	1.6	79
12	.....	.....	a.9	7.5	1.3	43	1.5	66	1.3	43	1.5	66
13	1.1	22	1.2	32	1.2	32	1.5	66	1.3	43	1.55	72
14	1.1	22	1.4	54	1.15	27	1.4	54	.....	.....	a 1.4	54
15	1.15	27	1.25	38	1.1	22	1.4	54	1.4	54	1.5	66
16	1.0	14	1.1	22	1.1	22	1.1	22	1.3	43	1.5	66
17	1.0	14	1.2	32	1.1	22	1.3	43	1.2	32	1.3	43
18	.9	7.5	1.0	14	1.1	22	1.2	32	1.2	32	1.5	66
19	.....	.....	a.8	2.5	1.1	22	1.25	38	1.3	43	1.5	66
20	1.4	54	1.45	60	3.1	418	2.8	335	1.2	32	1.5	66
21	2.0	145	1.5	66	2.3	210	2.0	145	.....	.....	a 1.2	32
22	1.6	79	1.8	110	1.7	94	1.7	94	1.2	32	1.35	48
23	1.4	54	1.8	110	1.55	72	1.5	66	1.3	43	1.4	54
24	1.2	32	1.4	54	1.4	54	1.6	79	1.1	22	1.35	48
25	1.2	32	2.6	283	1.3	43	1.5	66	1.15	27	1.2	32
26	2.1	165	2.3	210	1.3	43	1.4	54	1.2	32	1.3	43
27	2.5	258	2.2	187	1.0	14	1.0	14	1.1	22	1.3	43
28	1.7	94	1.6	79	1.0	14	1.4	54	.....	.....	a 1.2	32
29	1.3	43	1.5	66	1.05	18	1.4	54	1.2	32	1.5	66
30	1.3	43	1.5	66	.....	.....	a 1.0	14	1.2	32	1.4	54
31	1.2	32	1.45	60	.....	.....	.....	.....	1.3	43	1.5	66

a On Sunday usually one gage reading between 2 and 5 p. m.

NOTE.—Discharge relation affected by ice about Feb. 9 to Mar. 16.

DOG RIVER AT NORTHFIELD, VT.

Location.—At highway bridge in Northfield, Vt., near Norwich University grounds. Union Brook flows into Dog River a short distance below station.

Records available.—May 14, 1909, to December 31, 1913. August 23, 1910, station at lower bridge; August 23, 1910, to December 31, 1913, present station.

Drainage area.—57 square miles.

Gage.—Vertical staff attached to highway bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0.

Control.—Probably permanent.

Discharge measurements.—Made from highway bridge during high water and by wading during low water.

Regulation.—Diurnal fluctuation caused by operations of power plant probably not sufficient to affect materially computations based on semidaily observations of gage height.

Floods.—Flood of March, 1913, reached a maximum stage 8.5 feet at approximately 10 p. m. March 25. A second maximum of 7.7 feet was reached at noon March 27 Maximum discharge was about 3,400 second-feet, or 60 second-feet per square mile of drainage area.

Discharge measurements of Dog River at Northfield, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 27	R. S. Barnes	7.50	2,520
27	do	7.00	1,960
Apr. 28	do	1.93	90
Sept. 14[a]	G. H. Canfield	0.70	3.68

[a] Measurement made by wading.

Daily gage height, in feet, of Dog River at Northfield, Vt., for 1913.

[Florence C. Doyle, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.62	2.0	1.10	2.85	1.90	2.0	0.96	0.85	0.70	0.80	1.55	1.60
2	1.55	1.35	1.20	2.6	1.84	1.90	.92	.85	.68	1.25	1.50	1.70
3	2.25	1.40	1.05	2.4	1.80	1.85	.96	.81	.72	1.22	1.41	1.95
4	2.25	1.48	1.10	3.4	1.71	1.95	.90	.89	.80	1.05	1.35	1.85
5	1.80	1.48	1.10	4.0	1.76	1.82	.95	.90	.72	.94	1.48	1.75
6	1.28	1.32	1.02	3.3	1.65	1.73	.90	.92	.69	.80	1.40	1.65
7	2.2	1.35	1.05	2.85	1.55	1.70	.90	.82	.69	.74	1.40	1.68
8	1.20	1.30	.....	2.6	1.55	1.64	1.05	.80	.70	.75	1.45	2.15
9	1.30	.....	.....	2.35	1.60	1.60	1.18	.79	.68	.85	2.15	2.3
10	1.35	.....	3.0	2.6	1.52	1.50	1.25	.78	.62	.90	2.6	1.90
11	1.45	.....	1.80	2.6	1.51	1.35	1.12	.78	.62	.80	2.05	1.78
12	3.4	.....	2.15	2.5	1.48	1.20	.96	.75	.72	1.15	1.78	1.78
13	1.95	.....	1.68	2.45	1.44	1.35	1.05	.75	.70	1.25	1.80	1.72
14	1.80	.....	6.2	2.5	1.51	1.34	1.00	.82	.70	1.25	1.72	1.76
15	1.80	.....	4.7	2.5	1.42	1.20	.95	.78	.70	1.18	1.68	1.75
16	1.75	.....	3.1	2.25	1.60	1.32	.90	.78	.70	1.05	1.65	1.65
17	2.65	.....	1.60	2.3	1.55	1.35	.88	.75	.72	1.00	1.65	1.68
18	3.1	.....	1.90	2.25	1.5	1.42	.84	.85	.72	.88	1.59	1.65
19	2.9	.....	3.1	2.55	1.49	1.35	.88	.80	.70	.99	1.70	1.55
20	2.4	.....	3.9	2.30	1.41	1.28	.85	.70	.75	1.98	2.4	1.56
21	4.0	1.65	3.4	2.2	1.39	1.22	.86	.70	.70	2.0	1.95	1.58
22	2.45	2.1	2.4	2.2	1.85	1.19	.82	.80	1.50	1.78	1.82	1.52
23	2.1	1.68	2.6	2.3	2.3	1.22	.82	.85	1.25	1.35	1.81	1.30
24	2.45	1.30	3.8	2.3	2.6	1.18	.88	.72	.86	1.29	1.78	1.42
25	2.0	1.22	5.2	2.2	2.1	1.08	.92	.70	.80	1.82	1.68	1.50
26	1.92	1.05	4.4	2.15	2.0	1.02	1.00	.69	.74	2.4	1.61	1.52
27	2.1	1.10	7.1	2.1	1.89	1.12	.79	.90	.78	2.45	1.55	1.60
28	1.75	1.08	3.7	2.1	2.1	1.02	1.29	.80	.78	1.88	1.65	1.52
29	1.45	.....	3.1	2.0	3.2	1.00	1.20	.80	.69	1.85	1.60	1.50
30	1.70	.....	2.95	1.94	2.45	1.00	1.00	.78	.68	1.81	1.55	1.40
31	1.62	.....	4.0	.....	2.2	.....	.92	.74	.....	1.68	.....	1.40

NOTE.—Discharge relation affected by ice about Feb. 9–20.

