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

WATER-SUPPLY PAPER 356

SURFACE WATER SUPPLY OF THE UNITED STATES

1913

PART VI. MISSOURI RIVER BASIN

N. C. GROVER, Chief Hydraulic Engineer
W. A. LAMB and ROBERT FOLLANSBEE, District Engineers

Prepared in cooperation with the States of Montana and Nebraska

WASHINGTON
GOVERNMENT PRINTING OFFICE
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SURFACE WATER SUPPLY OF MISSOURI RIVER BASIN, 1913.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of twelve 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 8.

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 in collecting 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 17.

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. In July, 1913, about 13,880 gaging stations were being maintained by the Survey and the cooperating organizations in the United States. Many miscellaneous discharge measurements are 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 has been prepared for each year 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 twelve 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 drainage basins	Calendar year.
II	352	South Atlantic and eastern Gulf of Mexico drainage 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 drainage basins in California	Do.
XII	362	North Pacific drainage 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	Description information only	
11th A, pt. 2	Monthly discharge	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
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	do	1912.
WS 351 to 362	do	1913.

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 any station in the area covered by Part I 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. The year covered by the report is indicated at the head of the column in which the paper is listed.

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 (St. John River to York River)	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 (James River to the Mississippi)	[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, 100	[j] 128, 130	171	207	245	265	285	305	325	355
Missouri River	[l] 36, 37	49, [m] 50	66, 75	84	[k] 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	310	330	360
Pacific coast in 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. Estimates for 1899 in Twenty-first Annual Report, part 4.
[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. Estimates for 1900 in Twenty-second Annual Report, part 4.
[c] Wissahickon and Schuylkill rivers to James River.
[d] New England rivers only.
[e] Hudson River to Delaware River, inclusive.
[f] Susquehanna 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 Platte 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] Mohave River only.
[r] Great Basin in California, except Truckee and Carson drainage basins.
[s] King and Kern rivers and south Pacific coast drainage basin.
[t] Rogue, Umpqua, and Siletz rivers only.
[u] In three parts: *A*, Pacific drainage basins in Washington and upper Columbia River basin; *B*, Snake River basin; *C*, Lower Columbia River and Rogue, Umpqua, and Siletz river basins.

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.
Madison, Wis., Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, 421 Federal Building.
Pheonix, Ariz., 417 Fleming Building.
Boise, Idaho, 615 Idaho Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., Federal Building.
San Francisco, Cal., 328 Customhouse.
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 (pp. 12–14).

"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.

"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 common use:

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

"Control," "controlling section," and "point of control," are terms used to designate the section or sections of the stream below the gage which determines the discharge relation at the gage. It should be noted that the control may not be the same section at all stages.

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 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	5.578	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	15.514	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 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 equals 18.7 United States gallons per second.

100 California miner's inches for one day equals 4.96 acre-feet.

100 Colorado miner's inches equals 2.60 second-feet.

100 Colorado miner's inches equals 19.5 Unlted States gallons per second.

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

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

100 United States gallons per minute for one day equals 0.442 acre-feet.

1,000,000 United States gallons per day equals 1.55 second-feet.

1,000,000 United States gallons equals 3.07 acre-feet.

1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equals about 1 kilowatt.

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

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 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 a 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 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 heights 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.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge

was consequently larger than given in the maximum column. Likewise, in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on pages 11–12, are based.

The base data presented in this report, unless otherwise stated in description of station, have been collected by the methods commonly used at current-meter gaging stations and described in standard textbooks. (See Pls. I and II.)

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

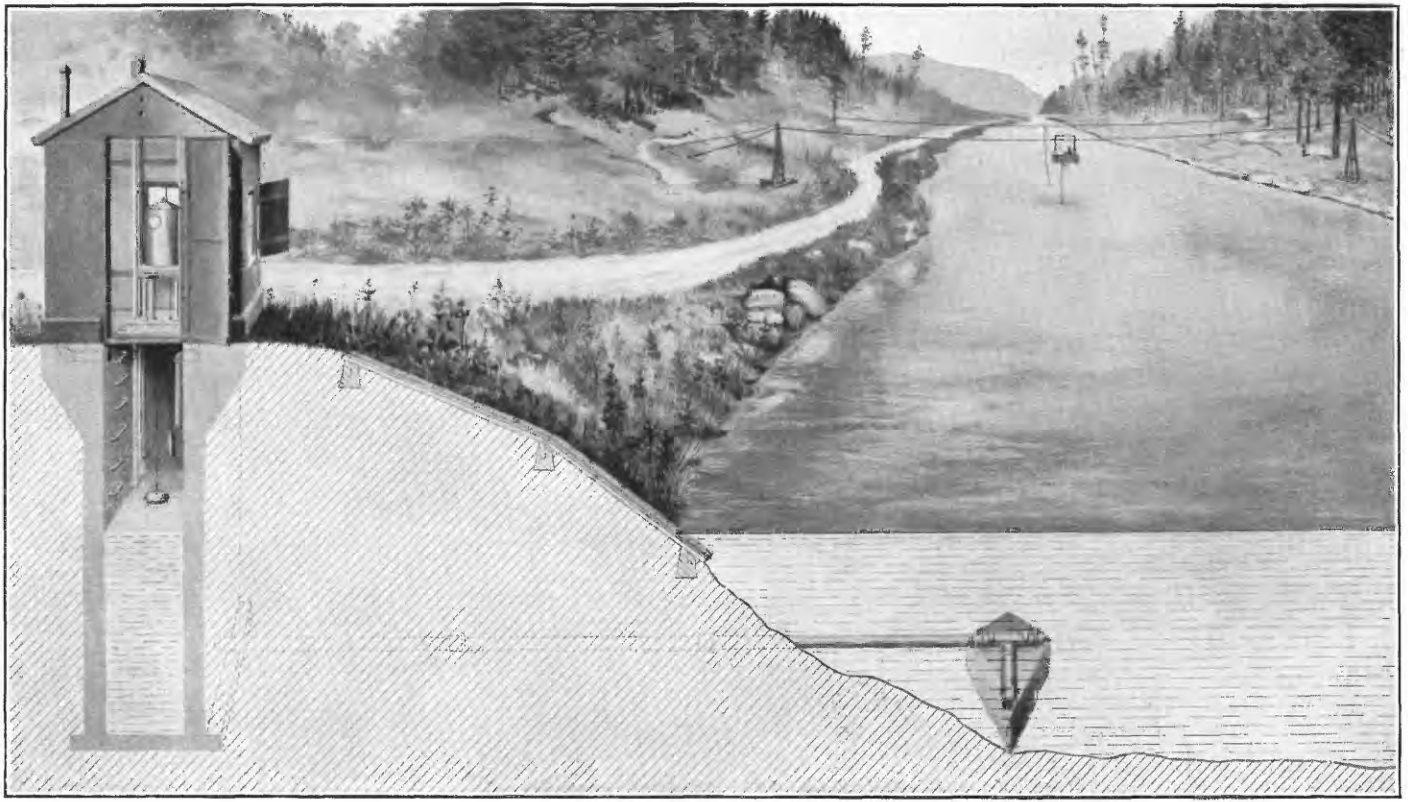
The accuracy of stream-flow data depends (1) on the permanence of channel and of the relation between discharge and stage, and (2) on the accuracy of observation of stage, measurement of discharge and interpretation of data.

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.

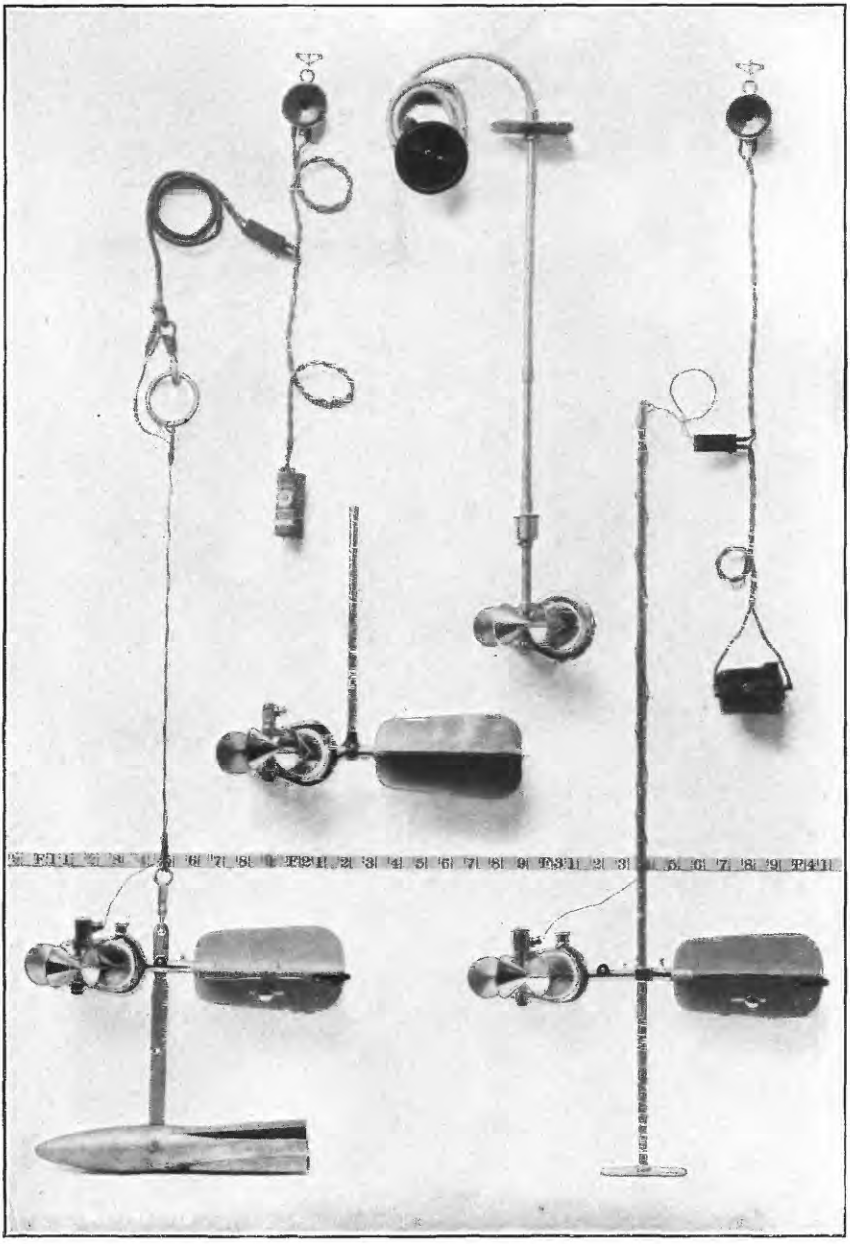
The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean.

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 stations draining areas of over 20 inches of rainfall for which it is



TYPICAL GAGING STATIONS.



PRICE CURRENT METERS.

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.

Much of the work in Montana has been carried on under cooperative agreement with the United States Reclamation Service, the work being done by the Geological Survey and the expense borne by the Reclamation Service. The Legislature of the State of Montana made an appropriation for stream-gaging work, which was expended by the State engineer, as provided in the act, in accordance with paragraph 3, section 2244, of the Revised Codes of 1907 of the State of Montana, which reads as follows:

> The State engineer shall become conversant with the waterways of the State and the needs of the State as to irrigation matters, shall make, or cause to be made, measurements and calculations of the ordinary and flood discharge of streams, cooperating in this work as much as possible with the United States Geological Survey and the Montana Experiment Station; such measurements to be made on streams in order of their importance, provided that measurements already made, if deemed reliable, may be adopted.

This fund was expended largely on work in connection with the several Carey projects in Montana and in computing data on water-right filings and adjudications. A State hydrographer was employed who worked directly with the Geological Survey.

The expense of work on the Crow Reservation in Montana, the Standing Rock Reservation in North and South Dakota, and the

Pine Ridge and Rosebud reservations in South Dakota was borne by the Office of Indian Affairs.

The work in Nebraska was carried on by the State engineer, Mr. D. D. Price, who paid all field expenses.

Other assistance in collecting records in the Missouri River basin is acknowledged in connection with the descriptions of the stations.

DIVISION OF WORK.

The field data in the upper Missouri River drainage basin were collected under the direction of W. A. Lamb, district engineer, assisted by B. E. Jones, R. R. Randell, J. M. Ray, junior engineers, J. B. Stewart, field assistant, and C. S. Heidel, State hydrographer.

The work in North Dakota was carried on by E. F. Chandler, assistant engineer.

The field data for three stations in the Yellowstone National Park were collected under the direction of G. C. Baldwin, district engineer, assisted by R. C. Pierce, junior engineer.

The field data for the Missouri River basin in Colorado and Wyoming were collected under the direction of Robert Follansbee, district engineer, assisted by R. H. Fletcher. The field work in Nebraska was carried on under the supervision of D. D. Price, State engineer, by D. P. Weeks, jr.

The ratings, special estimates, and studies of the completed data were made by W. A. Lamb, Robert Follansbee, B. E. Jones, and H. D. Padgett.

Computations were made by B. E. Jones and H. D. Padgett, assisted by J. G. Mathers, H. J. Dean, A. W. Harrington, and R. H. Fletcher. The completed data were prepared for publication by H. D. Padgett.

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

GAGING-STATION RECORDS.

MISSOURI RIVER PROPER.

RED ROCK RIVER BELOW RED ROCK RESERVOIR, NEAR MONIDA, MONT.

Location.—In sec. 32, T. 13 S., R. 6 W., just below the reservoir of the Red Rock Reservoir & Irrigation Co., 8 miles northeast of Monida and 15 miles east of Lima.

Records available.—July 22, 1911, to December 31, 1913. Miscellaneous measurements were made at this point on Red Rock River during the summer of 1910.

Drainage area.—About 560 square miles.

Gages.—A temporary staff gage about 300 yards downstream from the dam and a float gage in a concrete well on the right bank, at a 40-foot weir, about halfway between the dam and the staff gage. The 1911 records are referred to the staff gage. The 1912–13 records give the head on the weir.

Control.—Probably permanent; bed of stream composed of coarse gravel, pebbles, and bowlders; current strong.

Discharge measurements.—Made by wading.
Winter flow.—Affected by ice.
Regulation.—Dam used to store flood waters, which are released during the later part of irrigation season.
Accuracy.—Both staff gage and weir readings should be reliable.

Discharge measurements of Red Rock River below Red Rock reservoir, near Monida, Mont., in 1913.

Date.	Hydrographer.	Head on weir.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 7	C. S. Heidel	1.30	250
7	.....do	1.70	399
8	.....do	1.14	196
8	.....do	.86	118

Daily gage height, in feet, of Red Rock River below Red Rock reservoir, near Monida, Mont., for 1913.

[P. V. Maxwell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.10	0.10	0.10	0.10	2.90	2.05	1.60	1.40	1.30	1.32	1.40	0.98
2	.10	.10	.10	.10	2.90	2.05	1.60	1.40	1.32	1.39	1.40	.70
3	.10	.10	.10	.10	2.90	2.05	1.60	1.40	1.38	1.36	1.40	.69
4	.10	.10	.10	.10	2.82	2.12	1.60	1.38	1.32	1.36	1.40	.54
5	.10	.10	.10	.10	2.80	2.20	1.60	1.35	1.40	1.35	1.40	.54
6	.10	.10	.10	.10	2.60	2.20	1.52	1.35	1.36	1.35	1.40	.54
7	.10	.10	.10	.10	2.42	2.20	1.40	1.50	1.35	1.35	1.40	.54
8	.10	.10	.10	.10	2.41	2.20	1.40	1.48	1.35	1.35	1.40	.34
9	.10	.10	.10	.10	2.41	2.20	1.28	1.26	1.36	1.35	1.40	.34
10	.10	.10	.10	.10	2.41	2.20	1.22	1.25	1.38	1.35	1.04	.34
11	.10	.10	.10	.18	2.42	2.10	1.22	1.28	1.35	1.35	.98	.34
12	.10	.10	.10	.63	2.42	2.10	1.25	1.27	1.39	1.40	.98	.34
13	.10	.10	.10	1.30	2.42	2.10	1.18	1.29	1.39	1.40	.98	.34
14	.10	.10	.10	1.80	2.42	2.08	1.15	1.28	1.35	1.38	.98	.34
15	.10	.10	.10	2.26	2.25	2.05	1.15	1.30	1.35	1.40	.99	.34
16	.10	.10	.10	2.59	2.00	2.02	1.11	1.30	1.36	1.40	.98	.34
17	.10	.10	.10	2.72	2.00	2.01	1.11	1.28	1.35	1.48	.98	.34
18	.10	.10	.10	2.80	2.00	1.99	1.08	1.28	1.30	1.54	.97	.34
19	.10	.10	.10	2.84	2.00	1.97	1.08	1.31	1.35	1.55	.97	.34
20	.10	.10	.10	2.92	2.00	1.72	1.06	1.30	1.34	1.48	.97	.34
21	.10	.10	.10	3.03	1.90	1.71	1.05	1.31	1.36	1.43	.98	.34
22	.10	.10	.10	3.04	1.90	1.62	1.04	1.33	1.35	1.42	.98	.33
23	.10	.10	.10	3.04	1.90	1.52	1.03	1.32	1.39	1.42	.98	.34
24	.10	.10	.10	3.02	1.90	1.42	1.04	1.31	1.38	1.40	.99	.34
25	.10	.10	.10	3.00	1.90	1.35	1.10	1.34	1.40	1.40	.99	.34
26	.10	.10	.10	2.98	1.90	1.35	1.16	1.30	1.34	1.45	.98	.34
27	.10	.10	.10	2.95	1.75	1.38	1.24	1.32	1.36	1.45	.98	.34
28	.10	.10	.10	2.90	1.60	1.45	1.28	1.32	1.37	1.40	.99	.34
29	.10	.....	.10	2.90	1.65	1.45	1.30	1.29	1.36	1.40	.98	.34
30	.10	.....	.10	2.90	1.72	1.56	1.30	1.30	1.34	1.40	.99	.34
31	.10	.....	.10	.....	1.91	.....	1.37	1.30	.....	1.40	.....	.34

NOTE.—Stream is controlled; observer's gage heights do not check the hydrographer's, because the flow was varied to enable him to rate the station.