Daily discharge, in second-feet, of Dog River at Northfield, Vt., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	59	99	18	215	88	99	10	7	4	5	52	57
2	52	35	24	177	81	88	9	7	4	28	48	67
3	130	39	15	149	77	82	10	6	4	25	40	94
4	130	46	18	312	68	94	8	8	5	15	35	82
5	77	46	18	443	73	79	10	8	4	10	46	72
6	30	33	13	293	62	70	8	9	4	5	39	62
7	123	35	15	215	52	67	8	6	4	4	39	65
8	24	31	15	177	52	61	15	5	4	4	44	117
9	31	.....	50	142	57	57	23	5	4	7	117	136
10	35	.....	239	177	50	48	28	5	3	8	177	88
11	44	.....	77	177	49	35	19	5	3	5	105	75
12	312	.....	117	163	46	24	10	4	4	21	75	75
13	94	.....	65	156	43	35	15	4	4	28	77	69
14	77	.....	1,390	163	49	34	12	6	4	28	69	73
15	77	.....	647	163	41	24	10	5	4	23	65	72
16	72	.....	256	130	57	33	8	5	4	15	62	62
17	184	.....	57	136	52	35	8	4	4	12	62	65
18	256	.....	88	130	48	41	6	7	4	8	56	62
19	223	.....	256	170	47	35	8	5	4	12	67	52
20	149	.....	419	136	40	30	7	4.	4	97	149	53
21	443	62	312	123	38	25	7	4	4	99	94	55
22	156	111	149	123	82	23	6	5	48	75	79	50
23	111	65	177	136	136	25	6	7	28	35	78	31
24	156	31	396	136	177	23	8	4	7	30	75	41
25	99	25	838	123	111	17	9	4	5	79	65	48
26	90	15	553	117	99	13	12	4	4	149	58	50
27	111	18	2,100	111	87	19	5	8	5	156	52	57
28	72	17	374	111	111	13	30	5	5	76	62	50
29	44	.....	256	99	274	12	24	5	4	82	57	48
30	67	.....	231	92	156	12	12	5	4	78	52	39
31	59	.....	443	.....	123	.....	9	4	.....	65	.....	39

Monthly discharge of Dog River at Northfield, Vt., for 1913.

[Drainage area, 57 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	443	24	116	2.04	2.35	A.
February	111	.....	33.4	.586	.61	C.
March	2,100	13	311	5.46	6.30	A.
April	443	92	166	2.91	3.25	A.
May	274	38	81.5	1.43	1.65	A.
June	99	12	41.8	.733	.82	B.
July	30	5	11.6	.204	.24	C.
August	9	4	5.48	.0961	.11	C.
September	48	3	6.43	.113	.13	C.
October	156	4	41.4	.726	.84	B.
November	177	35	69.9	1.23	1.37	A.
December	136	31	64.7	1.14	1.31	A.
The year	2,100	3	79.5	1.39	18.98	

NOTE.—Discharge Feb. 9 to 20, inclusive, interpolated by comparison with records of nearby streams and a study of the climatologic records at Northfield.

LAMOILLE RIVER AT CADYS FALLS, VT.

Location.—About 1,000 feet below power plant of Morrisville Electric Light & Power Co., 1,000 feet below the highway bridge at what was formerly known as Cadys Falls, and about 2 miles downstream from village of Morrisville; Hyde Park is 1 mile north. Both Hyde Park and Morrisville are on the St. Johnsbury & Lake Champlain Railroad.

Records available.—September 4 to December 31, 1913. A station was maintained in the village of Morrisville July 28, 1909, to July 13, 1910, and was replaced by a station at Johnson July 14, 1910. See Water-Supply Paper 324, page 126.

Drainage area.—Not measured.

Gage.—Gurley electric water-stage register in standard timber shelter over timber-lined well.

Control.—Gravel 500 feet below gage well defined; bed of stream smooth gravel.

Discharge measurements.—At low stages made by wading 500 feet below gage; at medium and high stages from a cable.

Winter flow.—Discharge relation affected by ice during extremely cold weather.

Accuracy.—Conditions for making discharge measurements are excellent. Rating curve fairly well defined. Diurnal fluctuation determined by recording gage.

Discharge measurements of Lamoille River at Cadys Falls, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Sept. 4[a]	G. H. Canfield	2.06	107
6[a]	do	2.05	102
6[a]	do	1.95	73.4
Oct. 31[b]	C. S. De Golyer	2.54	251

[a] Measurement made by wading. [b] Measurement made from cable.

NOTE.—Additional measurements made early in 1914 were used in determining the rating curve.

Daily gage height, in feet, of Lamoille River at Cadys Falls, Vt., for 1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	2.04	2.50	2.42	16	1.95	2.02	2.16	2.42
2	.....	1.96	2.27	2.68	17	1.95	1.99	2.08	2.39
3	.....	1.98	2.48	2.89	18	1.96	1.95	2.17	2.41
4	2.06	2.09	2.50	3.00	19	1.95	1.87	2.19	2.26
5	2.05	2.01	2.45	2.69	20	1.95	2.27	3.34	2.28
6	2.01	1.99	2.33	2.57	21	1.87	2.80	2.94	2.25
7	1.93	1.97	2.28	2.34	22	1.99	2.44	2.67	2.26
8	1.98	2.00	2.35	3.08	23	2.32	2.36	2.44	2.19
9	1.98	1.96	2.22	2.85	24	2.19	.....	2.52	2.14
10	2.03	1.97	2.51	2.66	25	2.16	.....	2.53	2.22
11	1.98	2.00	2.49	2.52	26	2.08	.....	2.50	2.23
12	2.01	2.04	2.37	2.31	27	2.07	.....	2.35	2.13
13	1.94	2.13	2.26	2.45	28	2.00	.....	2.26	2.04
14	1.89	2.21	2.28	2.37	29	2.00	.....	2.31	.....
15	1.93	2.10	2.22	2.37	30	2.05	2.85	2.20	.....
					31	.....	262	.....	.....

NOTE.—Gage heights computed from records obtained by a Gurley electric water-stage register. No records obtained Oct. 24–29 and Dec. 29–31.

Daily discharge, in second-feet, of Lamoille River at Cadys Falls, Vt., for 1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	99	237	211	16	78	94	a 132	211
2	.....	80	a 164	302	17	78	87	110	201
3	.....	84	230	383	18	80	78	135	207
4	105	112	237	428	19	78	a 60	140	161
5	102	a 92	220	305	20	78	164	578	167
6	92	87	182	262	21	a 60	347	403	a 158
7	a 73	82	167	a 185	22	87	217	298	161
8	84	89	188	462	23	179	192	a 217	140
9	84	80	a 149	367	24	140	.....	244	126
10	97	82	240	294	25	132	.....	248	149
11	84	89	234	244	26	110	.....	237	152
12	92	a 99	195	176	27	107	.....	188	123
13	75	123	161	220	28	a 89	.....	161	a 99
14	a 64	146	167	a 195	29	89	.....	176	.....
15	73	115	149	195	30	102	367	a 143	.....
					31	.....	279	.....	.....

a Sunday.

NOTE.—Discharge computed from a fairly well-defined rating curve.

Monthly discharge of Lamoille River at Cadys Falls, Vt., for 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
September 4–30	179	60	93	B.
October	.....	60	188	B.
November	578	110	211	A.
December	462	99	213	A.

NOTE.—Discharge for period Oct. 24–29 estimated by comparison with records at Johnson, Vt. Discharge for Dec. 29, 30, and 31 estimated at 110 second-feet.

LAMOILLE RIVER AT JOHNSON, VT.

Location.—At highway bridge on main road from railroad station to post office in town of Johnson, Vt., and about 400 feet above the mouth of Ginon River.

Records available.—July 14, 1910, to December 31, 1913. From July 28, 1909, to July 13, 1910, a station was maintained on Lamoille River at Morrisville, Vt.

Drainage area.—Not measured.

Gage.—Chain gage fastened to the handrail of the bridge; read daily, morning and evening, to tenths.

Control.—Channel fairly permanent; bed composed of gravel; ledge rock projects from the left bank; a small gravel riffle about 350 feet below the bridge indicates no backwater from Ginon River at ordinary stages.

Discharge measurements.—At high stages made from highway bridge; at low stages made by wading about 500 feet above the bridge.

Regulation.—Operation of mills and power plants above the station cause considerable daily fluctuations in flow.

Winter flow.—Discharge relation affected by ice.

Floods.—Flood of March, 1913, reached a peak stage of 12.4 feet at 6 p. m. March 25 and a maximum stage of 13 feet at 6 p. m. March 27, as indicated by the observer's records and later verified by an engineer of the Survey from high-water marks. Maximum discharge, approximately 8,500 second-feet.

Accuracy.—Rating curve fairly well defined for ordinary stages. Two gage-height readings a day and corresponding discharge values are published, as it is not known how closely the semidaily readings indicate the mean gage height for the day.

Discharge measurements of Lamoille River at Johnson, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 7[a]	C. S. De Golyer	5.49	235	Aug. 20[b]	G. H. Canfield	2.18	98
29	R. S. Barnes	6.12	2,190	20[b]	do	2.37	136
Apr. 25	do	3.35	555				

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Gage height, in feet, and discharge, in second-feet, of Lamoille River at Johnson, Vt., for 1913.

[F. M. Ward, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.0	345	3.3	465								
2	3.0	345	3.2	425								
2	3.1	385	3.0	345								
4	4.6	1,140	4.7	1,200								
5	4.3	965	4.0	800								
6	4.0	800	3.8	700								
7	3.7	650	3.8	700								
8	3.6	600	3.8	700								
9	4.0	800	3.9	750								
10	3.7	650	3.6	600								
11	4.5		4.8									
12	4.2		4.0									
13												
14												
15												
16									11.0		9.3	
17									6.0		5.9	
18									5.6		5.4	
19									5.0		5.9	
20	8.6		8.4						6.0		7.3	
21	9.2		9.4						8.3		9.0	
22	8.0		8.3						12.6		9.3	
23	7.5		7.3						7.0		5.9	
24	7.2		7.3						5.2	1,530	5.7	1,880
25	6.8		6.9						8.0	3,650	12.4	7,840
26	6.3		6.1						10.6	5,980	11.0	6,360
27	6.7		6.8						8.8	4,310	13.0	8,500
28	6.0								9.8	5,220	8.3	3,890
29									6.3	2,300	6.2	2,230
30									5.9	2,020	4.7	1,200
31									5.0	1,400	7.6	3,330

Gage height, in feet, and discharge, in second-feet, of Lamoille River at Johnson, Vt., for 1913—Continued.

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	7.3	3,090	6.4	2,370	3.1	385	3.0	345	3.9	750	3.6	600
2	5.5	1,740	5.2	1,530	3.0	345	2.8	275	3.4	510	3.2	425
3	4.8	1,260	4.6	1,140	3.0	345	2.9	310	3.2	425	3.4	510
4	5.0	1,400	6.4	2,370	2.8	275	2.7	242	3.0	345	2.8	275
5	8.4	3,970	8.4	3,970	2.8	275	2.8	275	2.9	310	3.0	345
6	6.0	2,090	5.8	1,950	2.8	275	2.9	310	2.8	275	2.9	310
7	5.4	1,670	5.0	1,400	2.9	310	2.8	275	2.6	212	3.0	345
8	4.5	1,080	4.3	965	2.75	258	2.8	275	2.9	310	3.0	345
9	4.4	1,020	4.25	938	2.8	275	2.9	310	3.0	345	3.1	385
10	4.3	965	4.1	855	2.7	242	2.8	275	3.0	345	2.8	275
11	4.1	855	4.4	1,020	2.7	242	2.6	212	2.2	119	2.3	140
12	4.5	1,080	4.7	1,200	2.6	212	2.55	199	2.2	119	2.3	140
13	4.5	1,080	4.4	1,020	2.5	186	2.6	212	2.4	162	2.6	212
14	4.5	1,080	4.45	1,050	2.6	212	2.5	186	2.2	119	2.1	99
15	4.3	965	4.4	1,020	2.5	186	2.6	212	2.1	99	2.3	140
16	4.45	1,050	4.4	1,020	2.5	186	2.45	174	2.3	140	2.6	212
17	4.1	855	4.0	800	2.5	186	2.6	212	3.6	600	3.4	510
18	4.0	800	3.8	700	2.6	212	2.5	186	2.9	310	3.0	345
19	4.1	855	5.65	1,840	2.8	275	2.85	292	2.6	212	2.7	242
20	5.4	1,670	5.0	1,400	2.8	275	2.75	258	2.7	242	2.5	186
21	4.0	800	3.9	750	2.6	212	2.7	242	2.4	162	2.3	140
22	3.9	750	3.8	700	2.7	242	2.8	275	2.2	119	2.1	99
23	3.8	700	3.7	650	2.9	310	3.2	425	2.2	119	2.45	174
24	3.6	600	3.5	555	3.0	345	2.9	310	2.3	140	2.5	186
25	3.7	650	3.4	510	3.4	510	3.2	425	2.4	162	2.5	186
26	3.4	510	3.5	555	3.8	700	3.6	600	2.4	162	2.5	186
27	3.6	600	3.4	510	3.0	345	2.9	310	2.8	275	2.6	212
28	3.3	465	3.3	465	3.2	425	3.6	600	2.4	162	2.2	119
29	3.3	465	3.2	425	6.0	2,090	6.3	2,300	2.3	140	2.4	162
30	3.2	425	3.1	385	6.2	2,230	5.0	1,400	2.3	140	2.35	151
31					4.6	1,140	4.0	800				

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	2.3	140	2.4	162	2.5	186	2.6	212	2.2	119	2.2	119
2	2.2	119	2.3	140	2.4	162	2.5	186	2.1	99	2.2	119
3	2.3	140	2.4	162	2.5	186	2.4	162	2.2	119	2.3	140
4	2.2	119	2.3	140	2.3	140	2.4	162	2.2	119	2.3	140
5	2.1	99	2.2	119	2.4	162	2.3	140	2.1	99	2.2	119
6	2.4	162	2.3	140	2.3	140	2.35	151	2.1	99	2.1	99
7	2.4	162	2.3	140	2.3	140	2.4	162	2.2	119	2.3	140
8	2.25	130	2.4	162	2.2	119	2.4	162	2.1	99	2.2	119
9	2.2	119	2.3	140	2.2	119	2.2	119	2.1	99	2.3	140
10	2.4	162	2.8	275	2.2	119	2.3	140	2.1	99	2.2	119
11	2.8	275	2.9	310	2.3	140	2.4	162	2.1	99	2.25	130
12	2.5	186	2.5	186	2.3	140	2.35	151	2.0	81	2.3	140
13	2.4	162	2.3	140	2.3	140	2.4	162	2.1	99	3.0	345
14	2.3	140	2.4	162	2.3	140	2.4	162	2.0	81	2.1	99
15	2.3	140	2.4	162	2.3	140	2.3	140	2.0	81	2.2	119
16	2.3	140	2.2	119	2.3	140	2.2	119	2.0	81	2.1	99
17	2.3	140	2.2	119	2.2	119	2.3	140	2.0	81	2.2	119
18	2.4	162	2.3	140	2.3	140	2.1	99	2.0	81	2.3	140
19	2.9	310	3.0	345	2.2	119	2.3	140	2.0	81	2.2	119
20	2.4	162	2.5	186	2.3	140	2.25	130	2.0	81	2.1	99
21	2.3	140	2.2	119	2.2	119	2.3	140	2.0	81	2.3	140
22	2.3	140	2.2	119	2.2	119	2.25	130	2.8	275	3.6	600
23	2.3	140	2.1	99	2.2	119	2.4	162	2.8	275	2.6	212
24	2.3	140	2.4	162	2.3	140	2.2	119	2.4	162	2.6	212
25	2.4	162	2.6	212	2.1	99	2.3	140	2.4	162	2.3	140
26	2.5	186	2.4	162	2.2	119	2.3	140	2.4	162	2.25	130
27	2.3	140	2.3	140	2.3	140	2.4	162	2.3	140	2.25	130
28	2.4	162	3.0	345	2.3	140	2.4	162	2.4	162	2.3	140
29	3.8	425	3.1	385	2.3	140	2.35	151	2.3	140	2.0	81
30	3.0	345	2.9	310	2.3	140	2.4	162	2.1	99	2.2	119
31	2.8	275	2.7	242	2.2	119	2.3	140				