Daily discharge, in second-feet, of Red Rock River below Red Rock reservoir, near Monida, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5	5	5	5	1,040	565	360	280	245	252	280	149
2	5	5	5	5	1,040	565	360	280	252	276	280	58
3	5	5	5	5	1,040	565	360	280	273	266	280	85
4	5	5	5	5	987	600	360	273	252	266	280	84
5	5	5	5	5	975	640	360	262	280	262	280	86
6	5	5	5	5	860	640	328	262	266	262	280	58
7	5	5	5	5	761	640	280	320	262	262	280	58
8	5	5	5	5	756	640	280	312	262	262	280	30
9	5	5	5	5	756	640	238	232	266	262	280	30
10	5	5	5	5	756	640	219	228	273	262	165	30
11	5	5	5	11	761	590	219	238	262	262	149	30
12	5	5	5	73	761	590	228	235	276	280	149	30
13	5	5	5	245	761	590	206	242	276	280	149	30
14	5	5	5	445	761	580	197	238	262	273	149	30
15	5	5	5	673	668	565	197	245	262	280	151	30
16	5	5	5	854	540	550	185	245	266	280	149	30
17	5	5	5	927	540	545	185	238	262	312	149	30
18	5	5	5	975	540	535	176	238	245	336	146	30
19	5	5	5	999	540	525	176	248	262	340	146	30
20	5	5	5	1,050	540	409	171	245	259	312	146	30
21	5	5	5	1,110	490	404	168	248	266	292	149	30
22	5	5	5	1,120	490	368	165	256	262	288	149	29
23	5	5	5	1,120	490	328	162	252	276	288	149	30
24	5	5	5	1,110	490	288	165	248	273	280	151	30
25	5	5	5	1,100	490	262	182	259	280	280	151	30
26	5	5	5	1,080	490	262	200	245	259	300	149	30
27	5	5	5	1,060	422	273	225	252	266	300	149	30
28	5	5	5	1,040	360	300	238	252	270	280	151	30
29	5	.....	5	1,040	380	300	245	242	266	280	149	30
30	5	.....	5	1,040	409	344	245	245	259	280	151	30
31	5	.....	5	.....	495	.....	270	245	.....	280	.....	30

NOTE.—Daily discharge determined from a rating curve well defined below 550 second-feet and fairly well defined at higher stages. Change in rating curve for 1913 due to change in condition of channel above the weir.

Monthly discharge of Red Rock River below Red Rock reservoir, near Monida, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	5	5	5.0	307	C.
February	5	5	5.0	278	C.
March	5	5	5.0	307	C.
April	1,120	5	571	34,000	B.
May	1,040	360	658	40,500	B.
June	640	262	491	29,200	A.
July	360	162	237	14,600	A.
August	320	228	254	15,600	A.
September	280	245	235	15,800	A.
October	340	252	282	17,300	A.
November	280	146	189	11,200	A.
December	149	29	410	2,520	A.
The year	1,120	5	251	182,000	

NOTE.—Accuracy for January, February, and March reduced because of possible effect of ice.

BEAVERHEAD RIVER AT BARRATTS, MONT.

Location.—One mile above Barratts and 2 miles southwest of Dillon, Mont., in the SW. ¼ SW. ¼ sec. 20, T. 8 S., R. 9 W.

Records available.—August 12, 1907, to December 31, 1913.

Drainage area.—Not measured.

Gage.—A standard chain gage was installed on the downstream side of the bridge June 22, 1908, to replace the staff gage which had previously been used; datum of chain gage the same as that of the staff gage.

Control.—Should not shift; rocky at the measuring section.

Discharge measurements.—Made from downstream side of the bridge.

Winter flow.—Stream remains open during the winter months.

Diversions.—Numerous diversions are made above the station. Decreed water rights, aggregating 85,866 inches of water, are filed on from Lima on Red Rock River to a point 10 miles above Twin Bridges. The three largest canals diverted below the station are Canyon Creek canal, appropriating 6,000 inches; Union canal, appropriating 4,000 inches; and Beaverhead canal, diverted just north of Dillon, appropriating 5,000 inches. The Union Electric Co., of Dillon, has a canal with a carrying capacity of 6,000 inches.

Beaverhead River is called Red Rock River from its source in Red Rock Lakes to the post office of Red Rock, below which it is called the Beaverhead. The principal tributaries to the Beaverhead above the station are Grasshopper Creek, 12 miles south of Dillon; Horse Prairie Creek, 20 miles south; and Rattlesnake and Blacktail Deer creeks. Irrigation has probably been practiced in Beaverhead Valley longer than in any other valley in Montana, ditches constructed in the early seventies being still in operation.

Discharge measurements of Beaverhead River at Barratts, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 3	C. S. Heidel	2.87	1,290
June 18	J. M. Ray	2.80	1,220
Aug. 6	C. S. Heidel	2.06	789

Daily gage height, in feet, of Beaverhead River at Barratts, Mont., for 1913.

[M. E. Meeds, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.7	3.2	3.8	2.3	2.0	1.2	1.7	1.85	1.5
2	.....	3.7	3.0	3.8	2.4	2.0	1.2	1.7	1.9	1.4
3	.....	2.8	2.9	3.7	2.3	1.9	1.25	1.7	1.9	1.4
4	.....	2.3	2.9	3.6	2.2	1.9	1.25	1.7	1.9	1.3
5	.....	2.6	2.8	3.5	2.1	1.9	1.3	1.75	1.85	1.3
6	.....	2.8	2.8	3.4	2.0	2.2	1.3	1.8	1.85	1.3
7	.....	2.4	2.8	3.3	1.9	2.1	1.3	1.8	1.85	1.25
8	.....	2.2	3.1	3.2	1.65	2.1	1.3	1.8	1.9	1.2
9	.....	2.2	3.4	3.2	1.6	1.9	1.25	1.8	1.9	1.2
10	.....	2.2	3.3	3.3	1.4	1.9	1.2	1.8	1.9	1.1
11	.....	2.4	3.4	3.4	1.4	1.9	1.2	1.85	1.85	1.1
12	.....	2.7	3.4	3.8	1.3	1.85	1.25	1.85	1.8	1.1
13	.....	3.0	3.3	4.3	1.2	1.8	1.3	1.85	1.8	1.1
14	.....	3.4	3.2	4.3	1.2	1.65	1.3	1.9	1.8	1.1
15	1.0	3.4	3.2	3.9	1.2	1.5	1.35	1.9	1.8	1.1
16	1.0	3.2	3.1	3.9	1.2	1.5	1.35	1.9	1.85	1.1
17	1.2	2.8	2.8	3.8	1.2	1.5	1.35	1.9	1.85	1.1
18	1.05	2.8	2.8	2.8	1.2	1.4	1.4	1.85	1.8	1.1
19	1.1	3.2	3.2	2.6	1.2	1.4	1.4	1.9	1.8	1.1
20	1.2	3.3	3.2	2.6	1.2	1.35	1.4	1.9	1.8	.....
21	1.05	3.2	3.1	2.5	1.2	1.2	1.45	1.9	1.8	.....
22	1.05	3.3	2.8	2.4	1.2	1.2	1.5	1.9	1.7	.....
23	1.0	3.3	2.4	2.2	1.2	1.2	1.5	1.85	1.7	.....
24	1.0	3.0	2.5	2.2	1.25	1.25	1.55	1.8	1.7	.....
25	.95	3.0	2.7	2.6	1.4	1.25	1.6	1.85	1.65	.....
26	.90	2.9	3.0	2.6	1.45	1.25	1.6	1.8	1.6	.....
27	.95	3.1	3.2	3.1	1.55	1.25	1.6	1.8	1.6	.....
28	1.1	3.2	3.4	3.2	2.1	1.25	1.6	1.8	1.6	.....
29	1.3	3.2	3.6	3.0	2.2	1.2	1.65	1.8	1.5	.....
30	2.3	3.0	3.8	2.8	2.0	1.2	1.65	1.8	1.5	.....
31	3.2	.....	4.0	.....	2.0	1.2	.....	1.8	.....	.....

Daily discharge, in second-feet, of Beaverhead River at Barratts, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,860	1,510	1,930	940	760	350	600	675	500
2	.....	1,860	1,380	1,930	1,000	760	350	600	700	450
3	.....	1,240	1,310	1,860	940	700	375	600	700	450
4	.....	940	1,310	1,790	880	700	375	600	700	400
5	.....	1,120	1,240	1,720	820	700	400	625	675	400
6	.....	1,240	1,240	1,650	760	880	400	650	675	400
7	.....	1,000	1,240	1,580	700	820	400	650	675	375
8	.....	880	1,440	1,510	575	820	400	650	700	350
9	.....	880	1,650	1,510	550	700	375	650	700	350
10	.....	880	1,580	1,580	450	700	350	650	700	305
11	.....	1,000	1,650	1,650	450	700	350	675	675	305
12	.....	1,180	1,650	1,930	400	675	375	675	650	305
13	.....	1,380	1,580	2,280	350	650	400	675	650	305
14	.....	1,650	1,510	2,280	350	575	400	700	650	305
15	265	1,650	1,510	2,000	350	500	425	700	650	305
16	265	1,510	1,440	2,000	350	500	425	700	675	305
17	350	1,240	1,240	1,930	350	500	425	700	675	305
18	285	1,240	1,240	1,240	350	450	450	675	650	305
19	305	1,510	1,510	1,120	350	450	450	700	650	305
20	350	1,580	1,510	1,120	350	425	450	700	650	305
21	285	1,510	1,440	1,060	350	350	475	700	650	285
22	285	1,580	1,240	1,000	350	350	500	700	600	285
23	265	1,580	1,000	880	350	350	500	675	600	285
24	265	1,380	1,060	880	375	375	525	650	600	285
25	245	1,380	1,180	1,120	450	375	550	675	575	285
26	225	1,310	1,380	1,120	475	375	550	650	550	265
27	245	1,440	1,510	1,440	525	375	550	650	550	265
28	305	1,510	1,650	1,510	820	375	550	650	550	265
29	400	1,510	1,790	1,380	880	350	575	650	500	265
30	940	1,380	1,930	1,240	760	350	575	650	500	265
31	1,510	.....	2,070	.....	760	350	.....	650	.....	265

NOTE.—Discharge determined from a rating curve well defined between 500 and 1,400 second-feet and fairly well defined at other stages. Discharge estimated Dec. 20–31.

Monthly discharge of Beaverhead River at Barratts, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Mar. 15–31	1,510	225	399	13,500	B.
April	1,860	880	1,350	80,300	A.
May	2,070	1,000	1,450	89,200	B.
June	2,280	880	1,540	91,600	B.
July	1,000	350	560	34,400	A.
August	880	350	546	33,600	A.
September	575	350	442	26,300	B.
October	700	600	660	40,600	A.
November	700	500	638	38,000	A.
December	500	265	324	19,900	B.
The period	.....	.....	.....	467,000	

JEFFERSON RIVER NEAR SILVERSTAR, MONT.

Location.—In sec. 23, T. 2 S., R. 6 W., at the big highway bridge on the road from Silverstar to Iron Rod, a station on a branch of the Northern Pacific Railway. The principal tributaries below the station are Pipestone and Whitetail creeks and Boulder River.

Records available.—August 11, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage fastened to pier on downstream side.

Control.—Gravel.

Discharge measurements.—Made from the lower side of highway bridge.

Winter flow.—Ice present.

Diversions.—Irrigation is carried on extensively from the headwaters of this stream to its mouth.

Discharge measurements of Jefferson River near Silverstar, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 7	C. S. Heidel	3.88	3,280
June 20	do	5.68	7,620
Aug. 11	do	3.20	1,710
Oct. 10	do	3.10	1,610

Daily gage height, in feet, of Jefferson River near Silverstar, Mont., for 1913.

[C. A. Barkell, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.55	4.4	8.0	5.8	3.1	2.65	2.95	3.2	2.45
2	3.6	4.4	7.7	5.7	2.95	2.65	2.9	3.25	.....
3	3.6	4.5	7.6	5.4	2.7	2.7	2.85	3.35	.....
4	3.6	4.4	7.4	5.1	2.6	2.7	2.85	3.25	.....
5	3.6	4.3	7.4	5.0	2.55	2.8	2.9	3.2	.....
6	3.5	4.2	6.9	4.9	2.25	2.95	2.9	3.2	.....
7	3.45	3.8	6.7	4.6	2.4	2.8	2.9	3.15	.....
8	3.45	3.9	6.7	4.5	2.45	2.75	2.95	3.1	.....
9	3.35	4.2	6.8	4.4	2.6	2.7	3.0	3.1	.....
10	3.3	4.2	6.9	4.2	3.0	2.7	3.1	3.1	.....
11	3.5	4.8	7.1	4.0	3.2	2.7	3.0	3.1	.....
12	3.8	5.5	8.2	3.6	3.5	2.75	3.0	3.15	.....
13	4.1	5.9	8.6	3.5	3.5	2.8	3.1	3.15	.....
14	4.4	5.9	8.7	3.4	3.45	2.85	3.1	3.2	.....
15	4.8	5.9	8.8	3.35	3.4	2.85	3.1	3.25	.....
16	5.4	5.9	8.5	3.3	3.3	2.9	3.15	3.3	.....
17	5.2	5.8	7.8	3.15	3.25	2.9	3.2	3.3	.....
18	5.2	5.7	7.2	3.15	3.2	2.9	3.3	3.25	.....
19	5.1	5.4	6.1	2.9	3.2	2.85	3.25	3.2	.....
20	4.8	5.4	5.6	2.9	3.15	2.85	3.2	3.15	.....
21	4.7	5.2	5.4	2.85	3.0	2.9	3.2	3.0	.....
22	4.6	5.3	4.9	2.8	3.0	2.85	3.15	3.0	.....
23	4.4	5.7	4.8	2.6	3.0	2.85	3.15	3.0	.....
24	4.2	6.1	4.7	2.6	2.85	2.85	3.15	3.0	.....
25	4.1	6.3	5.1	2.75	2.8	2.9	3.15	3.0	.....
26	4.2	6.3	5.4	2.8	2.8	2.9	3.2	2.95	.....
27	4.3	6.4	5.6	2.95	2.7	3.0	3.2	2.95	.....
28	4.3	6.4	5.8	2.75	2.7	3.05	3.25	2.9	.....
29	4.3	7.3	6.0	3.0	2.7	3.15	3.25	2.9	.....
30	4.2	8.1	6.0	3.05	2.7	3.0	3.2	2.95	.....
31	.....	8.2	.....	3.2	2.65	.....	3.15	.....	.....