Gage height, in feet, and discharge, in second-feet, of Lamoille River at Johnson, Vt., for 1913—Continued.

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	2.2	119	2.3	140	3.1	385	3.0	345	2.6	212	2.7	242
2	2.1	99	2.0	81	2.9	310	2.8	275	2.8	275	3.0	345
3	2.3	140	2.6	212	2.6	212	2.7	242	3.4	510	3.6	600
4	2.3	140	2.4	162	2.5	186	2.5	186	3.6	600	3.5	555
5	2.2	119	2.1	99	2.7	242	2.8	275	3.5	555	3.4	510
6	2.1	99	2.0	81	2.6	212	2.7	242	3.2	425	3.1	385
7	2.1	99	2.1	99	2.5	186	2.6	212	3.4	510	3.6	600
8	2.0	81	2.1	99	2.9	310	2.8	275	3.7	650	3.7	650
9	2.2	119	2.1	99	2.8	275	2.7	242	3.2	425	3.0	345
10	2.1	99	2.1	99	3.0	345	3.1	385	3.4	510	3.3	465
11	2.1	99	2.1	99	3.0	345	2.9	310	3.2	425	3.1	385
12	2.2	119	2.4	162	2.8	275	2.6	212	3.0	345	3.0	345
13	2.6	212	2.7	242	2.7	242	2.6	212	3.0	345	3.3	465
14	2.6	212	2.6	212	2.6	212	2.5	186	3.0	345	3.1	385
15	2.4	162	2.7	242	2.5	186	2.5	186	3.2	425	3.0	345
16	2.4	162	2.3	140	2.4	162	2.5	186	3.0	345	2.9	310
17	2.3	140	2.2	119	2.3	140	2.4	162	3.0	345	2.9	310
18	2.9	310	2.1	99	2.5	186	2.6	212	2.9	310	3.0	345
19	2.1	99	2.3	140	2.5	186	2.4	162	2.9	310	2.8	275
20	2.3	140	2.4	162	4.1	855	4.8	1,260	2.8	275	2.9	310
21	2.9	310	3.6	600	3.6	600	3.4	510	3.1	385	3.2	425
22	2.6	212	2.5	186	3.4	510	3.2	425	3.1	385	3.0	345
23	2.4	162	2.6	212	3.1	385	3.0	345	3.4	510	3.05	365
24	2.6	212	2.6	212	3.0	345	2.9	310	3.2	425	3.1	385
25	2.7	242	2.8	275	3.0	345	2.9	310	3.1	385	3.2	425
26	3.0	345	3.4	510	2.9	310	2.9	310	3.1	385	3.0	345
27	3.9	750	4.1	855	2.6	212	2.7	242	3.0	345	3.1	385
28	3.6	600	3.5	555	2.5	186	2.5	186	3.0	345	3.2	425
29	3.3	465	3.2	425	2.8	275	2.7	242	2.9	310	3.0	345
30	3.0	345	2.9	310	2.9	310	3.0	345	3.0	.....	3.4	.....
31	3.1	385	3.2	425	.....	.....	.....	.....	3.4	.....	3.6	.....

NOTE.—Discharge relation affected by ice from about Jan. 11 to Mar. 23 and about Dec. 30–31.

MISSISQUOI RIVER NEAR RICHFORD, VT.

Location.—At highway bridge 200 feet below Central Vermont Railway bridge, 3 miles downstream from Richford, about 8 miles below mouth of North Branch, and 2 miles above mouth of Trout River.

Records available.—May 29, 1909, to June 28, 1913; September 9 to December 13, 1913.

Drainage area.—300 square miles.

Gage.—Chain, fastened to the downstream side of the bridge; installed June 26, 1911. From May 29, 1909, to December 31, 1910, the gage was just below the plant of the Sweat, Comings Co., but this site was found unsatisfactory because of the great daily fluctuations caused by the operation of the turbines. Gage read daily, morning and evening, to half-tenths. Limits of use: Half-tenths below and tenths above 6.5 feet.

Control.—A well-defined riffle about half a mile downstream protects gage from backwater from mills. Channel deep; banks not liable to be overflowed; bed composed of gravel, bowlders, and rock ledge; current sluggish at low stages.

Discharge measurements.—At high stages made from downstream side of bridge; at low stages by wading.

Regulation.—Considerable daily fluctuation at low water caused by operation of power plants above station.

Winter flow.—Discharge relation seriously affected by ice.

Floods.—Flood of March, 1913, reached maximum stage of 16.7 feet at 8.30 a. m. March 26, as indicated by the observer's records. Discharge approximately 11,700 second-feet, or 39 second-feet per square mile of area drained.

Accuracy.—Rating curve well defined. It is not known how closely semidaily observations indicate the true mean gage height for day.

Discharge measurements of Missisquoi River near Richford, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 3[a]	C. S. DeGolyer	7.34	281
Apr. 2	R. S. Barnes	10.24	3,860
22	do	7.10	1,170
Sept. 9[b]	G. H. Canfield	4.63	50.5

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Gage height, in feet, and discharge, in second-feet, of Missisquoi River near Richford, Vt., for 1913.

[P. Sloan, observer.]

Day.	March.						April.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1												
2												
3							7.30	8.7	2,460			
4							8.30	8.0	1,860			
5							8.15	9.7	3,360			
6												
7							8.00	9.0	2,730			
8							7.45	8.3	2,120			
9							7.30	7.9	1,780			
10							7.30	7.4	1,380			
11							8.15	7.2	1,240			
12							7.30	7.4	1,380			
13												
14							7.15	7.2	1,240			
15							7.45	7.4	1,380			
16							8.15	7.6	1,540			
17							7.45	7.4	1,380			
18							8.00	7.3	1,310			
19							8.45	7.2	1,240			
20												
21	7.00	14.0	7,940				7.00	7.4	1,380			
22	8.30	15.4	9,810				7.00	7.1	1,160			
23							6.45	7.0	1,090			
24	7.45	11.8	5,330				7.15	6.8	950			
25				3.30	15.2	9,530	7.30	6.7	880			
26	8.30	16.7	11,700				6.45	6.7	880			
27	7.30	13.9	7,820	3.00	15.3	9,670						
28	8.15	14.6	8,730				7.30	6.3	620			
29	7.45	12.9	6,580				7.30	6.15	530			
30							7.15	6.0	445			
31												

Gage height, in feet, and discharge, in second-feet, of Missisquoi River near Richford, Vt., for 1913—Continued.

Day.	May.						June.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.15	5.9	395									
2	9.00	5.85	372				6.00	6.9	1,020			
3	7.00	5.8	350				5.30	6.8	950			
4							6.00	6.6	815			
5	7.00	5.65	292				5.30	6.4	685			
6	6.45	5.55	258				5.30	6.1	500			
7	6.00	5.5	240				5.45	6.0	445			
8	6.00	5.45	225									
9	5.45	5.45	225				5.30	6.7	880			
10	6.15	5.45	225				5.30	6.25	590			
11							5.30	5.95	420			
12	5.45	5.3	182				5.30	5.85	372			
13	5.45	5.35	196				5.45	5.6	275			
14	7.45	5.3	182				5.30	5.55	258			
15	5.45	5.3	182									
16	5.45	5.3	182				5.30	5.4	210			
17	5.45	5.35	196				5.15	6.4	685			
18							6.45	6.4	685			
19	5.45	5.65	292				5.30	5.85	372			
20	5.30	6.25	590				5.30	5.55	258			
21	7.15	6.0	445				5.45	5.45	225			
22	5.30	5.7	310									
23	5.45	6.1	500				5.30	5.2	157			
24	5.30	6.45	718				6.45	5.1	135			
25							6.30	5.0	114			
26							5.30	5.0	114			
27	5.30	6.1	500				6.15	5.3	182			
28	7.15	6.15	530				5.30	5.7	310			
29	6.00	9.0	2,730									
30	6.00	9.8	3,450									
31	5.45	8.2	2,030									

Day.	September.						October.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1							6.40	4.85	86	5.45	4.7	61
2							6.45	4.65	54	5.30	4.85	86
3							7.00	5.7	310	4.50	5.7	310
4							6.45	5.85	372			
5							7.15	5.5	240	5.15	5.3	182
6							6.45	5.2	157	5.10	5.3	182
7							6.40	5.0	114	4.50	5.0	114
8							6.45	5.0	114	5.10	4.75	69
9	7.45	4.62	50	4.55	4.6	47	6.35	4.95	104	4.45	5.1	135
10	6.25	4.4	24	5.35	4.5	35	6.45	5.0	114	5.15	5.1	135
11	6.55	4.65	54	4.45	4.7	61	7.00	4.9	95			
12	6.30	4.6	47	5.20	4.55	41	7.30	5.0	114	5.10	5.2	157
13	6.45	4.6	47				6.30	5.0	114	4.50	4.85	86
14	7.15	4.8	77	5.15	4.65	54	6.35	5.15	146	4.50	5.05	124
15	7.05	4.5	35	4.45	4.7	61	7.10	5.1	135	4.45	5.2	157
16	7.45	4.82	81	5.10	4.6	47	6.35	5.0	114	4.50	5.1	135
17	7.15	4.55	41				7.50	4.95	104	4.45	4.85	86
18	6.55	4.9	95	4.45	4.7	61	6.40	4.95	104			
19	7.50	4.7	61	5.30	4.7	61	7.15	5.0	114	4.45	4.95	104
20	7.25	4.8	77				7.10	5.05	124	4.50	5.0	114
21	7.20	4.85	86	5.00	4.6	47	6.30	6.0	445	5.10	6.25	590
22	6.50	4.75	69	5.30	5.5	240	6.35	6.2	560	4.50	6.0	445
23	6.45	6.5	750	4.45	6.4	685	6.30	5.8	350	5.10	5.5	240
24	6.45	5.95	420	4.50	5.75	330	6.50	5.4	210	4.40	5.45	225
25	6.25	5.35	196	5.45	5.3	182	6.25	5.4	210			
26	6.45	5.35	196	5.30	5.1	135	6.50	6.25	590	4.30	6.8	950
27	6.30	4.9	95				6.50	7.0	1,090	4.45	7.1	1,160
28	7.00	5.0	114	4.45	5.2	157	6.35	7.0	1,090	5.00	6.6	815
29	6.30	5.0	114	5.45	4.9	95	6.30	6.6	815	4.45	6.4	685
30	6.25	4.8	77	5.40	4.65	54	6.50	6.25	590	4.40	6.2	560
31							6.40	6.1	500	4.10	6.1	500

Gage height, in feet, and discharge, in second-feet, of Missisquoi River near Richford, Vt., for 1913—Continued.

Day.	November.						December.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	6.50	5.9	395	.....	.....	.....	7.25	5.8	350	4.10	6.0	445
2	7.30	5.75	330	4.20	5.7	310	7.15	5.95	420	4.20	5.8	350
3	6.55	5.6	275	4.30	5.6	275	7.45	6.2	560	3.50	7.0	1,090
4	7.05	5.55	258	4.50	5.85	372	7.20	6.8	950	4.10	6.8	950
5	6.25	6.05	472	4.45	6.0	445	7.50	6.6	815	4.15	6.6	815
6	6.30	5.85	372	4.40	5.7	310	7.10	6.3	620	.....	.....	.....
7	6.50	5.65	292	4.45	5.5	240	7.55	6.0	445	3.50	6.25	590
8	6.45	5.55	258	.....	.....	.....	7.30	7.1	1,160	4.10	7.2	1,240
9	7.30	5.5	240	4.45	5.3	182	8.10	6.6	815	4.15	6.8	950
10	7.10	5.15	146	4.30	5.2	157	7.40	7.0	1,090	3.45	7.4	1,380
11	7.15	5.1	135	4.20	5.4	210	8.10	7.1	1,160	4.00	7.5	1,460
12	7.35	5.6	275	4.35	5.45	225	7.45	7.9	1,780	3.30	8.4	2,200
13	7.00	5.5	240	4.15	5.55	258	7.35	8.5	2,280	.....	.....	.....
14	7.10	5.45	225	4.20	5.55	258	.....	.....	.....	.....	.....	.....
15	7.35	5.5	240	.....	.....	.....	.....	.....	.....	.....	.....	.....
16	7.40	5.35	196	4.10	5.4	210	.....	.....	.....	.....	.....	.....
17	7.20	5.25	170	4.40	5.1	135	.....	.....	.....	.....	.....	.....
18	7.35	5.4	210	4.35	5.35	196	.....	.....	.....	.....	.....	.....
19	7.15	5.4	210	4.20	5.6	275	.....	.....	.....	.....	.....	.....
20	7.10	7.55	1,500	4.30	8.4	2,200	.....	.....	.....	.....	.....	.....
21	7.20	8.1	1,940	4.10	7.6	1,540	.....	.....	.....	.....	.....	.....
22	7.35	6.8	950	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	7.15	6.45	718	4.20	7.2	1,240	.....	.....	.....	.....	.....	.....
24	8.05	7.1	1,160	4.30	7.0	1,090	.....	.....	.....	.....	.....	.....
25	7.50	6.7	880	4.15	6.6	815	.....	.....	.....	.....	.....	.....
26	7.10	6.4	685	4.20	6.4	685	.....	.....	.....	.....	.....	.....
27	7.15	6.15	530	4.30	6.2	560	.....	.....	.....	.....	.....	.....
28	8.15	5.9	395	4.10	5.6	275	.....	.....	.....	.....	.....	.....
29	7.15	5.8	350	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	8.10	5.8	350	4.15	5.75	330	.....	.....	.....	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

ST. FRANCIS RIVER.