Daily discharge, in second-feet, of Jefferson River near Silverstar, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,360	4,220	14,100	7,800	1,600	1,000	1,380	1,760	805
2	2,460	4,220	13,200	7,530	1,380	1,000	1,310	1,840	.....
3	2,460	4,460	12,900	6,730	1,060	1,060	1,240	2,000	.....
4	2,460	4,220	12,300	5,950	950	1,060	1,240	1,840	.....
5	2,460	3,990	12,300	5,690	900	1,180	1,310	1,760	.....
6	2,270	3,760	10,900	5,440	630	1,380	1,310	1,760	.....
7	2,180	2,870	10,300	4,700	760	1,180	1,310	1,680	.....
8	2,180	3,090	10,300	4,460	805	1,120	1,380	1,600	.....
9	2,000	3,760	10,600	4,220	950	1,060	1,450	1,600	.....
10	1,920	3,760	10,900	3,760	1,450	1,060	1,600	1,600	.....
11	2,270	5,190	11,400	3,310	1,760	1,060	1,450	1,600	.....
12	2,870	6,990	14,700	2,460	2,270	1,120	1,450	1,680	.....
13	3,530	8,070	15,900	2,270	2,270	1,180	1,600	1,680	.....
14	4,220	8,070	16,200	2,090	2,180	1,240	1,600	1,760	.....
15	5,190	8,070	16,500	2,000	2,090	1,240	1,600	1,840	.....
16	6,730	8,070	15,600	1,920	1,920	1,310	1,680	1,920	.....
17	6,210	7,800	13,500	1,680	1,840	1,310	1,760	1,920	.....
18	6,210	7,530	11,700	1,680	1,760	1,310	1,920	1,840	.....
19	5,950	6,730	8,610	1,310	1,760	1,240	1,840	1,760	.....
20	5,190	6,730	7,260	1,310	1,680	1,240	1,760	1,680	.....
21	4,940	6,210	6,730	1,240	1,450	1,310	1,760	1,450	.....
22	4,700	6,470	5,440	1,180	1,450	1,240	1,680	1,450	.....
23	4,220	7,530	5,190	950	1,450	1,240	1,680	1,450	.....
24	3,760	8,610	4,940	950	1,240	1,240	1,680	1,450	.....
25	3,530	9,170	5,950	1,120	1,180	1,310	1,680	1,450	.....
26	3,760	9,170	6,730	1,180	1,180	1,310	1.760	1,380	.....
27	3,990	9,450	7,260	1,380	1,060	1,450	1,760	1,380	.....
28	3,990	9,450	7,800	1,120	1,060	1,520	1,840	1,310	.....
29	3,990	12,000	8,340	1,450	1,060	1,680	1,840	1,310	.....
30	3,760	14,400	8,340	1,520	1,060	1,450	1,760	1,380	.....
31	.....	14,700	.....	1,760	1,000	.....	1,680	.....	.....

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

Monthly discharge of Jefferson River near Silverstar, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	6,730	1,920	3,730	222,000	B.
May	14,700	2,870	7,060	434,000	B.
June	16,500	4,940	10,500	625,000	B.
July	7,800	950	2,910	179,000	B.
August	2,270	630	1,390	85,500	B.
September	1,680	1,000	1,240	73,800	B.
October	1,920	1,240	1,590	97,800	B.
November	2,000	1,310	1,640	97,600	B.
The period	.....	.....	.....	1,810,000	

MISSOURI RIVER AT TOSTON, MONT.

Location.—In the SW. ¼ sec. 23, T. 5 N., R. 2 E., at the highway bridge crossing Missouri River at Toston, Mont.; about 25 miles below the union of Gallatin, Jefferson, and Madison rivers.

Records available.—April 5, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to downstream side of bridge.

Control.—Rocky and permanent.

Discharge measurements.—Made from cable just above bridge.

Winter flow.—Affected by ice.

Cooperation.—Gage-height record furnished by the Montana Power Co. Estimates of winter flow at Canyon Ferry, 40 miles below Toston, are also furnished by the Montana Power Co.

The following measurement was made by R. R. Randell:

June 6, 1913. Gage height, 8.82 feet; discharge, 26,200 second-feet.

Daily gage height, in feet, of Missouri River at Toston, Mont., for 1913.

[W. B. Lorentz, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	6.6	5.5	4.4	5.3	9.4	6.6	4.7	3.5	4.1	4.2	3.9
2	3.6	6.4	5.4	4.3	5.2	9.3	6.4	4.7	3.6	3.9	4.2	3.8
3	3.7	6.4	5.2	4.2	5.0	9.1	6.3	4.6	3.7	3.9	4.2	3.7
4	3.6	5.6	4.5	4.3	4.9	9.0	.....	4.5	3.75	3.9	4.2	3.6
5	3.2	5.3	4.4	4.6	5.0	9.0	6.4	4.5	3.7	3.95	4.3	3.6
6	3.0	5.9	4.4	4.8	4.8	8.8	6.2	4.4	3.6	3.95	4.3	3.5
7	3.1	6.0	4.2	4.8	4.8	8.7	6.0	4.4	3.6	4.1	4.2	3.5
8	3.5	5.4	4.1	4.7	5.1	8.4	5.9	4.4	3.6	4.1	4.2	3.55
9	3.55	5.6	4.1	4.7	5.4	8.4	5.6	4.4	3.65	4.2	4.2	3.7
10	3.55	5.5	4.2	4.6	5.8	8.3	5.2	4.4	3.7	4.1	4.2	3.5
11	3.7	5.6	4.1	4.5	6.1	8.2	4.8	4.5	3.7	4.1	4.3	3.65
12	7.1	5.9	4.0	4.7	6.4	8.5	4.7	4.4	.....	4.1	4.2	3.6
13	7.8	6.2	3.9	4.8	6.5	8.3	4.6	4.4	3.7	4.2	4.2	3.6
14	7.85	6.4	4.0	5.1	6.6	8.4	4.3	4.4	3.7	4.3	4.2	3.65
15	7.85	6.4	3.85	5.3	6.6	8.8	4.2	4.4	3.7	4.3	4.2	3.75
16	8.0	6.5	3.8	5.3	6.3	8.8	4.1	4.3	3.65	4.3	4.2	2.75
17	7.8	6.9	3.7	5.5	6.1	8.5	3.9	4.2	3.7	4.3	4.2	3.7
18	7.5	7.0	3.7	5.7	6.0	8.0	3.85	4.2	3.7	4.2	4.1	3.75
19	7.4	6.8	3.65	5.6	6.2	7.5	3.9	4.2	3.7	4.1	4.2	4.0
20	7.5	6.4	3.2	5.5	6.2	7.3	3.85	4.0	3.7	4.1	4.2	3.85
21	7.2	6.2	3.6	5.4	6.1	6.9	3.8	3.9	3.6	4.2	4.2	3.9
22	7.1	6.2	3.4	5.4	6.1	6.6	3.95	3.9	3.7	4.2	4.0	3.85
23	7.5	6.2	3.6	5.4	5.9	6.4	3.85	3.85	3.8	4.1	4.0	3.9
24	7.6	6.0	3.5	5.4	6.3	6.3	3.90	3.75	3.7	4.0	4.0	3.85
25	7.1	5.9	3.5	5.1	6.7	6.2	3.8	3.7	3.75	4.2	3.9	3.8
26	6.9	5.9	3.4	5.0	7.0	6.2	3.85	3.7	3.9	4.2	4.0	3.65
27	6.6	5.8	3.5	4.9	7.5	6.4	4.05	3.7	3.9	4.1	4.0	3.8
28	6.5	5.5	3.9	5.0	7.8	6.5	4.2	3.7	3.9	4.1	4.0	4.0
29	6.4	.....	4.2	5.0	8.6	6.8	4.4	3.7	4.0	4.2	3.9	3.8
30	6.5	.....	4.3	.....	8.8	6.8	4.6	3.65	4.2	4.2	4.0	3.7
31	6.6	.....	4.3	.....	9.1	.....	4.7	3.65	.....	4.2	.....	3.7

NOTE.—Gage heights Jan. 1 to Mar. 19 probably affected by ice.

Daily discharge, in second-feet, of Missouri River at Toston, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,420	2,770	3,080	5,940	9,560	29,800	15,400	7,080	3,110	4,890	5,230	4,250
2	2,680	2,860	3,410	5,580	9,130	29,300	14,500	7,080	3,380	4,250	5,230	3,950
3	3,100	2,930	3,310	5,230	8,300	28,200	14,000	6,690	3,660	4,250	5,230	3,660
4	2,650	2,730	4,250	5,580	7,890	27,700	14,200	6,310	3,800	4,250	5,230	3,380
5	2,120	2,050	4,780	6,690	8,300	27,700	14,500	6,310	3,660	4,400	5,580	3,380
6	1,310	2,130	4,090	7,480	7,480	26,600	13,500	5,940	3,380	4,400	5,580	3,110
7	1,630	1,770	4,120	7,480	7,480	26,100	12,600	5,940	3,380	4,890	5,230	3,110
8	1,310	1,960	4,510	7,080	8,710	24,500	12,200	5,940	3,380	4,890	5,230	3,240
9	1,660	1,480	4,090	7,080	9,990	24,500	10,800	5,940	3,520	5,230	5,230	3,660
10	1,620	1,790	4,560	6,690	11,700	24,000	9,130	5,940	3,660	4,890	5,230	3,110
11	1,900	2,200	4,410	6,310	13,100	23,500	7,480	6,310	3,660	4,890	5,580	3,520
12	2,020	2,800	4,580	7,080	14,500	25,000	7,080	5,940	3,660	4,890	5,230	3,380
13	1,680	2,540	4,280	7,480	15,000	24,000	6,690	5,940	3,660	5,230	5,230	3,380
14	1,770	3,000	3,750	8,710	15,400	24,500	5,580	5,940	3,660	5,580	5,230	3,520
15	2,130	3,730	3,940	9,560	15,400	26,600	5,230	5,940	3,660	5,580	5,230	3,800
16	2,740	3,000	4,020	9,560	14,000	26,600	4,890	5,580	3,520	5,580	5,230	3,800
17	2,910	3,600	3,890	10,400	13,100	25,000	4,250	5,230	3,660	5,580	5,230	3,660
18	2,640	4,420	4,030	11,300	12,600	22,400	4,100	5,230	3,660	5,230	4,890	3,800
19	2,610	4,500	3,390	10,800	13,500	19,900	4,250	5,230	3,660	4,890	5,230	4,560
20	2,590	4,270	2,360	10,400	13,500	18,900	4,100	4,560	3,660	4,890	5,230	4,100
21	2,370	3,820	3,380	9,990	13,100	16,900	3,950	4,250	3,380	5,230	5,230	4,250
22	2,340	3,700	2,850	9,990	13,100	15,400	4,400	4,250	3,660	5,230	4,560	4,100
23	2,520	3,410	3,380	9,990	12,200	14,500	4,100	4,100	3,950	4,890	4,560	4,250
24	3,200	3,320	3,110	9,990	14,000	14,000	4,250	3,800	3,660	4,560	4,560	4,100
25	2,860	3,520	3,110	8,710	15,900	13,500	3,950	3,660	3,800	5,230	4,250	3,950
26	3,020	3,270	2,850	8,300	17,400	13,500	4,100	3,660	4,250	5,230	4,560	3,520
27	3,040	3,210	3,110	7,890	19,900	14,500	4,720	3,660	4,250	4,890	4,560	3,950
28	3,080	3,020	4,250	8,300	21,400	15,000	5,230	3,660	4,250	4,890	4,560	4,560
29	3,120	.....	5,230	8,300	25,600	16,400	5,940	3,660	4,560	5,230	4,250	3,950
30	3,280	.....	5,580	8,930	26,600	16,400	6,690	3,520	5,230	5,230	4,560	3,660
31	3,110	.....	5,580	.....	28,200	.....	7,080	3,520	.....	5,230	.....	3,660

NOTE.—Discharge determined from a rating curve fairly well defined between 1,560 and 28,000 second-feet. Discharges for the period Jan. 1 to Mar. 19 represent flow at Canyon Ferry, about 40 miles below Toston, and were furnished by Montana Power Co. No large tributaries enter between the two stations, and the flow at Canyon Ferry during this period ought not to exceed that at Toston by more than 5 per cent.

Monthly discharge of Missouri River at Toston, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	3,280	1,310	2,430	149,000	
February	4,500	1,480	2,990	166,000	
March	5,580	2,360	3,910	240,000	
April	11,300	5,230	8,230	490,000	B.
May	28,200	7,480	14,100	867,000	B.
June	29,800	13,500	21,800	1,300,000	B.
July	15,400	3,950	7,710	474,000	B.
August	7,080	3,520	5,190	319,000	B.
September	5,230	3,110	3,750	223,000	B.
October	5,580	4,250	4,980	306,000	B.
November	5,580	4,250	5,030	299,000	B.
December	4,560	3,110	3,750	231,000	B.
The year	29,800	1,310	6,990	5,060,000	

NOTE.—Estimates for the period Jan. 1 to Mar. 19 represent flow at Canyon Ferry, about 40 miles below Toston.

MISSOURI RIVER AT CASCADE, MONT.

Location.—In sec. 35, T. 18 N., R. 1 W. At the highway bridge, 100 yards from the Great Northern Railway, on the east side of the town of Cascade, Mont.

Records available.—July 20, 1902, to December 31, 1913.

Drainage area.—18,300 square miles.

Gage.—Standard chain gage attached to bridge.

Control.—Probably permanent except at extreme flood stages.

Discharge measurements.—Made from lower side of bridge.

Winter flow.—Affected by ice.

Storage.—The Montana Power Co. has a large reservoir near Helena, between the stations at Toston and Cascade.

The most important tributaries between this station and the station at Toston, above, are Dearborn River, Little Prickly Pear Creek, and Prickly Pear Creek. Although irrigation is extensively practiced in the Missouri River Valley, the water is taken from the tributary streams, the Missouri itself being little used because of its high banks and great variation in flow and the difficulty of diversion.

Discharge measurements of Missouri River at Cascade, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 7	R. R. Randell	11.80	29,600
Sept. 19	J. M. Ray	4.71	4,050

Daily gage height, in feet, of Missouri River at Cascade, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.6	5.7	6.0	6.5	6.8	11.6	8.6	5.6	4.6	4.9	5.6	5.2
2	5.3	5.6	6.0	6.5	7.0	12.0	8.6	5.8	3.9	4.7	5.6	5.3
3	5.9	5.6	6.5	5.8	6.8	12.2	8.4	5.7	4.3	4.8	5.7	5.2
4	5.8	5.3	5.8	6.4	6.7	12.2	8.2	5.4	4.2	5.2	5.7	5.2
5	5.6	5.7	6.0	5.9	6.6	12.3	8.1	5.8	4.3	5.2	5.6	5.0
6	5.1	6.0	6.2	6.0	6.4	12.0	8.1	5.6	4.3	5.2	5.5	4.7
7	5.4	6.0	6.2	5.9	6.3	11.8	8.1	5.4	4.2	5.0	5.4	4.6
8	6.1	6.1	6.4	6.6	6.4	11.3	7.9	5.4	3.95	5.1	5.4	4.4
9	6.1	5.8	6.7	6.8	6.3	11.3	7.7	5.4	4.1	5.2	5.7	4.6
10	5.9	5.6	6.6	6.5	6.6	11.1	7.5	5.3	4.2	5.1	5.6	4.6
11	6.1	5.8	6.2	6.3	7.0	11.0	7.2	5.1	4.3	5.2	5.5	4.5
12	6.1	5.8	6.4	6.0	7.3	10.8	6.6	5.0	4.05	5.6	5.5	4.6
13	5.9	5.8	6.0	6.0	8.0	10.6	6.0	5.0	4.05	5.7	5.5	4.5
14	6.0	5.8	6.1	6.2	8.3	10.9	6.0	5.0	4.3	5.8	5.4	4.5
15	6.1	5.8	6.2	6.5	8.5	11.2	5.8	5.2	4.4	5.6	5.3	4.4
16	6.0	6.0	6.0	6.8	8.3	11.1	5.4	5.1	4.05	5.6	5.4	4.2
17	5.8	5.9	4.8	7.0	8.1	11.3	4.6	5.0	4.15	5.6	5.4	4.4
18	5.9	6.2	4.7	7.0	8.5	11.6	4.0	4.8	4.0	5.6	5.6	4.6
19	5.7	6.3	7.2	7.1	8.0	11.2	4.0	5.0	4.6	5.6	5.5	4.8
20	5.8	6.4	7.2	7.4	8.0	11.0	4.3	4.8	4.8	5.5	5.5	4.8
21	6.1	6.6	7.1	7.2	8.0	9.7	4.4	4.9	4.5	5.3	5.5	5.0
22	6.2	6.4	6.6	7.2	8.0	9.0	4.6	4.6	4.6	5.4	5.1	8.2
23	6.0	6.2	6.6	7.3	7.9	8.9	4.7	4.6	4.8	5.3	5.1	8.1
24	6.2	6.0	6.1	7.2	7.9	8.6	4.1	4.5	5.0	5.4	5.0	8.0
25	6.2	6.0	5.6	7.1	7.9	6.5	4.2	4.6	4.6	5.6	5.2	7.4
26	6.1	5.7	5.5	6.9	8.2	7.7	4.5	4.6	4.4	5.4	5.2	7.2
27	5.8	5.8	6.5	6.4	8.9	8.0	4.8	4.5	4.3	5.1	5.2	7.2
28	6.0	6.2	6.2	6.6	9.2	8.2	4.7	4.6	4.6	5.4	5.1	7.5
29	6.0	.....	5.8	6.6	10.1	8.2	4.7	4.4	4.4	5.5	5.2	7.4
30	5.8	.....	8.1	5.7	10.6	8.4	5.0	4.6	4.8	5.4	5.2	7.0
31	5.7	.....	5.9	.....	11.2	.....	5.1	4.4	.....	5.4	.....	7.1

NOTE.—Gage heights Jan. 1 to Mar. 30 and Dec. 22 to 31 affected by ice.