CLYDE RIVER AT WEST DERBY, VT.

Location.—Just below the plant of the Newport Electric Light Co., at West Derby, Vt.

Records available.—May 25, 1909, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, in two sections; low section about 75 feet below the plant; high-water section nailed to a tree on right bank 10 feet farther downstream; datum unchanged. On August 10, 1910, a chain gage was attached to the same tree at the same datum. All records from chain gage since this date. Gage read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Control.—Bed rough; fall of river rapid near and below the station.

Discharge measurements.—Made from highway bridge about half a mile below gage.

Regulation.—At West Derby are two dams. Part of water at upper dam is used by paper mill; remainder is delivered to water wheels at electric plant through steel penstock; total operating head for this dam about 108 feet. All flow from second dam diverted to wheels in the power house, giving a head of about 30 feet. Practically no water is stored at the upper dam, but a pond of considerable size may be made by building a dam above this point.

Winter flow.—Discharge relation affected by ice during periods of extremely cold weather.

Floods.—High water of March 25–30, 1913, reached maximum stage of 5.8 feet gage height, as determined by engineers of Geological Survey from high-water marks. Corresponding discharge approximately 6,300 second-feet.

Accuracy.—Discharge rating curve fairly well defined. Mean gage heights computed from semidaily observations are uncertain.

Discharge measurements of Clyde River at West Derby, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 4[a]	C. S. De Golyer	2.21	130	Sept. 9[b]	G. H. Canfield	1.83	47.4
Apr. 1	R. S. Barnes	3.85	1,380	9[b]	do	1.87	52.4
23	do	2.98	481				

[a] Measurement made under complete ice cover at a section about one-half mile below gage, but very little ice at control.
[b] Measurement made by wading.

Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913.

[E. C. Rogers, observer.]

Day.	January.						February.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.45	2.38	184	4.20	2.40	190						
2	7.55	2.38	184	4.10	2.38	184				3.00		
3	7.50	2.42	198	4.15	2.50	228						
4	7.45	2.52	237	4.00	2.60	272						
5	8.00	2.60	272	4.10	2.60	272						
6				3.45	2.62	282						
7	7.45	2.60	272	3.40	2.65	297						
8	8.00	2.70	322	4.50	2.72	333						
9	7.30	2.62	282	4.00	2.72	333						
10	7.35	2.62	282	4.10	2.60	272						
11	7.30	2.62	282	4.00	2.58	263						
12												
13												
14							10.40	2.45	209	4.45	2.42	198
15							9.00	2.25	145	5.00	2.30	158
16							7.30	2.22	137	5.10	2.28	153
17							7.50	2.25	145	4.30	2.28	153
18	10.30	2.68					7.10	2.20	132	5.00	2.30	158
19							7.20	2.18	128	6.40	2.22	137
20				2.30	2.90		7.30	2.20	132	5.00	2.20	132
21							7.10	2.30	158	5.10	2.28	153
22				12.50	3.1		7.00	2.28	153	5.00	2.32	164
23							7.10	2.25	145	5.20	2.28	153
24	10.30	2.98					7.20	2.25	145	5.10	2.25	145
25							7.20	2.22	137	5.35	2.25	145
26				2.00	2.85		7.30	2.25	145	5.00	2.30	158
27							7.25	2.20	132	4.45	2.28	153
28							7.30	2.20	132	4.30	2.20	132
29												
30												
31				1.00	2.58							

Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913—Continued.

Day.	March.						April.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.30	2.20	132	4.20	2.25	145	8.00	3.8	1,330	5.45	3.8	1,330
2	7.45	2.22	137	5.40	2.18	128	7.35	3.7	1,200	6.10	3.65	1,140
3	8.00	2.15	121	5.15	2.20	132	5.30	3.65	1,140	5.50	3.6	1,080
4	7.45	2.11	112	5.15	2.14	119	9.15	3.6	1,080	4.40	3.65	1,140
5	7.45	2.17	125	5.30	2 14	119	7.50	3.65	1,140	5.30	3.6	1,080
6	7.40	2.11	112	4.50	2.17	125	8.00	3.55	1,020	6.00	3.6	1,080
7	7.30	2.14	119	4.55	2.11	112	8.00	3.55	1,020	6.15	3.5	970
8	7.40	2.11	112	4.50	2.19	130	5.40	3.5	970	5.10	3.45	915
9	7.55	2.17	125	5.10	2.11	112	7.20	3.35	810	6.15	3.3	760
10	8.00	2.14	119	5.15	2.19	130	7.40	3.25	715	5.25	3.2	670
11	8.30	2.14	119	5.50	2.21	135	6.25	3.15	625	6.15	3.15	625
12	7.30	2.19	130	4.45	2.19	130	6.00	3.1	580	5.00	3.1	580
13	7.50	2.14	119	4.00	2.21	135	6.15	3.05	540	6.30	3.05	540
14	7.40	2.34	171	4.10	2.94	472	7.10	3.05	540	6.10	3.05	540
15	7.00	2.89	436	5.45	3.1	600	6.45	3.05	540	5.30	3.0	500
16	7.30	3.35	840	5.00	3.4	890	8.00	3.05	540	6.15	2.98	486
17	7.30	3.5	990	5.45	3.6	1,100	6.35	3.0	500	6.30	2.98	486
18	7.35	3.4	890	6.00	3.35	840	7.00	3.0	500	6.40	2.98	486
19	7.40	3.4	890	5.30	3.3	790	7.00	3.0	500	5.10	3.0	500
20	7.45	3.35	840	5.35	3.3	790	9.50	3.0	500	6.30	3.0	500
21	7.45	3.3	790	5.20	3.35	840	7.45	2.98	486	6.20	2.98	486
22	6.40	3.55	1,040	6.00	3.6	1,100	7.00	2.98	486	6.00	2.98	486
23	9.30	3.65	1,160	6.35	3.7	1,210	6.00	3.0	500	6.20	3.0	500
24	7.45	3.75	1,260	5.30	3.7	1,210	6.35	2.95	465	5.30	2.90	430
25	7.30	3.75	1,260	4.45	3.9	1,430	5.50	2.90	430	6.00	2.88	418
26	7.50	3.9	1,430	4.00	4.0	1,540	6.40	2.85	399	5.30	2.85	399
27	7.30	4.2	1,760	5.20	4.6	2,660	4.30	2.82	380	6.20	2.82	380
28	7.30	4.6	2,660	4.40	4.6	2,660	.....	.....	.....	6.00	2.80	368
29	7.45	4.6	2,660	5.30	4.5	2,450	5.30	2.80	368	6.40	2.75	340
30	7.45	4.4	2,260	4.30	4.4	2,260	6.00	2.75	340	6.10	2.70	313
31	8.00	3.95	1,530	5.30	3.95	1,530	.....	.....	.....	.....	.....	.....

Day.	May.						June.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	6.30	2.68	303	6.00	2.68	303	6.00	2.80	368	6.05	2.80	368
2	6.55	2.70	313	6.20	2.60	265	6.30	2.80	368	5.15	2.80	368
3	6.00	2.62	275	5.00	2.55	244	6.20	2.78	357	6.15	2.80	368
4	5.25	2.60	265	7.50	2.52	231	6.30	2.72	324	5.50	2.70	313
5	6.30	2.50	223	5.50	2.45	204	6.00	2.70	313	6.00	2.62	275
6	5.00	2.50	223	6.30	2.30	154	5.30	2.60	265	5.00	2.62	275
7	5.50	2.32	160	6.00	2.40	186	7.25	2.65	289	6.30	2.68	303
8	6.15	2.42	193	6.20	2.45	204	.....	.....	.....	7.00	2.52	231
9	6.20	2.48	216	6.50	2.50	223	7.05	2.65	289	6.30	2.50	223
10	6.50	2.45	204	5.30	2.40	186	.....	.....	.....	6.20	2.48	216
11	7.00	2.45	204	6.00	2.45	204	5.00	2.48	216	6.30	2.50	223
12	5.55	2.40	186	6.40	2.35	170	5.30	2.50	223	6.00	2.45	204
13	7.20	2.35	170	6.20	2.30	154	.....	.....	.....	5.50	2.42	193
14	7.10	2.32	160	5.45	2.30	154	6.25	2.40	186	6.45	2.32	160
15	6.10	2.32	160	5.50	2.25	140	6.30	2.40	186	7.00	2.30	154
16	7.15	2.30	154	6.30	2.30	154	7.40	2.38	180	6.00	2.28	148
17	7.00	2.30	154	6.00	2.30	154	6.50	2.32	160	6.20	2.30	154
18	7.25	2.25	140	6.10	2.25	140	6.15	2.30	154	5.50	2.28	148
19	7.15	2.30	154	7.10	2.32	160	6.05	2.30	154	6.50	2.30	154
20	7.00	2.32	160	6.00	2.30	154	6.10	2.30	154	6.30	2.25	140
21	6.40	2.35	170	5.40	2.35	170	6.10	2.30	154	6.00	2.20	126
22	7.00	2.40	186	6.30	2.38	180	6.10	2.25	140	7.00	2.18	121
23	6.10	2.40	186	6.00	2.38	180	6.05	2.20	126	6.45	2.15	113
24	6.40	2.42	193	6.00	2.45	204	6.05	2.20	126	6.30	2.12	105
25	7.00	2.48	216	5.55	2.50	223	6.00	2.15	113	6.15	2.15	113
26	6.30	2.52	231	6.15	2.52	231	7.10	2.15	113	7.00	2.10	100
27	6.55	2.52	231	6.00	2.52	231	.....	.....	.....	6.20	2.12	105
28	6.40	2.55	244	5.45	2.60	265	7.30	2.12	105	5.45	2.05	89
29	7.00	2.70	313	6.10	2.72	324	7.10	2.10	100	6.10	2.10	100
30	7.30	2.72	324	6.30	2.78	357	6.55	2.12	105	5.20	2.12	105
31	6.30	2.75	340	7.15	2.78	357	.....	.....	.....	.....	.....	.....

Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913—Continued.

Day.	July.						August.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.20	2.10	100	6.10	2.05	89	6.45	2.15	113	7.00	2.18	121
2	7.00	2.10	100	5.05	2.02	82	8.00	2.15	113	5.50	2.10	100
3	6.55	2.08	96	6.35	2.00	78	7.00	2.10	100	6.20	2.08	96
4	7.30	2.08	96	6.00	2.02	82	.....	.....	.....	6.30	2.22	132
5	6.10	2.05	89	6.20	2.02	82	7.00	2.12	105	6.10	2.05	89
6	6.00	2.08	96	6.30	2.00	78	6.00	2.08	96	4.50	2.00	78
7	7.40	2.05	89	6.25	2.00	78	7.30	2.08	96	5.40	2.02	82
8	7.25	1.98	74	6.10	1.88	56	5.55	2.00	78	6.10	1.95	68
9	5.25	1.95	68	7.00	1.98	74	7.05	2.00	78	5.45	1.98	74
10	7.35	2.00	78	6.05	1.92	63	7.20	2.02	82	5.40	2.08	96
11	6.30	2.05	89	5.10	2.02	82	7.30	2.10	100	5.00	2.00	78
12	8.15	2.05	89	6.00	2.10	100	6.45	1.98	74	6.20	1.95	68
13	6.30	2.15	113	6.10	2.20	126	6.15	2.00	78	5.20	1.92	63
14	5.30	2.20	126	6.30	2.20	126	7.00	2.00	78	7.10	1.88	56
15	7.00	2.22	132	6.15	2.18	121	6.55	2.00	78	5.30	1.95	68
16	7.30	2.20	126	6.30	2.12	105	6.15	1.98	74	7.15	1.85	50
17	5.45	2.20	126	5.30	2.20	126	7.15	1.90	59	6.15	1.92	63
18	7.05	2.15	113	6.50	2.18	121	6.10	1.92	63	6.10	1.90	59
19	.....	.....	.....	6.15	2.12	105	7.15	1.90	59	5.30	1.88	56
20	6.30	2.15	113	6.00	2.12	105	7.05	1.90	59	6.30	1.85	50
21	6.25	2.20	126	6.50	2.10	100	7.00	1.90	59	6.50	1.70	28
22	5.50	2.12	105	6.10	2.10	100	6.35	1.85	50	5.30	1.85	50
23	6.20	2.08	96	5.35	2.05	89	7.15	1.88	56	5.20	1.90	59
24	6.45	2.10	100	6.25	2.00	78	8.00	1.85	50	5.40	1.85	50
25	7.05	2.10	100	7.20	1.95	68	7.00	1.85	50	5.45	1.60	17
26	7.00	2.08	96	6.15	2.00	78	7.10	1.82	45	5.15	1.82	45
27	8.00	2.02	82	6.10	1.98	74	7.30	1.85	50	6.00	1.90	59
28	7.20	2.02	82	6.00	2.00	78	6.50	1.85	50	6.10	1.92	63
29	6.25	2.02	82	5.50	2.10	100	6.50	1.92	63	5.30	1.95	68
30	6.45	2.10	100	6.25	2.10	100	6.45	1.90	59	6.10	1.90	59
31	6.50	2.12	105	5.20	2.15	113	8.05	1.85	50	6.40	1.85	50