Daily discharge, in second-feet, of Missouri River at Cascade, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9,900	11,000	29,300	17,900	6,750	3,850	4,650	6,750	5,510
2	9,900	11,800	30,800	17,900	7,410	2,200	4,110	6,750	5,810
3	7,410	11,000	31,600	17,100	7,080	3,100	4,380	7,080	5,510
4	9,530	10,700	31,600	16,400	6,120	2,860	5,510	7,080	5,510
5	7,750	10,300	31,900	16,000	7,410	3,100	5,510	6,750	4,930
6	8,100	9,530	30,800	16,000	6,750	3,100	5,510	6,430	4,110
7	7,750	9,160	30,000	16,000	6,120	2,860	4,930	6,120	3,850
8	10,300	9,530	28,100	15,200	6,120	2,300	5,220	6,120	3,340
9	11,000	9,160	28,100	14,500	6,120	2,630	5,510	7,080	3,850
10	9,900	10,300	27,400	13,700	5,810	2,860	5,220	6,750	3,850
11	9,160	11,800	27,000	12,600	5,220	3,100	5,510	6,430	3,590
12	8,100	12,900	26,200	10,300	4,930	2,520	6,750	6,430	3,850
13	8,100	15,600	25,500	8,100	4,930	2,520	7,080	6,430	3,590
14	8,800	16,700	26,600	8,100	4,930	3,100	7,410	6,120	3,590
15	9,900	17,500	27,800	7,410	5,510	3,340	6,750	5,810	3,340
16	11,000	16,700	27,400	6,120	5,220	2,520	6,750	6,120	2,860
17	11,800	16,000	28,100	3,850	4,930	2,740	6,750	6,120	3,340
18	11,800	17,500	29,300	2,410	4,380	2,410	6,750	6,750	3,850
19	12,200	15,600	27,800	2,410	4,930	3,850	6,750	6,430	4,380
20	13,300	15,600	27,000	3,100	4,380	4,380	6,430	6,430	4,380
21	12,600	15,600	22,100	3,340	4,650	3,590	5,810	6,430	4,930
22	12,600	15,600	19,400	3,850	3,850	3,850	6,120	5,220	.....
23	12,900	15,200	19,000	4,110	3,850	4,380	5,810	5,220	.....
24	12,600	15,200	17,900	2,630	3,590	4,930	6,120	4,930	.....
25	12,200	15,200	9,900	2,860	3,850	3,850	6,750	5,510	.....
26	11,400	16,400	14,500	3,590	3,850	3,340	6,120	5,510	.....
27	9,530	19,000	15,600	4,380	3,590	3,100	5,220	5,510	.....
28	10,300	20,200	16,400	4,110	3,850	3,850	6,120	5,220	.....
29	10,300	23,600	16,400	4,110	3,340	3,340	6,430	5,510	.....
30	7,080	25,500	17,100	4,930	3,850	4,380	6,120	5,510	.....
31	.....	27,800	.....	5,220	3,340	.....	6,120	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Dec. 22–31 estimated from flow at Toston, Mont., at 4,500 second-feet.

Monthly discharge of Missouri River at Cascade, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 2,800	172,000	C.
February	.....	.....	[a] 3,600	200,000	C.
March	.....	.....	[a] 4,700	289,000	C.
April	13,300	7,080	10,200	607,000	B.
May	27,800	9,160	15,100	928,000	B.
June	31,900	9,900	24,700	1,470,000	B.
July	17,900	2,410	8,650	532,000	B.
August	7,410	3,340	5,050	311,000	B.
September	4,930	2,200	3,260	194,000	B.
October	7,410	4,110	5,940	365,000	B.
November	7,080	4,930	6,150	366,000	B.
December	5,810	.....	4,290	264,000	C.
The year	31,900	.....	7,870	5,700,000	

[a] Estimated from records of flow at Canyon Ferry dam furnished by the Missouri River Power Co. See footnote to table of daily discharge at Toston, Mont.

MISSOURI RIVER AT FORT BENTON, MONT.

Location.—In NE. ¼, sec. 26, T. 24 N., R. 8 E., at the public highway bridge at Fort Benton, Mont.

Records available.—July 1, 1902, to April 27, 1910, gage heights recorded by United States Weather Bureau; April 28, 1910, to December 31, 1913, United States Geological Survey records for parts of years.

Drainage area.—24,600 square miles.

Gage.—A Mott gage installed April 11, 1907, on upstream side of bridge; gage heights for 1911, 1912, and 1913 are referred to the datum used by the United States Army engineers from 1881 to 1890, which is 0.43 foot higher than that used by the United States Geological Survey in 1910.

Control.—Probably permanent except in flood.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Affected by ice.

Accuracy.—Conditions for obtaining accurate discharge data are good.

Discharge measurements of Missouri River at Fort Benton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar 26	R. R. Randell	0.62	5,150
June 7	J. B. Stewart	8.20	43,300
July 8	.....do	4.66	19,500
Nov. 14	W. A. Lamb	1.72	7,360

Daily gage height, in feet, of Missouri River at Fort Benton, Mont., for 1913.

[W. P. Ward, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.3	.....	.....	.....	1.1	1.3	0.9	1.8	1.4
2	.....	2.7	.....	.....	.....	1.1	1.3	.9	1.8	1.4
3	.....	2.8	.....	.....	.....	1.1	1.1	.9	1.9	1.4
4	.....	2.3	.....	.....	.....	1.1	1.0	1.0	1.9	1.3
5	.....	2.6	.....	.....	.....	1.6	.9	1.1	1.8	1.3
6	.....	2.4	.....	.....	.....	1.7	.8	1.1	1.8	.9
7	.....	2.4	.....	8.2	.....	2.0	.7	1.2	1.8	.7
8	.....	2.6	.....	.....	4.7	1.9	.6	1.3	1.9	.8
9	.....	2.8	.....	.....	4.7	1.9	.4	1 4	1 9	.9
10	.....	3.0	.....	7.8	4.3	1.8	.4	1.5	1.9	1.1
11	.....	3.0	.....	.....	4.0	1.7	.4	1.6	1.9	.8
12	.....	2.8	.....	.....	3.8	1.5	.4	1.7	1.8	.9
13	.....	2.6	.....	.....	3.4	1.5	.4	1.7	1.8	.9
14	.....	2.8	.....	.....	2.8	1.5	.5	1.8	1.8	1.0
15	.....	3.2	4.9	.....	2.6	1.5	.6	1.9	1.7	1.1
16	1.0	3.3	.....	.....	2.4	1.5	.6	2.1	.....	1.1
17	.9	3.4	.....	.....	2.0	1.5	.7	2.2	1.7	1.1
18	.9	3.4	.....	.....	1.6	1.5	.7	2.4	1.7	1.0
19	.9	3.5	.....	.....	1.3	1.5	.8	2.2	1 7	.9
20	1.0	3.7	.....	.....	1.1	1.4	.8	2.2	1.5	.9
21	1.0	4.0	.....	.....	1.0	1.4	.9	2.2	1.2	.8
22	1.0	4.0	.....	.....	1.0	1.4	1.0	2.1	1.1	.7
23	1.0	4.0	.....	.....	1.1	1.4	1.1	2.1	1.1	.7
24	.9	4.0	.....	.....	1.1	1.4	1.2	2.0	1.2	.6
25	.7	3.8	.....	.....	1.1	1.4	1.1	2.0	1.2	.6
26	1.1	3.7	.....	4.2	1.1	1.5	1.1	1.9	1.2	.6
27	1.1	.....	.....	4.5	1.2	1.5	1.1	1.9	1.3	.7
28	1.1	3.4	.....	4.7	1.4	1.5	1.0	1.9	1.4	.7
29	1.2	.....	.....	5.0	1.4	1.4	.9	1.8	1.4	.7
30	1.4	.....	.....	5.2	1.2	1.4	.8	1.8	1.4	.7
31	1.9	.....	.....	.....	1.1	1.4	.....	1.7	.....	.7

Daily discharge, in second-feet, of Missouri River at Fort Benton, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	10,000	.....	.....	.....	5,650	6,350	5,000	8,100	6,700
2	.....	11,600	.....	.....	.....	5,650	6,350	5,000	8,100	6,700
3	.....	12,100	.....	.....	.....	5,650	5,650	5,000	8,450	6,700
4	.....	10,000	.....	.....	.....	5,650	5,300	5,300	8,450	6,350
5	.....	11,200	.....	.....	.....	7,400	5,000	5,650	8,100	6,350
6	.....	10,400	.....	.....	.....	7,750	4,750	5,650	8,100	5,000
7	.....	10,400	.....	43,900	.....	8,800	4,500	6,000	8,100	4,500
8	.....	11,200	.....	.....	21,800	8,450	4,250	6,350	8,450	4,750
9	.....	12,100	.....	.....	21,800	8,450	3,750	6,700	8,450	5,000
10	.....	13,000	.....	41,100	19,600	8,100	3,750	7,050	8,450	5,650
11	.....	13,000	.....	.....	18,000	7,750	3,750	7,400	8,450	4,750
12	.....	12,100	.....	.....	17,000	7,050	3,750	7,750	8,100	5,000
13	.....	11,200	.....	.....	15,000	7,050	3,750	7,750	8,100	5,000
14	.....	12,100	.....	.....	12,100	7,050	4,000	8,100	8,100	5,300
15	.....	14,000	22,900	.....	11,200	7,050	4,250	8,450	7,750	5,650
16	5,300	14,500	.....	.....	10,400	7,050	4,250	9,200	7,750	5,650
17	5,000	15,000	.....	.....	8,800	7,050	4,500	9,600	7,750	5,650
18	5,000	15,000	.....	.....	7,400	7,050	4,500	10,400	7,750	5,300
19	5,000	15,500	.....	.....	6,350	7,050	4,750	9,600	7,750	5,000
20	5,300	16,500	.....	.....	5,650	6,700	4,750	9,600	7,050	5,000
21	5,300	18,000	.....	.....	5,300	6,700	5,000	9,600	6,000	4,750
22	5,300	18,000	.....	.....	5,300	6,700	5,300	9,200	5,650	4,500
23	5,300	18,000	.....	.....	5,650	6,700	5,650	9,200	5,650	4,500
24	5,000	18,000	.....	.....	5,650	6,700	6,000	8,800	6,000	4,250
25	4,500	17,000	.....	.....	5,650	6,700	5,650	8,800	6,000	4,250
26	5,650	16,500	.....	19,000	5,650	7,050	5,650	8,450	6,000	4,250
27	5,650	15,800	.....	20,600	6,000	7,050	5,650	8,450	6,350	4,500
28	5,650	15,000	.....	21,800	6,700	7,050	5,300	8,450	6,700	4,500
29	6,000	15,000	.....	23,500	6,700	6,700	5,000	8,100	6,700	4,500
30	6,700	15,000	.....	24,700	6,000	6,700	4,750	8,100	6,700	4,500
31	8,450	.....	.....	.....	5,650	6,700	.....	7,750	.....	4,500

NOTE.—Daily discharge determined from a rating curve, which is fairly well defined throughout. Discharge estimated, by comparison with records of flow at Cascade station, as follows: Apr. 29 to May 10, 15,000 second-feet; May 11 to 14, 20,000 second-feet; May 16 to 26, 21,000 second-feet; May 27 to 31, 30,000 second-feet; June 1 to 6, 45,000 second-feet; June 11 to 20, 40,000 second-feet; June 21 to 25, 25,000 second-feet; July 1 to 7, 23,000 second-feet.

Monthly discharge of Missouri River at Fort Benton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	8,450	4,500	5,570	177,000	B.
April	18,000	10,000	13,900	827,000	B.
May	.....	.....	20,400	1,250,000	D.
June	.....	.....	35,800	2,130,000	D.
July	.....	5,300	12,900	793,000	B.
August	8,800	5,650	7,000	430,000	B.
September	6,350	3,750	4,860	289,000	B.
October	10,400	5,000	7,760	477,000	B.
November	8,450	5,650	7,440	443,000	B.
December	6,700	4,250	5,130	315,000	B.
The period	.....	.....	.....	7,130,000	

NOTE.—See footnote to table of daily discharge.

PASSAMARI RIVER BASIN.

PASSAMARI RIVER [1] NEAR ALDER, MONT.

Location.—At the private bridge on Lauterbach's ranch, about 8 miles south of Alder, Mont.

Records available.—April 27, 1911, to December 31, 1913.

Drainage area.—About 540 square miles.

Gage.—Vertical staff spiked to bridge pile 4 feet from right bank.

Control.—Slightly shifting. Bed of stream below the gage composed of gravel and pebbles. At the gage the water is deeper and the material of the bed is finer.

Discharge measurements.—At low and ordinary stages made by wading on riffle at control 200 feet below gage; high-stage measurements made from downstream side of bridge.

Winter flow.—Affected by ice.

Discharge measurements of Passamari River near Alder, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 5	C. S. Heidel	4.50	243
June 21	do	4.80	317
Aug. 9	do	4.50	203
Oct. 8	do	4.30	184

[1] Called Ruby River in previous reports.

Daily gage height in feet, of Passamari River near Alder, Mont., for 1913.

[Leo Hadel, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	5.3	4.6	4.1	.....	4.2	4.1
2	.....	.....	5.3	4.6	4.1	.....	4.3	4.1
3	.....	.....	5.2	4.6	4.1	.....	4.25	4.1
4	.....	.....	5.1	4.6	4.1	.....	4.3	4.1
5	4.5	.....	5.0	4.6	4.1	.....	4.3	4.0
6	4.55	.....	4.95	4.5	4.1	.....	4.3	4.0
7	4.7	.....	4.9	4.45	4.0	.....	4.3	.....
8	5.2	.....	4.85	4.45	4.1	.....	4.3	.....
9	5.5	.....	4.8	4.45	4.1	.....	4.2	.....
10	.....	.....	4.8	4.5	4.0	.....	4.15	.....
11	5.6	.....	4.75	4.45	4.0	.....	4.15	.....
12	5.5	.....	4.7	4.45	4.0	.....	4.15	.....
13	5.8	.....	4.65	4.45	4.0	.....	4.15	.....
14	5.4	.....	4.6	4.4	4.0	.....	4.15	.....
15	.....	.....	4.6	4.4	4.0	.....	4.15	.....
16	.....	.....	4.5	4.4	4.0	.....	4.2	.....
17	.....	.....	4.45	4.4	4.0	.....	4.2	.....
18	.....	.....	4.4	4.35	4.0	.....	4.2	.....
19	.....	.....	4.4	4.3	4.0	4.2	4.2	.....
20	.....	.....	4.4	4.3	4.0	4.2	4.15	.....
21	.....	.....	4.4	4.2	4.0	4.2	4.1	.....
22	.....	4.8	4.5	4.2	4.1	4.2	4.1	.....
23	.....	4.8	4.5	4.2	4.1	4.2	4.1	.....
24	.....	5.0	4.5	4.2	4.1	4.2	4.1	.....
25	.....	5.1	4.6	4.1	4.2	4.2	4.1	.....
26	.....	5.1	4.7	4.0	4.1	4.2	4.1	.....
27	.....	5.4	4.6	4.0	4.1	4.2	4.1	.....
28	.....	5.5	4.6	4.0	4.1	4.2	4.1	.....
29	.....	5.4	4.7	3.9	4.1	4.2	4.1	.....
30	.....	5.4	4.9	4.0	4.1	4.2	4.1	.....
31	.....	.....	4.7	4.1	.....	4.2	.....	.....

NOTE.—No observer available May 15 to June 21 and Oct. 1 to 18.

Daily discharge, in second-feet, of Passamari River near Alder, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	490	230	105	.....	192	166
2	.....	.....	490	230	105	.....	219	166
3	.....	.....	455	230	105	.....	206	166
4	.....	.....	420	230	105	.....	219	166
5	277	.....	385	230	105	.....	219	141
6	292	.....	368	200	105	.....	219	141
7	340	.....	350	188	85	.....	219	.....
8	507	.....	334	188	105	.....	219	.....
9	615	.....	317	188	105	.....	192	.....
10	636	.....	317	200	85	.....	179	.....
11	652	.....	300	188	85	.....	179	.....
12	615	.....	284	188	85	.....	179	.....
13	726	.....	269	188	85	.....	179	.....
14	579	.....	250	175	85	.....	179	.....
15	.....	.....	249	175	85	.....	179	.....
16	.....	.....	216	175	85	.....	192	.....
17	.....	.....	200	175	85	.....	192	.....
18	.....	.....	187	162	85	.....	192	.....
19	.....	.....	184	150	85	192	192	.....
20	.....	.....	182	150	85	192	179	.....
21	.....	.....	180	127	85	192	166	.....
22	.....	317	205	127	105	192	166	.....
23	.....	317	204	127	105	192	166	.....
24	.....	385	203	127	105	192	166	.....
25	.....	420	231	105	127	192	166	.....
26	.....	420	260	85	105	192	166	.....
27	.....	530	230	85	105	192	166	.....
28	.....	570	230	85	105	192	166	.....
29	.....	530	260	65	105	192	166	.....
30	.....	530	325	85	105	192	166	.....
31	.....	.....	260	105	.....	192	.....	.....

NOTE.—Discharge determined from three fairly well defined rating curves applicable as follows: Jan. 1 to May 15 and after Oct. 8, June 21 to July 10, and July 26 to Sept. 30. Indirect method for shifting channels used July 11 to 25. Discharge estimated Oct. 1 to 18 at 170 second-feet.

Monthly discharge of Passamari River near Alder, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 22–30	570	317	447	7,980	B.
July	490	180	285	17,500	C.
August	230	65	160	9,840	B.
September	127	85	97.1	5,780	B.
October			179	11,000	C.
November	219	166	186	11,100	B.
December 1–6	166	141	159	1,890	B.
The period				65,100	

BIGHOLE RIVER BASIN.

BIGHOLE RIVER NEAR DEWEY, MONT.

Location.—In sec. 36, T. 1 N., R. 11 W., at Young's bridge, 4 miles above Dewey and 11 miles above Divide, Mont.; a few miles below the mouth of Wise River.

Records available.—September 15, 1911, to July 31, 1913, when station was discontinued.

Drainage area.—Not measured.

Gage.—Staff fastened to southeast piling of bridge on downstream side. This gage was washed out on April 16, 1913, and on May 2, 1913, a temporary staff gage was installed on the left abutment of the old bridge. The temporary gage was read May 2, 1913, to July 31, 1913.

Control.—Rocky and clean; nonshifting.

Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice.

Diversions.—Water is diverted from this stream for irrigation.

Regulation.—A large hydroelectric power plant is in operation about 8 miles below the station.

The following discharge measurement was made by C. S. Heidel:

May 2, 1913: Gage height, 4.40 feet; discharge, 1,430 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Bighole River near Dewey, Mont., for 1913.

[W. T. Neal, observer.]

Day.	Mar.		Apr.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.5	350	.....	1,440	9.2	8,910	.....	3,940
2	.....	.....	2.5	350	4.4	1,440	9.0	8,550	.....	4,280
3	.....	.....	2.5	350	4.6	1,620	9.0	8,550	.....	4,610
4	.....	.....	2.5	350	4.4	1,440	8.8	8,190	7.0	4,950
5	.....	.....	2.55	370	4.2	1,280	8.6	7,830	6.8	4,590
6	.....	.....	2.6	390	4.2	1,280	8.6	7,830	6.2	3,600
7	.....	.....	2.8	470	4.6	1,620	8.4	7,470	6.2	3,600
8	.....	.....	2.8	470	5.4	2,460	8.4	7,470	6.4	3,920
9	.....	.....	2.85	492	6.2	3,600	8.4	7,470	6.2	3,600
10	.....	.....	3.0	560	6.6	4,250	8.4	7,470	5.8	3,020
11	.....	.....	3.1	605	6.8	4,590	8.6	7,830	5.4	2,460
12	.....	.....	3.4	755	6.8	4,590	9.4	9,270	5.0	2,000
13	.....	.....	4.4	1,440	6.8	4,590	10.4	11,100	5.0	2,000
14	2.3	280	4.9	1,900	6.8	4,590	9.6	9,630	4.8	1,810
15	2.45	332	5.4	2,460	6.6	4,250	8.6	7,830	4.7	1,720
16	2.25	265	.....	.....	6.2	3,600	8.2	7,110	4.6	1,620
17	2.2	250	.....	.....	6.2	3,600	7.7	6,210	4.6	1,620
18	2.3	280	.....	.....	6.0	3,300	7.4	5,670	4.4	1,440
19	2.3	280	.....	.....	5.6	2,740	.....	5,080	4.4	1,440
20	2.3	280	.....	.....	5.4	2,460	.....	4,480	4.2	1,280
21	2.2	250	.....	.....	5.6	2,740	.....	3,890	4.2	1,280
22	2.3	280	.....	.....	5.8	3,020	6.0	3,300	4.3	1,360
23	2.3	280	.....	.....	6.0	3,300	6.0	3,300	4.4	1,440
24	2.2	250	.....	.....	6.6	4,250	6.2	3,600	4.6	1,620
25	2.2	250	.....	.....	7.0	4,950	6.2	3,600	4.6	1,620
26	2.2	250	.....	.....	7.8	6,390	6.2	3,600	4.8	1,810
27	2.2	250	.....	.....	8.2	7,110	6.8	4,590	4.9	1,900
28	2.3	280	.....	.....	9.2	8,910	7.2	5,310	5.0	2,000
29	2.3	280	.....	.....	9.8	9,990	6.8	4,590	4.8	1,810
30	2.45	332	.....	.....	9.8	9,990	6.2	3,600	4.6	1,620
31	2.45	332	.....	.....	9.4	9,270	.....	.....	4.6	1,620

NOTE.—Bridge and gage destroyed by high water Apr. 16, 1913. On May 2, when the station was visited, it was found that the bench marks had been destroyed by a construction crew. A temporary staff gage was installed on the left abutment of the old bridge. The discharge measurement referred to this gage plotted 3.25 feet too low on the station gage height scale. The channel at this station being permanent, it was assumed that the temporary gage read 3.25 feet too low, and all readings made on this gage have been increased by that amount. The temporary gage was read May 2 to July 31, when the station was discontinued. Daily discharge was determined from the rating curve for 1910 to 1912 which was well defined for those years and for 1913 to April 15 and fairly well defined after April 15, on account of the method of correcting gage heights.

Monthly discharge of Bighole River near Dewey, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 14–31	332	250	278	9,930	A.
April 1–15	2,460	350	754	22,400	A.
May	9,990	1,280	4,150	255,000	B.
June	11,100	3,300	6,440	383,000	B.
July	4,950	1,280	2,440	150,000	B.

BOULDER RIVER BASIN.

MUSKRAT CREEK NEAR BOULDER, MONT.

Location.—In sec. 6, T. 6 N., R. 3 W., 1,000 feet above Boulder Nursery, near Boulder, Mont.

Records available.—April 27 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage fastened to a flume 2.5 feet upstream from crest of weir. Gage heights give the head on the weir.

Control.—Flume.

Discharge measurements.—Flow measured by a sharp-crested weir 4.85 feet long with end contractions. Discharge computed by Francis formula, correcting for end contractions and velocity of approach.

Winter flow.—Affected by ice.

Regulation.—No regulation or diversion above the station.

Accuracy.—Results should be good.

Daily gage height, in feet, of Muskrat Creek near Boulder, Mont., for 1913.

[C. O. Hansen, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	0.22	0.18	0.15	0.13	0.34	1.22	0.63	0.36	0.22	0.24
2	.22	.17	.14	.13	.32	1.22	.71	.36	.22	.24
3	.22	.17	.14	.13	.33	1.22	.66	.35	.21	.24
4	.22	.17	.15	.13	.30	1.20	.....	.34	.21	.22
5	.21	.17	.14	.15	.31	1.02	.62	.33	.20	.20
6	.21	.17	.14	.15	.33	.99	.59	.32	.20	.24
7	.21	.17	.14	.16	.42	.97	.57	.32	.20	.27
8	.21	.15	.15	.16	.50	.98	.55	.34	.20	.34
9	.20	.15	.16	.18	.63	.98	.53	.36	.20	.40
10	.20	.16	.16	.23	.66	.96	.53	.36	.19	.40
11	.20	.15	.14	.30	.62	1.48	.50	.36	.18	.38
12	.20	.15	.14	.34	.52	1.10	.47	.34	.18	.36
13	.20	.15	.14	.38	.51	1.08	.44	.33	.18	.35
14	.20	.16	.14	.33	.46	.98	.44	.32	.18	.33
15	.20	.16	.14	.36	.44	.94	.42	.31	.18	.....
16	.20	.16	.15	.32	.42	.81	.43	.30	.18	.....
17	.20	.15	.15	.38	.40	.....	.40	.29	.18	.....
18	.19	.15	.14	.41	.42	.75	.40	.28	.18	.....
19	.19	.15	.14	.44	.42	.76	.39	.27	.20	.....
20	.19	.15	.14	.42	.43	.72	.38	.26	.21	.....
21	.19	.15	.14	.43	.41	.66	.40	.25	.20	.....
22	.18	.15	.14	.....	.46	.66	.46	.25	.20	.....
23	.18	.15	.14	.....	.55	.64	.42	.24	.22	.....
24	.18	.15	.13	.....	.71	.65	.40	.23	.24	.....
25	.18	.15	.13	.30	.77	.76	.38	.23	.27	.....
26	.18	.15	.13	.32	1.01	.82	.56	.22	.27	.....
27	.18	.15	.13	.38	1.28	.76	.46	.22	.26	.....
28	.18	.15	.14	.42	1.42	.65	.42	.22	.26	.....
29	.18	.....	.14	.35	1.38	.62	.41	.22	.26	.....
30	.18	.....	.14	.32	1.24	.63	.40	.22	.25	.....
31	.18	.....	.16	.....	1.22	.....	.38	.22	.....	.....

Daily discharge, in second-feet, of Muskrat Creek near Boulder, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	1.6	1.2	1.0	0.8	3.2	21.8	8.4	3.5	1.6	1.9
2	1.6	1.1	.9	.8	2.9	21.8	10.0	3.5	1.6	1.9
3	1.6	1.1	.9	.8	3.0	21.8	9.0	3.4	1.5	1.9
4	1.6	1.1	1.0	.8	2.6	21.3	8.6	3.2	1.5	1.6
5	1.5	1.1	.9	1.0	2.8	16.9	8.2	3.0	1.4	1.4
6	1.5	1.1	.9	1.0	3.0	16.2	7.6	2.9	1.4	1.9
7	1.5	1.1	.9	1.0	4.5	15.7	7.2	2.9	1.4	2.2
8	1.5	1.0	1.0	1.0	5.9	15.9	6.8	3.2	1.4	3.2
9	1.4	1.0	1.0	1.2	8.4	15.9	6.5	3.5	1.4	4.1
10	1.4	1.0	1.0	1.8	9.0	15.5	6.5	3.5	1.3	4.1
11	1.4	1.0	.9	2.6	8.2	29.2	5.9	3.5	1.2	3.8
12	1.4	1.0	.9	3.2	6.3	18.8	5.4	3.2	1.2	3.5
13	1.4	1.0	.9	3.8	6.1	18.3	4.8	3.0	1.2	3.4
14	1.4	1.0	.9	3.0	5.2	15.9	4.8	2.9	1.2	3.0
15	1.4	1.0	.9	3.5	4.8	15.0	4.5	2.8	1.2	.....
16	1.4	1.0	1.0	2.9	4.5	12.1	4.6	2.6	1.2	.....
17	1.4	1.0	1.0	3.8	4.1	11.4	4.1	2.5	1.2	.....
18	1.3	1.0	.9	4.3	4.5	10.8	4.1	2.4	1.2	.....
19	1.3	1.0	.9	4.8	4.5	11.1	4.0	2.2	1.4	.....
20	1.3	1.0	.9	4.5	4.6	10.2	3.8	2.1	1.5	.....
21	1.3	1.0	.9	4.6	4.3	9.0	4.1	2.0	1.4	.....
22	1.2	1.0	.9	4.1	5.2	9.0	5.2	2.0	1.4	.....
23	1.2	1.0	.9	3.6	6.8	8.6	4.5	1.9	1.6	.....
24	1.2	1.0	.8	3.1	10.0	8.8	4.1	1.8	1.9	.....
25	1.2	1.0	.8	2.6	11.3	11.1	3.8	1.8	2.2	.....
26	1.2	1.0	.8	2.9	16.6	12.3	7.0	1.6	2.2	.....
27	1.2	1.0	.8	3.8	23.5	11.1	5.2	1.6	2.1	.....
28	1.2	1.0	.9	4.5	27.4	8.8	4.5	1.6	2.1	.....
29	1.2	.....	.9	3.4	26.2	8.2	4.3	1.6	2.1	.....
30	1.2	.....	.9	2.9	22.4	8.4	4.1	1.6	2.0	.....
31	1.2	.....	1.0	.....	21.8	.....	3.8	1.6	.....	.....

NOTE.—Discharge determined from a rating table computed from Francis's formula, correcting for end contractions and velocity of approach; uncertainty as to the velocity of approach reduces the accuracy.

Monthly discharge of Muskrat Creek near Boulder, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	1.6	1.2	1.36	83.6	C.
February	1.2	1.0	1.03	57.2	C.
March	1.0	.8	.91	56.0	C.
April	4.8	.8	2.74	163	B.
May	27.4	2.6	8.83	543	B.
June	29.2	8.2	14.4	857	B.
July	10.0	3.8	5.66	348	B.
August	3.5	1.6	2.55	157	B.
September	2.2	1.2	1.53	91.0	B.
October 1–14	4.1	1.4	2.71	75.2	B.
The period	.....	.....	.....	2,430	

NOTE.—Accuracy for January, February, and March reduced on account of the possibility of ice being present.

MADISON RIVER BASIN.

MADISON RIVER NEAR YELLOWSTONE, MONT.

Location.—In sec. 5, T. 14 S., R. 6 W. Montana meridian, at Riverside soldier station in the Yellowstone National Park, at the crossing of the stage road about 4 miles east of Yellowstone, Mont.

Records available.—June 16 to December 31, 1913.

Drainage area.—410 square miles (measured on topographic sheets).

Gage.—Vertical staff gage with bronze sections, braced to pine tree on left bank about 100 yards north of the road to west boundary of the park. Almost directly opposite the soldier station.

Control.—Probably fairly permanent. Bottom rough; grass and weeds may become troublesome in summer time. One channel at all stages.

Discharge measurements.—Made by wading at most stages; at high stages could be made from footbridge 250 feet upstream.

Winter flow.—Discharge relation apparently little affected by ice.

Cooperation.—Gage-height records and transportation within the park furnished by the Yellowstone National Park authorities.

Discharge measurements of Madison River near Yellowstone, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 16	G. C. Baldwin	2.05	1,220
23	do	1.86	952
Sept. 8	R. C. Pierce	1.56	695
15	do	1.54	665

Daily gage height, in feet, of Madison River near Yellowstone, Mont., for 1913.

[Bohen and Rowe, observers.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.85	1.9	1.55	1.5	1.55	1.5
2	.....	1.85	1.85	1.6	1.5	1.55	1.5
3	.....	1.9	1.75	1.65	1.5	1.6	1.5
4	.....	1.85	1.7	1.65	1.5	1.6	1.5
5	.....	1.85	1.7	1.6	1.55	1.65	1.45
6	.....	1.85	1.7	1.6	1.6	1.6	1.45
7	.....	1.7	1.7	1.6	1.6	1.6	1.45
8	.....	1.65	1.65	1.6	1.65	1.55	1.45
9	.....	1.65	1.7	1.6	1.65	1.55	1.45
10	.....	1.7	1.7	1.6	1.7	1.55	1.45
11	.....	1.7	1.65	1.6	1.7	1.6	1.45
12	.....	1.7	1.6	1.6	1.65	1.6	1.45
13	.....	1.65	1.6	1.6	1.65	1.6	1.45
14	.....	1.6	1.6	1.6	1.6	1.6	1.45
15	.....	1.6	1.6	1.6	1.6	1.6	1.45
16	2.05	1.6	1.6	1.55	1.6	1.55	1.45
17	2.05	1.6	1.6	1.5	1.55	1.55	1.45
18	2.0	1.55	1.6	1.5	1.55	1.55	1.45
19	2.0	1.55	1.6	1.5	1.55	1.6	1.45
20	1.95	1.55	1.6	1.5	1.6	1.6	1.45
21	1.9	1.55	1.6	1.5	1.6	1.6	1.4
22	1.85	1.8	1.6	1.65	1.55	1.6	1.45
23	1.85	1.8	1.55	1.6	1.55	1.55	1.45
24	1.85	1.85	1.55	1.6	1.55	1.55	1.45
25	1.9	2.2	1.55	1.6	1.55	1.5	1.45
26	1.9	1.9	1.55	1.55	1.55	1.5	1.4
27	1.9	1.85	1.55	1.55	1.55	1.5	1.4
28	1.9	1.95	1.55	1.55	1.6	1.55	1.4
29	1.85	2.1	1.55	1.55	1.6	1.55	1.4
30	1.9	2.4	1.55	1.5	1.6	1.55	1.4
31	.....	2.1	1.6	.....	1.55	.....	1.4

Daily discharge, in second-feet, of Madison River near Yellowstone, Mont., for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	974	1,020	681	635	681	635
2	.....	974	974	727	635	681	635
3	.....	1,020	872	775	635	727	635
4	.....	974	823	775	635	727	635
5	.....	974	823	727	681	775	590
6	.....	974	823	727	727	727	590
7	.....	823	823	727	727	727	590
8	.....	775	775	727	775	681	590
9	.....	775	823	727	775	681	590
10	.....	823	823	727	823	681	590
11	.....	823	775	727	823	727	590
12	.....	823	727	727	775	727	590
13	.....	775	727	727	775	727	590
14	.....	727	727	727	727	727	590
15	.....	727	727	727	727	727	590
16	1,180	727	727	681	727	681	590
17	1,180	727	727	635	681	681	590
18	1,130	681	727	635	681	681	590
19	1,130	681	727	635	681	727	590
20	1,080	681	727	635	727	727	590
21	1,020	681	727	635	727	727	546
22	974	922	727	775	681	727	590
23	974	922	681	727	681	681	590
24	974	974	681	727	681	681	590
25	1,020	1,350	681	727	681	635	590
26	1,020	1,020	681	681	681	635	546
27	1,020	974	681	681	681	635	546
28	1,020	1,080	681	681	727	681	546
29	974	1,240	681	681	727	681	546
30	1,020	1,570	681	635	727	681	546
31	.....	1,240	727	.....	681	.....	546

NOTE.—Discharge determined from a rating curve fairly well defined for observed range of stage.