Day.	September.						October.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	6.30	1.85	50	5.30	1.82	45	8.00	1.90	59	5.20	1.92	63
2	6.35	1.85	50	5.45	1.88	56	6.30	1.90	59	5.00	2.00	78
3	7.50	1.85	50	5.30	1.85	50	7.10	1.92	63	5.30	1.92	63
4	6.20	1.88	56	5.40	1.82	45	7.15	1.90	59	5.30	1.95	68
5	7.30	1.82	45	6.00	1.85	50	7.30	1.90	59	5.00	1.88	56
6	6.10	1.85	50	4.30	1.85	50	6.30	1.90	59	5.20	1.90	59
7	6.15	1.82	45	6.30	1.88	56	6.40	1.95	68	5.40	1.88	56
8	7.10	1.85	50	5.30	1.85	50	7.50	1.88	56	5.15	1.90	59
9	7.45	1.82	45	.....	.....	.....	6.10	1.85	50	3.50	1.68	26
10	8.00	1.82	45	.....	.....	.....	7.35	1.85	50	5.30	1.98	74
11	7.00	1.82	45	4.05	1.78	39	6.40	1.88	56	5.20	1.90	59
12	7.15	1.80	42	5.15	1.80	42	7.45	1.92	63	3.45	1.92	63
13	7.00	1.80	42	6.55	1.82	45	6.50	1.90	59	5.10	1.95	68
14	7.25	1.82	45	6.00	1.85	50	7.50	1.90	59	5.10	1.90	59
15	.....	.....	.....	.....	.....	.....	6.05	1.98	74	5.00	1.92	63
16	7.50	1.82	45	5.10	1.80	42	7.30	2.02	82	5.05	2.02	82
17	7.25	1.82	45	6.15	1.82	45	7.30	2.08	96	5.15	2.05	89
18	8.00	1.80	42	5.00	1.85	50	7.00	2.08	96	4.50	2.05	89
19	7.20	1.88	56	5.10	1.90	59	9.00	2.08	96	5.00	2.05	89
20	6.10	1.82	45	4.05	1.78	39	6.10	2.05	89	5.00	2.22	132
21	7.35	1.82	45	4.10	1.85	50	7.00	2.22	132	5.05	2.22	132
22	7.20	1.90	59	4.40	2.00	78	6.45	2.32	160	4.55	2.45	204
23	7.40	1.95	68	5.10	1.95	68	6.50	2.42	193	4.50	2.50	223
24	7.00	1.90	59	.....	.....	.....	7.45	2.52	231	4.15	2.60	265
25	7.20	1.90	59	4.30	1.90	59	6.30	2.55	244	4.30	2.58	257
26	7.00	1.90	59	4.30	2.05	89	7.55	2.52	231	4.50	2.55	244
27	7.20	1.98	74	6.25	1.95	68	6.30	2.55	244	4.45	2.55	244
28	7.35	1.95	68	4.50	1.92	63	6.35	2.55	244	4.30	2.60	265
29	7.00	1.95	68	4.00	1.88	56	8.40	2.55	244	4.25	2.58	257
30	6.55	1.92	63	4.30	1.92	63	7.15	2.58	257	4.50	2.62	275
31	.....	.....	.....	.....	.....	.....	7.05	2.60	265	5.00	2.58	257

Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913—Continued.

Day.	November.						December.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.35	2.52	231	4.10	2.50	223	7.25	2.20	126	4.00	2.18	121
2	7.50	2.48	216	4.30	2.48	116	7.45	2.20	126	7.30	2.15	113
3	8.15	2.45	204	4.40	2.40	186	7.45	2.20	126	4.00	2.20	126
4	8.00	2.40	186	4.25	2.38	180	7.00	2.22	132	4.05	2.20	126
5	6.45	2.35	170	4.45	2.32	160	8.00	2.20	126	4.25	2.25	140
6	6.50	2.32	160	4.40	2.30	154	7.50	2.25	140	4.20	2.22	132
7	6.20	2.32	160	4.25	2.30	154	7.35	2.25	140	4.00	2.25	140
8	.....	.....	.....	4.15	2.28	148	8.40	2.28	148	4.15	2.32	160
9	7.50	2.25	140	4.30	2.25	140	7.25	2.30	154	4.10	2.28	148
10	7.50	2.25	140	4.40	2.25	140	7.15	2.30	154	4.00	2.30	154
11	6.35	2.22	132	4.25	2.20	126	7.15	2.30	154	4.10	2.32	160
12	7.35	2.20	126	4.30	2.25	140	7.20	2.32	160	3.30	2.48	216
13	6.30	2.22	132	4.10	2.25	140	7.25	2.30	154	4.15	2.30	154
14	.....	.....	.....	4.20	2.22	132	7.40	2.30	154	3.40	2.22	132
15	7.35	2.20	126	4.15	2.15	113	7.15	2.30	154	4.00	2.20	126
16	7.20	2.12	105	4.30	2.15	113	8.15	2.22	132	3.25	2.20	126
17	7.30	2.20	126	4.40	2.15	113	8.00	2.20	126	4.10	2.20	126
18	7.35	2.18	121	3.20	2.00	78	7.45	2.20	126	4.15	2.20	126
19	6.45	2.15	113	4.00	2.15	113	7.15	2.20	126	4.05	2.18	121
20	6.55	2.25	140	4.15	2.20	126	7.30	2.20	126	4.00	2.15	113
21	7.00	2.25	140	4.00	2.28	148	7.30	2.20	126	4.35	2.15	113
22	6.50	2.30	154	4.00	2.30	154	8.15	2.12	105	4.15	2.10	100
23	8.55	2.38	180	3.00	2.38	180	7.15	2.12	105	4.00	2.08	96
24	8.10	2.38	180	4.10	2.38	180	7.35	2.15	113	3.40	2.15	113
25	6.50	2.40	186	3.55	2.38	180	8.15	2.15	113	4.20	2.10	100
26	7.20	2.35	170	4.25	2.35	170	8.10	2.15	113	3.30	2.12	105
27	6.50	2.30	154	4.30	2.28	148	7.45	2.12	105	4.10	2.20	126
28	7.15	2.30	154	7.30	2.18	121	7.50	2.22	132	4.35	2.18	121
29	8.00	2.25	140	4.00	2.20	126	7.50	2.42	193	4.20	2.50	223
30	8.05	2.20	126	4.20	2.18	121	7.40	2.48	216	4.00	2.30	154
31	.....	.....	.....	.....	.....	.....	7.25	2.30	154	4.00	2.28	148

NOTE.—Discharge relation affected by ice about Jan. 12 to Feb. 13.

MISCELLANEOUS MEASUREMENTS.

Discharge measurements at points other than regular gaging stations were made during 1913 as shown by the following table:

Miscellaneous measurements in St. Lawrence River drainage basin in 1913.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
July 31	Black River	Lake Ontario	Davis Bridge, Port Leyden, N. Y.	[a]15.0	166
Aug. 8	....do	....do	....do	[a]14.5	20.1
Nov. 6	Black River canal	....do	2 miles above Delta dam	.....	72.5
6	....do	....do	1 mile below Delta dam	.....	128
July 29	Forestport feeder	Black River canal	Hawkinsville, N. Y.	[b]0.80	262
Aug. 5	....do	....do	....do	[b].82	247
4	Spillway [c]	Black River	Boonville, N. Y.	.54	18.7
Mar. 16	South Branch, Oswegatchie River.	Oswegatchie River	Talcville, N. Y.	[a]2.50	2,520
Aug. 27	....do	....do	....do	[d]3.65	113
Nov. 1	....do	....do	....do	[d]5.70	748

[a] Reference point on highway bridge.
[b] Reference point near highway bridge.
[c] On Black River Canal.
[d] Tail race gage.

Miscellaneous measurements of Beaver River at State Dam, N. Y., in 1912–13.

Date.	Hydrographer.	Gate		Lake elevation.	Discharge.
		No.	Opening.		
1912.				*Feet.*	*Sec.-ft.*
Oct. 17	Frank Weber	1	Full	4.70	184
18	do	4	Half	4.70	139
18	do	1,4	do	4.70	263
1913.					
Sept. 30	O. W Hartwell	4	Full	3.00	62.0
30	do	4	Half	3.00	62.2
Oct. 22	G. H. Canfield	4	Quarter	9.42	65.4
22	do	4	Half	9.45	128
23	do	1	Quarter	9.92	70.6
23	do	1	Half	9.96	136
23	do	3	do	10.04	128
24	do	3	Three-quarters	10.28	178
24	do	4	do	10.30	178
24	do	4	Full	10.30	204
24	do	1	Three-quarters	10.30	183
25	do	1	44½ inches	10.51	212

INDEX.