Monthly discharge of Madison River near Yellowstone, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 16–30	1,180	974	1,050	31,200	B.
July	1,570	681	917	56,400	B.
August	1,020	681	759	46,700	B.
September	775	635	704	41,900	B.
October	823	635	711	43,760	B.
November	775	635	699	41,600	B.
December	635	546	586	36,000	B.
The period	.....	.....	.....	298,000	

GIBBON RIVER NEAR YELLOWSTONE, MONT.

Location.—In sec. 6, T. 14 S., R. 8 E. Montana meridian, at the Wylie Gibbon lunch station in Yellowstone National Park, about 2 miles below Gibbon Falls.

Records available.—June 22 to December 31, 1913.

Drainage area.—117 square miles (measured on topographic sheets).

Gage.—Original gage a vertical staff on the downstream abutment of highway bridge was removed August 29 during construction of a new bridge. Temporary gage read until September 14, when a new vertical staff was installed on the left bank about 40 feet below original site.

Control.—Composed of gravel, which may shift at times. One channel at all stages.
Discharge measurements.—Made by wading.
Cooperation.—Gage heights are furnished by employees of the Wylie Co. during the tourist season and by soldiers stationed in the park during the winter. Transportation is furnished by the park authorities.

Discharge measurements of Gibbon River near Yellowstone, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 22	G. C. Baldwin	[a] 2.90	253
Sept. 8	R. C. Pierce	1.74	131
14	....do	1.70	125

[a] Old gage which bears no determined relation to new gage used after Aug. 30.

Daily gage height, in feet, of Gibbon River near Yellowstone, Mont., for 1913.

[Vetter and Hood, observers.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.9	2.8	1.7	.....	.....	.....	16	.....	2.5	2.45	.....	.....	1.65	.....
2	.....	3.05	2.7	1.7	1.7	.....	.....	17	.....	2.5	2.45	.....	1.6	.....	.....
3	.....	3.0	.....	1.8	.....	.....	.....	18	.....	2.5	2.45	.....	.....	.....	1.55
4	.....	2.9	2.7	1.7	.....	.....	.....	19	.....	2.5	2.4	.....	.....	.....	.....
5	.....	2.8	2.6	1.7	.....	.....	1.65	20	.....	2.6	2.4	.....	1.7	.....	.....
6	.....	2.8	2.6	1.7	.....	1.7	.....	21	.....	2.65	2.4	.....	.....	.....	.....
7	.....	2.7	.....	1.7	.....	.....	.....	22	2.9	2.75	2.4	.....	.....	.....	.....
8	.....	2.65	2.6	1.7	.....	.....	.....	23	2.9	2.6	2.4	.....	.....	1.6	1.5
9	.....	2.6	.....	1.8	1.8	.....	.....	24	3.0	2.7	2.4	.....	.....	.....	.....
10	.....	2.65	2.6	1.7	.....	.....	.....	25	3.0	2.75	2.4	.....	.....	.....	.....
11	.....	2.65	2.6	1.7	.....	.....	1.55	26	3.0	2.8	2.4	.....	.....	.....	.....
12	.....	2.6	2.6	1.7	.....	1.7	.....	27	3.0	2.75	2.4	.....	.....	.....	1.5
13	.....	2.6	2.5	1.7	.....	.....	.....	28	3.0	2.85	2.35	.....	.....	.....	.....
14	.....	2.6	2.5	1.7	.....	.....	.....	29	3.0	3.1	2.4	.....	.....	.....	.....
15	.....	2.55	2.5	.....	.....	.....	.....	30	2.95	3.6	.....	.....	1.75	1.65	.....
								31	.....	3.1	1.7	.....	.....	.....	.....

NOTE.—Gage heights June 22 to Aug. 29 read on original gage. Readings Aug. 31 to Dec. 31 have been reduced to datum of new gage installed Sept. 14.

Daily discharge, in second-feet, of Gibbon River near Yellowstone, Mont., for 1913.

Day.	June.	July.	Aug.	Day.	June.	July.	Aug.	Day.	June.	July.	Aug.
1	.....	253	227	11	.....	188	176	21	.....	188	130
2	.....	294	201	12	.....	176	176	22	253	214	130
3	.....	280	201	13	.....	176	152	23	253	176	130
4	.....	253	201	14	.....	176	152	24	280	201	130
5	.....	227	176	15	.....	164	152	25	280	214	130
6	.....	227	176	16	.....	152	141	26	280	227	130
7	.....	201	176	17	.....	152	141	27	280	214	130
8	.....	188	176	18	.....	152	141	28	280	240	120
9	.....	176	176	19	.....	152	130	29	280	308	130
10	.....	188	176	20	.....	176	130	30	266	454	128
								31	.....	308	125

NOTE.—Discharge June 22 to Aug. 31 computed from a section of rating curve constructed for the range of gage heights from three current-meter measurements. Range was not great, so the results should be fairly accurate. Measurements connected with new gage insufficient to warrant discharge estimates.

Monthly discharge of Gibbon River near Yellowstone, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 22-30	280	253	272	4,860	B.
July	454	152	216	13,300	C.
August	227	120	155	9,530	C.

NOTE.—Monthly estimates Sept. 1 to Dec. 31 not prepared, as the section of the stream at the new gage has not been rated.

GALLATIN RIVER BASIN.

WEST GALLATIN RIVER NEAR SALESVILLE, MONT.

Location.—On highway bridge 4 miles above Salesville, Mont., just below mouth of canyon. Above the station Spanish Creek is the most important tributary.

Records available.—July 18, 1895, to December 31, 1905; August 9, 1910, to July 31, 1913, when station was discontinued.

Drainage area.—860 square miles.

Gage.—Standard chain, boxed and fastened near middle of bridge on upstream side.

Control.—Bed of stream is of gravel and small bowlders; will not shift.

Discharge measurements.—Made from lower side of the highway bridge.

Diversions.—Irrigation is practiced extensively on this stream, and practically the entire low-water flow of the river is appropriated.

Daily gage height, in feet, and discharge, in second-feet, of West Gallatin River near Salesville, Mont., for 1913.

[C. L. Crew, observer.]

Day.	April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.0	335	3.9	880	7.4	6,220	5.3	2,550
2	3.0	335	3.7	725	7.3	6,040	5.2	2,400
3	2.9	295	3.5	590	7.3	6,040	5.2	2,400
4	3.2	425	3.6	655	7.3	6,040	5.2	2,400
5	3.2	425	3.6	655	7.2	5,860	5.0	2,100
6	3.1	380	3.6	655	7.1	5,680	5.0	2,100
7	3.2	425	3.9	880	7.0	5,500	4.9	1,960
8	3.3	475	4.3	1,240	6.8	5,140	4.8	1,830
9	3.2	425	4.6	1,570	6.9	5,320	4.8	1,830
10	3.4	530	4.9	1,960	6.9	5,320	4.8	1,830
11	3.4	530	5.0	2,100	6.6	4,780	4.6	1,570
12	3.4	530	4.9	1,960	6.6	4,780	4.6	1,570
13	3.5	590	4.9	1,960	6.6	4,780	4.5	1,450
14	3.6	655	4.7	1,700	6.3	4,240	4.3	1,240
15	3.5	590	4.5	1,450	6.3	4,240	4.3	1,240
16	3.6	655	4.3	1,240	6.2	4,060	4.2	1,140
17	3.7	725	4.3	1,240	6.0	3,700	4.0	965
18	3.6	655	4.2	1,140	6.1	3,880	4.0	965
19	3.7	725	4.5	1,450	5.9	3,520	3.9	880
20	3.6	655	4.5	1,450	5.5	2,850	3.9	880
21	3.5	590	3.9	880	5.5	2,850	4.2	1,140
22	3.6	655	4.6	1,570	5.5	2,850	4.2	1,140
23	3.5	590	5.2	2,400	5.4	2,700	4.1	1,060
24	3.4	530	6.1	3,880	5.5	2,850	4.3	1,240
25	3.4	530	6.4	4,420	5.5	2,850	4.2	1,140
26	3.4	530	6.4	4,420	5.4	2,700	4.1	1,060
27	3.5	590	7.1	5,680	5.8	3,350	4.1	1,060
28	3.9	880	7.8	6,940	5.8	3,350	4.1	1,060
29	3.9	880	7.6	6,580	5.6	3,010	4.5	1,450
30	4.1	1,060	7.5	6,400	5.4	2,700	4.5	1,450
31			7.4	6,220				1,450

NOTE.—No discharge measurements made in 1913. Discharge determined from rating curve for 1912, which was fairly well defined for that year but uncertain for 1913.

Monthly discharge of West Gallatin River near Salesville, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	1,060	295	573	34,100	C.
May	6,940	590	2,420	149,000	C.
June	6,220	2,700	4,240	252,000	C.
July	2,550	880	1,500	92,200	C.

CROW CREEK BASIN.

CROW CREEK NEAR TOWNSEND, MONT.

Location.—In the SE. ¼ sec. 5, T. 6 N., R. 1 W., near the Eagle Creek ranger station, about 1,000 feet above the mouth of Eagle Creek, and about 10 miles west of Townsend.

Records available.—January 5, 1912, to December 31, 1913 (fragmentary).

Drainage area.—33 square miles.

Gage.—Vertical staff.

Control.—Gravel, irregular, and possibly shifting.

Discharge measurements.—Made by wading near the gage.

Winter flow.—Affected by ice.

Diversion.—Above this point water has been used and is used for placer mining; below this point the entire flow during the summer is used for placer work and irrigation.

No discharge measurements were made during 1913.

Daily gage height, in feet, of Crow Creek near Townsend, Mont., for 1913.

[Charles Larson, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	1.7	.....	.....	.....	.....	16	1.4	.....	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	.....
3	.....	.....	.....	.....	.....	1.7	18	1.6	.....	.....	.....	.....	.....
4	.....	1.4	.....	.....	.....	.....	19	.....	.....	.....	1.7	.....	.....
5	.....	.....	.....	2.0	1.5	.....	20	.....	.....	.....	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	21	.....	.....	.....	1.7	.....	.....
7	.....	.....	.....	.....	.....	1.6	22	.....	.....	.....	.....	.....	.....
8	.....	2.0	.....	.....	.....	.....	23	.....	.....	.....	.....	1.7	.....
9	.....	.....	.....	1.8	1.6	.....	24	.....	.....	.....	.....	1.7	.....
10	.....	.....	.....	.....	1.6	1.5	25	.....	2.8	.....	.....	.....	.....
11	.....	2.5	.....	.....	.....	.....	26	.....	3.6	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	.....	27	.....	4.6	.....	.....	.....	.....
13	.....	2.1	.....	1.9	.....	.....	28	.....	.....	.....	1.6	.....	.....
14	.....	.....	.....	.....	1.6	1.6	29	.....	.....	.....	.....	1.6	.....
15	.....	.....	.....	.....	.....	.....	30	.....	.....	.....	.....	.....	.....
							31	.....	.....	.....	.....	.....	.....

DEEP CREEK BASIN.

DEEP CREEK NEAR TOWNSEND, MONT.

Location.—In sec. 29, T. 7 N., R. 4 E., unsurveyed, 12 miles east of Townsend, directly back of the ranger station in the canyon of Deep Creek, approximately 10 miles above the confluence with the Missouri River.

Records available.—Gage heights, October 9, 1910, to December 31, 1913 (fragmentary).

Drainage area.—89 square miles.

Gage.—Vertical staff.

Control.—Small rock; probably permanent.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversion.—Small quantities of water are diverted for irrigation on small flats above the gage. Below the gage nearly the entire flow is diverted or will eventually be diverted, for irrigation on the land adjoining this creek and Missouri River.

No discharge measurements were made during 1913.

Daily gage height, in feet, of Deep Creek near Townsend, Mont., for 1913.

[Evans and Bradeen, observers,]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.3	1.95	1.35	1.1	0.8	0.8	0.8	.....
2	.....	1.3	2.0	1.48	1.1	.8	.8	.....	0.7
3	.....	1.2	1.85	1.40	1.1	.8	.....	.8	.....
4	.....	1.2	.....	1.4	1.1	.....	.....	.8	.....
5	.....	.....	.....	1.35	1.05	.....	.85	.8	.7
6	.....	.....	1.7	1.40	1.05	.....	.85	.8	.7
7	.....	1.2	1.7	1.38	1.05	.8	.85	.8	.....
8	.....	1.3	.....	1.35	1.05	.8	.85	.8	.7
9	.....	1.4	.....	1.35	1.05	.8	.8	.....	.....
10	.....	1.5	1.6	1.32	.....	.8	.8	.8	.....
11	.....	.....	1.6	1.30	1.0	.8	.85	.8	.....
12	0.9	.....	1.7	1.3	1.0	.8	.9	.....	.....
13	1.2	.....	1.7	1.3	1.0	.....	.9	.8	.....
14	1.6	.....	1.65	1.3	.....	.75	.9	.8	.....
15	1.6	.....	1.6	1.2	.....	.75	.....	.8	.....
16	1.3	.....	1.6	1.2	1.0	.....	.....	.8	.....
17	.....	.....	1.55	1.2	1.0	.75	.....	.8	.....
18	.....	.....	1.55	1.2	1.0	.75	.8	.8	.....
19	1.6	.....	1.60	1.15	.....	.75	.8	.....	.....
20	1.5	.....	1.52	1.1	.....	.75	.8	.8	.....
21	1.5	.....	1.50	1.1	.9	.75	.....	.8	.....
22	.....	.....	1.5	1.15	.9	.8	.....	.8	.....
23	.....	.....	1.45	1.1	.9	.8	.....	.....	.....
24	.....	2.1	1.45	1.05	.9	.8	.8	.8	.....
25	.....	2.0	1.5	1.1	.....	.8	.8	.8	.....
26	.....	2.1	.....	1.1	.....	.....	.8	.....	.....
27	1.4	2.45	.....	1.1	.....	.....	.....	.75	.....
28	1.4	2.5	1.4	1.1	.....	.....	.....	.....	.....
29	1.4	2.3	1.4	1.15	.8	.8	.....	.....	.....
30	1.3	2.05	1.4	1.12	.8	.8	.8	.....	.....
31	.....	2.0	.....	1.10	.8	.....	.8	.....	.....

NOTE.—Sufficient discharge measurements have not been obtained to define a rating curve.

PRICKLY PEAR CREEK BASIN.

PRICKLY PEAR CREEK NEAR CLANCY, MONT.

Location.—In sec. 34, T. 9 N., R. 3 W., at private wagon bridge back of the ranch buildings on the Stafford ranch, about 1 mile below Clancy and just below the mouth of Lump Gulch Creek. This station was established to take the place of the one previously maintained about a mile below. The same amount of water passes both stations.

Records available.—July 15, 1908, to June 30, 1909 (old site); July 12, 1910, to December 31, 1913 (present site).

Drainage area.—Not measured.

Gage.—Staff, nailed to bridge abutment, right bank, on downstream side.

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

Winter flow.—Ice is common in extreme cold weather.

Diversions.—Few diversions above station, but entire summer flow is appropriated and used for irrigation below station.

Discharge measurements of Prickly Pear Creek near Clancy, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 31	R. R. Randell	1.67	58
May 13	C. S. Heidel	2.31	154
Sept. 17	J. M. Ray	1.05	23

Daily gage height, in feet, of Prickly Pear Creek near Clancy, Mont., for 1913.

[J. J. Naab, jr., observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.8	2.6	2.15	1.3	1.0	1.25	1.7	1.25
2	.....	1.8	2.5	2.35	1.3	1.05	1.25	1.55	.....
3	.....	1.95	2.4	2.15	1.3	1.05	1.15	1.5	.....
4	.....	1.8	2.45	2.05	1.3	1.05	1.25	1.45	.....
5	.....	1.75	2.35	2.0	1.3	1.05	1.25	1.35	.....
6	2.15	1.7	2.15	1.9	1.25	1.1	1.25	1.35	.....
7	2.25	1.85	2.2	1.75	1.25	1.05	1.35	1.25	.....
8	.....	2.05	2.15	1.7	1.35	1.05	1.35	1.25	.....
9	.....	2.0	2.05	1.7	1.45	1.05	1.35	1.25	.....
10	.....	2.2	2.05	1.55	1.45	1.05	1.35	1.25	.....
11	1.65	2.25	3.5	1.6	1.45	1.1	1.3	1.25	.....
12	.....	2.15	3.75	1.4	1.45	1.05	1.45	1.25	.....
13	2.05	2.2	3.7	1.4	1.25	1.05	1.45	1.6	.....
14	1.95	2.15	2.6	1.3	1.2	1.05	1.45	1.35	.....
15	2.0	2.1	2.35	1.3	1.2	1.05	1.45	1.35	.....
16	1.8	2.1	2.25	1.3	1.2	1.1	1.35	1.3	.....
17	1.85	2.1	2.25	1.3	1.2	1.05	1.25	1.3	.....
18	2.0	2.1	2.25	1.2	1.2	1.05	1.25	1.3	.....
19	1.85	2.15	2.25	1.2	1.1	.95	1.25	1.25	.....
20	2.0	2.1	2.2	1.1	1.15	.95	1.25	1.15	.....
21	2.05	2.2	2.05	1.15	1.1	.95	1.35	1.05	.....
22	1.7	2.25	2.05	1.1	1.1	1.1	1.35	1.1	.....
23	2.15	2.25	2.05	1.15	1.1	1.15	1.3	1.15	.....
24	2.05	2.3	2.1	1.15	1.0	1.2	1.4	1.25	.....
25	1.95	2.45	2.05	1.2	1.1	1.25	1.45	1.25	.....
26	1.95	2.7	2.25	1.65	1.1	1.25	1.3	1.25	.....
27	2.05	3.0	2.4	1.5	1.1	1.25	1.35	1.3	.....
28	2.15	2.95	2.4	1.5	1.1	1.25	1.35	1.3	.....
29	2.0	3.05	2.05	1.4	1.0	1.25	1.35	1.25	.....
30	1.8	2.8	2.0	1.5	1.1	1.25	1.3	1.25	.....
31	.....	2.7	.....	1.45	1.1	.....	1.25	.....	.....

Daily discharge, in second-feet, of Prickly Pear Creek near Clancy, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	72	207	130	40	21	36	75	36
2	.....	72	188	162	40	24	36	60	.....
3	.....	89	170	130	40	24	30	55	.....
4	.....	72	179	116	40	24	36	51	.....
5	.....	67	162	110	40	24	36	44	.....
6	115	62	130	97	36	27	36	44	.....
7	130	78	137	80	36	24	44	36	.....
8	112	105	130	75	44	24	44	36	.....
9	94	102	116	75	51	24	44	36	.....
10	76	130	116	60	51	24	44	36	.....
11	58	140	420	65	51	27	40	36	.....
12	80	128	238	47	51	24	51	36	.....
13	102	137	227	47	36	24	51	65	.....
14	89	130	207	40	33	24	51	44	.....
15	95	123	162	40	33	24	51	44	.....
16	72	123	145	40	33	27	44	40	.....
17	78	123	145	40	33	24	36	40	.....
18	95	123	145	33	33	24	36	40	.....
19	78	130	145	33	27	18	36	36	.....
20	95	123	137	27	30	18	36	30	.....
21	102	137	116	30	27	18	44	24	.....
22	62	145	116	27	27	27	44	27	.....
23	115	145	116	30	27	30	40	30	.....
24	102	153	123	30	21	33	47	36	.....
25	89	179	116	33	27	36	51	36	.....
26	89	227	145	70	27	36	40	36	.....
27	102	293	170	55	27	36	44	40	.....
28	115	282	170	55	27	36	44	40	.....
29	95	306	116	47	21	36	44	36	.....
30	72	248	110	55	27	36	40	36	.....
31	.....	227	.....	51	27	.....	36	.....	.....

NOTE.—Discharge determined as follows: Apr. 6 to May 7, from a poorly defined rating curve; May 8 to 12, by indirect method for shifting channels; May 13 to Dec. 1, from a poorly defined rating curve; Apr. 1 to 5, estimated at 90 second-feet; Apr. 8 to 10 and Apr. 12, interpolated; June 12 and 13, estimated from the flow at East Helena.

Monthly discharge of Prickly Pear Creek near Clancy, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	a21	1,290	D.
February	.....	.....	a25	1,390	D.
March	.....	.....	a35	2,150	D.
April	.....	.....	92.1	5,480	C.
May	306	62	144	8,850	C.
June	420	110	160	9,520	C.
July	162	27	62.3	3,830	C.
August	51	21	34.3	2,110	C.
September	36	18	26.6	1,580	C.
October	51	30	41.7	2,560	C.
November	75	24	40.8	2,430	C.
December	.....	.....	a30	1,840	D.
The year	420	.....	59.5	43,000	

a Estimated.

PRICKLY PEAR CREEK AT EAST HELENA, MONT.

Location.—In the NE. ¼ sec. 36, T. 10 N., R. 3 E., at the point where the Northern Pacific Railway crosses the stream at East Helena, Mont. The only important tributaries entering Prickly Pear Creek above the station are McClellan and Lump Gulch creeks; Tenmile and Silver creeks come in below.

Records available.—July 18, 1908, to July 31, 1913, when station was discontinued.

Drainage area.—Not measured.

Gage.—Staff fastened to piling on the Northern Pacific Railway bridge; datum unchanged.

Control.—Rocky, clean, and nonshifting.

Discharge measurements.—Made from a highway bridge near the railway bridge or by wading just below the gage.

Diversions.—All the normal flow of Prickly Pear Creek is used for irrigation, the greater part of the water being diverted below the station.

Accuracy.—The bed of the stream is so extremely rough that discharge measurements are difficult, even in low water. Fair results have, however, been obtained.

Discharge measurements of Prickly Pear Creek at East Helena, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 20	R. R. Randell	[a] 1.00	36	May 14	Heidel and Walker	1.70	187
Apr. 2	do	1.16	51	June 4	J. M. Ray	1.80	239
2	do	1.16	52	July 17	do	1.30	86

[a] Some ice on banks at gage.

Daily gage height, in feet, and discharge, in second-feet, of Prickly Pear Creek at East Helena, Mont., for 1913.

[R. T. Ray, observer.]

Day.	Mar.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.15	50	1.35	89	1.95	286	1.6	172
2			1.2	58	1.4	100	1.9	268	1.8	240
3			1.15	50	1.4	100	1.85	254	1.7	205
4			1.2	58	1.40	100	1.82	247	1.70	205
5			1.5	126	1.42	105	1.80	240	1.62	179
6			1.5	126	1.40	100	1.7	205	1.60	172
7			1.35	89	1.45	113	1.65	188	1.55	156
8			1.3	78	1.55	141	1.65	188	1.5	141
9			1.3	78	1.55	141	1.6	172	1.45	126
10			1.35	89	1.7	188	1.6	172	1.42	118
11			1.48	121	1.8	220	1.55	156	1.40	112
12			1.50	126	1.7	188	2.4	450	1.3	88
13			1.55	141	1.80	220	2.0	310	1.25	78
14			1.60	156	1.68	182	1.88	268	1.25	78
15			1.62	162	1.65	172	1.80	240	1.25	78
16	1.05	44	1.45	113	1.6	156	1.75	222	1.25	78
17	1.05	44	1.4	100	1.6	156	1.7	205	1.3	88
18	1.0	37	1.4	100	1.65	172	1.7	205	1.3	88
19			1.55	141	1.68	182	1.7	205	1.25	78
20			1.35	89	1.65	172	1.65	188	1.25	78
21			1.55	141	1.65	172	1.6	172	1.25	78
22			1.55	141	1.7	188	1.6	172	1.3	88
23			1.4	100	1.75	204	1.55	156	1.30	88
24			1.40	100	1.8	220	1.55	156	1.28	84
25			1.38	96	1.9	254	1.6	172	1.28	84
26			1.40	100	1.9	258	1.65	188	1.45	126
27			1.5	126	2.1	328	1.8	240	1.35	100
28	1.2	68	1.5	126	2.2	366	1.65	188	1.3	88
29	1.70	199	1.4	100	2.1	331	1.62	179	1.3	88
30	1.68	182	1.5	126	2.1	334	1.60	172	1.3	88
31	1.32	82			2.0	300			1.25	78

NOTE.—Discharge determined from three rating curves, all fairly well defined below gage height 2.0 feet, and applicable as follows: Mar. 16 to 29, Mar. 30 to May 24, and June 4 to July 31. For the period May 25 to June 3, the indirect method for shifting channels was used. Discharge Mar. 1 to 15 estimated at 30 second-feet, and Mar. 19 to to 27 at 45 second-feet.

Monthly discharge of Prickly Pear Creek at East Helena, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	a 25	1,540	D.
February	.....	.....	a 30	1,670	D.
March	199	.....	48.7	2,990	D.
April	162	50	107	6,370	B.
May	366	89	192	11,800	B.
June	450	156	215	12,800	B.
July	240	78	114	7,010	B.
The period	.....	.....	.....	44,200	

a Estimated.

LUMP GULCH CREEK NEAR CLANCY, MONT.

Location.—In sec. 4, T. 8 N., R. 3 W., at the ranch of Charles Zastrow, 1 mile from Clancy, 15 miles from Helena, and half a mile above the junction of the creek with Prickly Pear Creek.

Records available.—July 15, 1908, to July 31, 1913, when station was discontinued.

Drainage area.—Not measured.

Gage.—Staff, on left bank directly south of observer's house. A new gage was set October 12, 1910, at the original site but at a datum 1 foot lower than that previously used. All gage heights for 1910 were reduced to new datum.

Control.—Sandy and shifting, likely to be blocked by drift.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—The water of Lump Gulch Creek has been extensively used for placer mining. At present the creek furnishes some water for irrigation, but the valley is narrow and affords but little irrigable land. The normal flow of the stream is appropriated.

Accuracy.—Data not entirely satisfactory; no flood records have been obtained.

Discharge measurements of Lump Gulch Creek near Clancy, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 31	R. R. Randell	1.32	12.5
May 13	C. S. Heidel	1.69	49

Daily gage height, in feet, and discharge, in second-feet, of Lump Gulch Creek near Clancy, Mont., for 1913.

[Chas. Zastrow, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.2	7	1.4	18	1.65	44	1.3	12
2			1.1	3.7	1.4	18	1.65	44	1.3	12
3			1.2	7	1.4	18	1.6	37	1.45	22
4			1.25	9	1.4	18	1.6	37	1.35	14
5			1.2	7	1.45	22	1.55	32	1.3	12
6			1.3	12	1.45	22	1.4	18	1.3	12
7			1.4	18	1.45	22	1.35	14	1.25	9
8			1.3	12	1.5	26	1.35	14	1.25	9
9			1.25	9	1.5	26	1.4	18	1.2	7
10			1.2	7	1.5	26	1.9	79	1.2	7
11			1.25	9	1.6	37	1.5	26	1.15	5
12			1.2	7	1.65	44	1.4	18	1.1	3.7
13			1.3	12	1.7	50	1.35	14	1.05	2.6
14			1.45	22	1.65	44	1.3	12	1.05	2.6
15			1.35	14	1.6	37	1.3	12	1.0	1.5
16			1.35	14	1.5	26	1.3	12	1.0	1.5
17			1.4	18	1.5	26	1.3	12	1.05	2.6
18			1.45	22	1.5	26	1.35	14	1.05	2.6
19			1.3	12	1.5	26	1.35	14	.9	.5
20			1.3	12	1.55	32	1.35	14	.9	.5
21			1.4	18	1.55	32	1.35	14	.85	.2
22			1.5	26	1 6	37	1.35	14	.85	.2
23			1.4	18	1.6	37	1.35	14	.85	.2
24			1.35	14	1.6	37	1.35	14	.9	.5
25			1.4	18	1.65	44	1.4	18	.9	.5
26			1.4	18	1.7	50	1.4	18	.9	.5
27			1.55	32	1.9	79	1.45	22	.9	.5
28			1.5	26	1.9	79	1.45	22	.9	.5
29			1.45	22	1.8	64	1.45	22	.9	.5
30			1.45	22	1.75	57	1.45	22	.85	.2
31	1.32	13			1.7	50			.85	.2

NOTE.—Discharge determined from a rating curve fairly well defined below 50 second-feet.

Monthly discharge of Lump Gulch Creek near Clancy, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	32	3.7	14.9	887	B.
May	79	18	36.5	2,240	B.
June	79	12	22.2	1,320	B.
July	22	.2	4.62	284	B.
The period				4,730	

TENMILE CREEK NEAR HELENA, MONT.

Location.—In the SW. ¼ SE. ¼ sec. 22, T. 10 N., R. 4 W., opposite the Broadwater Hotel, near Helena, Mont.

Records available.—July 8, 1908, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, on right bank; datum unchanged.

Channel.—Shifts somewhat during flood stages.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—Part of the water supply for the city of Helena is taken from Tenmile Creek above the station. Two irrigation ditches also take water from the creek above the gage. The entire low-water flow is appropriated and used before it reaches the mouth of the creek.

Accuracy.—At low and medium stages conditions favor accurate determination of discharge.

Discharge measurements of Tenmile Creek near Helena, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 17	B. E. Jones	[a] 1.93	8.4	May 26	B. E. Jones	4.00	266
Feb. 20	R. R. Randell	[a] 1.83	6.8	June 4	R. R. Randell	3.30	146
Apr. 2	do	1.78	8.1	July 17	J. M. Ray	2.05	19.0
May 10	C. S. Heidel	3.37	157	Oct. 29	do	2.18	17.7
14	do	3.48	156	Nov. 29	W. A. Lamb	1.9	5.9

[a] Ice present.

Daily gage height, in feet, of Tenmile Creek near Helena, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.92	3.00	3.8	2.78	1.7	1.6	1.7	2.2	2.0
2	.....	1.79	2.97	3.55	2.78	1.6	1.55	1.75	2.15	1.95
3	.....	1.77	2.88	3.4	3.10	1.6	1.55	1.75	2.1	1.85
4	.....	1.82	2.88	3.25	2.96	1.6	1.5	1.8	2.1	1.85
5	.....	1.87	2.78	3.2	2.88	1.55	1.55	1.85	2.15	1.85
6	.....	1.87	2.83	3.10	2.78	1.6	1.55	1.85	2.15	1.85
7	.....	1.97	2.98	2.98	2.68	1.6	1.55	2.0	2.1	1.85
8	.....	1.92	3.10	2.98	2.63	1.65	1.55	2.05	2.1	1.85
9	.....	1.87	3.25	2.98	2.58	2.0	1.5	2.05	2.1	1.85
10	.....	1.92	3.4	2.78	2.53	1.95	1.55	2.0	2.15	1.85
11	.....	2.02	3.65	2.88	2.43	2.0	1.55	1.95	2.25	1.9
12	.....	2.27	3.75	4.20	2.43	1.9	1.55	2.1	2.2	1.9
13	.....	2.32	3.7	3.55	2.43	1.9	1.55	2.3	2.15	1.9
14	.....	2.47	3.7	3.4	2.38	1.8	1.5	2.2	2.15	1.9
15	.....	2.67	3.4	3.15	2.28	1.65	1.55	2.2	2.15	1.9
16	.....	2.57	3.5	3.2	2.23	1.7	1.55	2.1	2.15	1.85
17	.....	2.67	3.5	3.2	2.08	1.6	1.55	2.0	2.15	1.8
18	.....	2.77	3.55	3.15	2.03	1.6	1.55	2.0	2.15	1.85
19	.....	2.97	3.45	3.15	1.98	1.6	1.5	2.05	2.1	1.85
20	.....	2.97	3.5	3.0	1.98	1.55	1.55	2.1	2.1	1.85
21	.....	3.20	3.45	2.90	1.93	1.55	1.55	2.15	2.0	1.85
22	.....	3.25	3.5	2.83	1.88	1.55	1.6	2.15	1.95	1.9
23	.....	3.15	3.55	2.78	1.83	1.55	1.6	2.2	1.95	1.9
24	.....	2.93	3.75	2.73	1.88	1.55	1.65	2.2	2.0	1.9
25	.....	2.92	3.9	2.73	1.93	1.5	1.7	2.55	2.0	1.9
26	.....	2.97	4.1	2.83	2.08	1.55	1.7	2.4	2.0	1.9
27	.....	3.20	4.1	3.10	1.98	1.55	1.7	2.3	2.0	1.9
28	.....	3.15	4.3	2.76	1.88	1.6	1.7	2.25	1.95	1.9
29	.....	3.1	4.2	2.78	1.78	1.65	1.65	2.2	1.95	1.9
30	1.97	3.0	4.0	2.78	1.78	1.6	1.7	2.2	1.95	1.85
31	1.97	.....	3.8	.....	1.73	1.6	.....	2.2	.....	1.85

Daily discharge, in second-feet, of Tenmile Creek near Helena, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	13	97	228	72	6.0	2.5	2.2	18	9.0
2	8.3	93	183	72	3.8	1.8	2.9	16	7.4
3	7.8	83	156	110	3.8	1.8	2.9	14	4.8
4	9.3	83	132	92	3.8	1.2	3.6	14	4.8
5	11	72	125	83	3.0	1.7	4.8	16	4.8
6	11	77	110	72	3.8	1.6	4.8	16	4.8
7	15	95	95	62	3.8	1.5	9.0	14	4.8
8	13	110	95	58	4.9	1.5	11	14	4.8
9	11	132	95	53	16	1.0	11	14	4.8
10	13	156	72	49	14	1.4	9.0	16	4.8
11	18	201	83	42	16	1.3	7.4	21	5.9
12	32	219	308	42	12	1.3	14	18	5.9
13	35	210	183	42	12	1.2	24	16	5.9
14	45	210	156	39	8.6	.9	18	16	5.9
15	61	156	118	33	4.9	1.1	18	16	5.9
16	53	174	125	30	6.0	1.1	14	16	4.8
17	61	174	125	21	3.8	1.1	9.0	16	3.6
18	71	183	118	18	3.8	1.0	9.0	16	4.8
19	93	165	118	16	3.8	.7	11	14	4.8
20	93	174	97	16	3.0	1.0	14	14	4.8
21	125	165	85	14	2.8	.9	16	9.0	4.8
22	132	174	77	13	2.7	1.2	16	7.4	5.9
23	118	183	72	9.7	2.7	1.2	18	7.4	5.9
24	89	219	67	12	2.5	1.7	18	9.0	5.9
25	87	248	67	14	1.8	2.2	38	9.0	5.9
26	93	288	77	21	2.4	2.2	30	9.0	5.9
27	125	288	110	16	2.2	2.2	24	9.0	5.9
28	118	328	70	13	2.8	2.2	21	7.4	5.9
29	110	308	72	8.1	3.6	1.7	18	7.4	5.9
30	97	268	72	8.1	2.7	2.2	18	7.4	4.8
31	.....	228	.....	6.8	2.5	.....	18	.....	4.8

NOTE.—Discharge determinued from two fairly well defined rating curves applicable to Aug. 20 and after Sept. 21, respectively. Indirect method for shifting channels used Aug. 21 to Sept. 20.

Monthly discharge of Tenmile Creek near Helena, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 8.0	492	D.
February	.....	.....	[a] 6.0	333	D.
March	.....	.....	[a] 8.0	492	D.
April	132	7.8	58.9	3,500	B.
May	328	72	179	11,000	B.
June	308	67	116	6,900	B.
July	110	6.8	37.3	2,290	B.
August	16	1.8	5.34	328	C.
September	2.5	.7	1.48	88.1	C.
October	38	2.2	14.0	861	C.
November	21	7.4	13.2	786	B.
December	9.0	3.6	5.44	334	B.
The year	328	.....	38.0	27,400	

[a] Estimated.

NOTE.—Accuracy for October is reduced because applicability of curve is uncertain.

SEVENMILE CREEK AT BIRDSEYE, MONT.

Location.—In SW. ¼ sec. 31, T. 11 N., R. 4 W., at Richard Tobin's ranch, one-fourth mile from Birdseye, Mont.

Records available.—March 27, 1909, to July 31, 1913. From July 16, 1908, to August 26, 1908, a station was maintained on this stream at Dr. Head's ranch, near Helena.

Drainage area.—Not measured.
Gage.—Staff.
Control.—Sandy and shifting.
Discharge measurements.—Made by wading.
Winter flow.—Affected by ice.
Diversions.—Entire flow of creek is appropriated and used for irrigation. Some placer mining on the creek above station. Water is stored during certain parts of the day and released at others, causing rapid fluctuations in stage.

Discharge measurements of Sevenmile Creek at Birdseye, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 19	W. A. Lamb	2.38	19.7
May 24	B. E. Jones	2.83	34
June 4	R. R. Randell	2.51	23.1

Daily gage height, in feet, and discharge, in second-feet, of Sevenmile Creek at Birdseye, Mont., for 1913.

[R. Tobin, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.38	19	2.28	16	2.78	32	2.78	32
2	.....	.....	2.18	13	2.28	16	2.73	31	2.78	32
3	.....	.....	2.03	9	2.28	16	2.58	25	2.73	31
4	.....	.....	2.03	9	2.38	19	2.58	25	2.68	29
5	.....	.....	2.08	10	2.38	19	2.66	28	2.63	27
6	.....	.....	2.08	10	2.48	22	2.58	25	2.58	25
7	.....	.....	2.03	9	2.38	19	2.48	22	2.48	22
8	.....	.....	2.08	10	2.38	19	2.48	22	2.48	22
9	.....	.....	2.13	12	2.33	18	2.58	25	2.48	22
10	.....	.....	2.18	13	2.43	21	2.58	25	2.48	22
11	.....	.....	2.18	13	2.38	19	2.63	29	2.48	22
12	.....	.....	2.08	10	2.43	21	2.78	32	2.48	22
13	.....	.....	2.08	10	2.48	22	2.88	36	2.48	22
14	2.78	.....	2.08	10	2.38	19	2.78	32	2.48	22
15	2.78	.....	2.18	13	2.48	22	2.78	32	2.48	22
16	2.78	.....	2.03	9	2.48	22	2.74	31	2.38	19
17	2.78	.....	2.08	10	2.43	21	3.98	39	2.38	19
18	2.78	.....	2.23	15	2.48	22	2.88	36	2.28	16
19	2.78	.....	2.38	19	2.48	22	2.88	36	2.28	16
20	.....	.....	2.28	16	2.58	25	2.78	32	2.28	16
21	.....	.....	2.38	19	2.53	24	2.88	36	2.18	13
22	.....	.....	2.28	16	2.48	22	3.08	43	2.18	13
23	.....	.....	2.38	19	2.48	22	3.08	43	2.18	13
24	.....	.....	2.33	18	2.68	29	2.98	39	2.18	13
25	.....	.....	2.38	19	2.83	34	2.98	39	2.18	13
26	.....	.....	2.38	19	2.88	36	2.98	39	2.18	13
27	.....	.....	2.28	16	2.78	32	2.98	39	2.18	13
28	.....	.....	2.38	19	3.03	41	2.98	39	2.18	13
29	4.98	.....	2.33	18	2.98	39	2.78	32	2.18	13
30	2.58	.....	2.23	15	2.98	39	2.78	32	2.18	13
31	2.33	.....	.....	.....	2.88	36	.....	.....	2.18	13

NOTE.—Gage heights for March affected by ice.
Discharge determined from a fairly well defined rating curve. Discharge estimated June 17 because of probable error in gage height.

Monthly discharge of Sevenmile Creek at Birdseye, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	19	9	13.9	827	B.
May	41	16	24.3	1,490	B.
June	43	22	32.5	1,930	B.
July	32	13	19.5	1,200	B.

LITTLE PRICKLY PEAR CREEK BASIN.

LITTLE PRICKLY PEAR CREEK NEAR MARYSVILLE, MONT.

Location.—At highway bridge on ranch of Casper Traufer, about 5 miles west and 3 miles north of Marysville, Mont.; about one-fourth mile below the mouth of Deadman Creek.

Records available.—April 12, 1913, to December 31, 1913, at present site; May 18, 1909, to December, 1911, at station formerly maintained above mouth of Deadman Creek.

Drainage area.—Not measured.

Gage.—Staff. From April 12 to May 23 gage was located about one-fourth mile farther upstream at a different datum, but where flow is practically the same as at site now used. Datum unchanged since May 24, 1913.

Control.—May shift during high water.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Affected by ice.

Diversions.—Many small ditches take water from the stream, practically the entire flow being appropriated.

Discharge measurements of Little Prickly Pear Creek near Marysville, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 12	C. S. Heidel	2.40	23	June 20	R. R. Randell	2.14	148
May 24	do	3.98	[a] 186	July 17	C. S. Heidel	1.50	50
24	do	2.6	[b] 208	Aug. 10	do	1.27	28
27	do	3.06	292	Oct. 3	do	1.10	14.7

[a] This is the water flowing in regular channel, and should be used in determining daily flow up to May 23.
[b] This is the total discharge referred to gage datum at new section, which is used for all subsequent readings.

Daily gage height, in feet, of Little Prickly Pear Creek near Marysville, Mont., for 1913.

[Casper Traufer, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.15	2.8	1.9	1.35	1.15	1.1	1.1	1.1
2	.....	3.00	2.7	1.8	1.35	1.15	1.1	1.1	1.05
3	.....	2.92	2.6	1.8	1.3	1.15	1.1	1.1	1.05
4	.....	2.95	2.5	1.8	1.3	1.15	1.15	1.1	1.05
5	.....	2.85	2.4	1.75	1.3	1.15	1.15	1.1	1.05
6	.....	2.82	2.3	1.7	1.35	1.15	1.15	1.1	1.05
7	.....	2.88	2.3	1.7	1.35	1.15	1.15	1.1	1.05
8	.....	3.00	2.3	1.7	1.3	1.15	1.15	1.1	1.05
9	.....	3.1	2.3	1.65	1.3	1.15	1.15	1.1	1.05
10	.....	3.2	2.3	1.6	1.3	1.1	1.15	1 1	1 05
11	.....	3.4	2.3	1.6	1.3	1.1	1.15	1.1	1.05
12	2.52	3.6	2.5	1.6	1.3	1.1	1.15	1.1	1.05
13	2.65	3.6	2.6	1.6	1.3	1.1	1.15	1.1	1.05
14	2.75	3.6	2.6	1.55	1.3	1.1	1.15	1.1	1 05
15	2.80	3.5	2.5	1.5	1.3	1.1	1.15	1.1	1.0
16	2.75	3.5	2.4	1.5	1.3	1.1	1.15	1.1	1.0
17	2.82	3.45	2.35	1.5	1.3	1.1	1.15	1.1	1.0
18	2.95	3.5	2.3	1.48	1.25	1.1	1.15	1.1	1.0
19	2.10	3.5	2.2	1.50	1.25	1.1	1.15	1.1	1.0
20	3.20	3.45	2.2	1.42	1.25	1.1	1.15	1.1	1.0
21	3.25	3.5	2.15	1.40	1.25	1.1	1.15	1.1	1.0
22	3.30	3.6	2.1	1.4	1.25	1.1	1.15	1.1	1.0
23	3.20	3.8	2.05	1.4	1.2	1.1	1.15	1.1	1.0
24	3.10	2.6	2.0	1.4	1.2	1.1	1.15	1.1	1.0
25	3.00	.....	2.0	1.4	1.2	1.15	1.15	1.1	1.0
26	3.00	3.0	1.95	1.4	1.2	1.15	1.15	1.1	1.0
27	3.15	3.1	2.0	1.4	1.2	1.1	1.15	1.1	1.0
28	3.20	3.2	1.95	1.4	1.2	1.1	1.15	1.1	1.0
29	3.20	3.1	1.9	1.35	1.15	1.1	1.1	1.1	1.0
30	3.15	2.9	1.9	1.35	1.15	1.1	1.1	1.1	1.0
31	.....	2.8	.....	1.35	1.15	.....	1.1	.....	1.0

NOTE.—Gage heights Apr. 12 to May 23 and May 24 to Dec. 31 read at stations about one-fourth mile apart, but with practically the same flow. Gage height Apr. 19 probably erroneous.

Daily discharge, in second-feet, of Little Prickly Pear Creek near Marysville, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	92	246	102	36	18	15	15	15
2	.....	77	229	87	36	18	15	15	12
3	.....	69	212	87	31	18	15	15	12
4	.....	72	196	87	31	18	18	15	12
5	.....	62	180	80	31	18	18	15	12
6	.....	59	164	74	36	18	18	15	12
7	.....	65	164	74	36	18	18	15	12
8	.....	77	164	74	31	18	18	15	12
9	.....	87	164	68	31	18	18	15	12
10	.....	97	164	62	31	15	18	15	12
11	.....	119	164	62	31	15	18	15	12
12	34	141	196	62	31	15	18	15	12
13	44	141	212	62	31	15	18	15	12
14	52	141	212	56	31	15	18	15	12
15	57	130	196	50	31	15	18	15	8
16	52	130	180	50	31	15	18	15	8
17	59	124	172	50	31	15	18	15	8
18	72	130	164	48	26	15	18	15	8
19	87	130	148	50	26	15	18	15	8
20	97	124	148	42	26	15	18	15	8
21	102	130	140	40	26	15	18	15	8
22	108	141	132	40	26	15	18	15	8
23	97	164	124	40	22	15	18	15	8
24	87	212	117	40	22	15	18	15	8
25	77	245	117	40	22	18	18	15	8
26	77	280	110	40	22	18	18	15	8
27	92	297	117	40	22	15	18	15	8
28	97	315	110	40	22	15	18	15	8
29	97	297	102	36	18	15	15	15	8
30	92	263	102	36	18	15	15	15	8
31	.....	246	.....	36	18	.....	15	.....	8

NOTE.—Discharge determined as follows: Apr. 12 to May 23, from a fairly well defined rating curve; May 24 to Dec. 31, from a well-defined rating curve change due to change in position of gage and not to a shift in the channel. Discharge estimated Apr. 19 and interpolated May 25.

Monthly discharge of Little Prickly Pear Creek near Marysville, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 12–30	108	34	77.9	2,940	B.
May	315	59	150	9,220	B.
June	246	102	162	9,640	A.
July	102	36	56.6	3,480	A.
August	36	18	27.8	1,710	A.
September	18	15	16.1	958	A.
October	18	15	17.4	1,070	A.
November	15	15	15.0	893	A.
December	15	8	9.9	609	A.
The period				30,500	

LITTLE PRICKLY PEAR CREEK NEAR CANYON CREEK, MONT.

Location.—In sec. 9, T. 12 N., R. 5 W., near Canyon Creek post office, Mont. Principal tributaries above the station are Canyon, Marsh, Lost Horse, and Deadman creeks.

Records available.—April 1, 1909, to December 31, 1911; April 12 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff.

Channel.—Permanent at ordinary stages; will shift at flood stages.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—Many small ditches take water from this stream and the low-water flow is practically all appropriated.

Discharge measurement of Little Prickly Pear Creek near Canyon Creek, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 12	C. S. Heidel	3.00	110	July 17	C. S. Heidel	2.50	55
May 24	do	4.3	424	Aug. 19	do	2.20	30
27	do	4.6	553	Oct. 3	do	2.15	26
June 20	R. R. Randell	3.92	276				

Daily gage height, in feet, of Little Prickly Pear Creek near Canyon Creek, Mont., for 1913.

[W. J. Carbis, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.6	4.4	3.6	2.2	2.1	2.1	2.2	2.0
2	.....	3.5	4.3	3.5	2.15	2.0	2.15	2.2	2.0
3	.....	3.4	4.2	3.4	2.1	2.0	2.15	2.25	2.0
4	.....	3.3	4.1	3.3	2.1	2.0	2.2	2.3	2.1
5	.....	3.2	4.0	3.4	2.05	2.0	2.2	2.3	2.1
6	.....	3.25	3.85	3.4	2.1	2.0	2.25	2.3	2.15
7	.....	3.3	3.6	3.5	2.1	2.1	2.3	2.4	2.1
8	.....	3.4	3.6	3.4	2.05	2.1	2.3	2.4	2.2
9	.....	3.5	3.5	3.4	2.1	2.15	2.3	2.5	2.2
10	.....	3.6	3.6	3.3	2.1	2.1	2.35	2.5	2.2
11	.....	3.7	3.7	3.2	2.1	2.15	2.3	2.4	2.2
12	3.0	3.95	4.4	3.2	2.1	2.2	2.3	2.4	2.3
13	3.25	4.0	4.2	3.1	2.1	2.2	2.2	2.3	2.3
14	3.4	3.9	4.1	3.0	2.0	2.1	2.2	2.2	2.3
15	3.35	.....	4.0	3.0	2.05	2.1	2.1	2.2	2.2
16	3.4	.....	3.9	2.9	1.95	2.0	2.0	2.25	2.2
17	3.5	.....	4.0	2.8	2.1	2.0	2.0	2.2	2.3
18	3.5	3.3	3.95	2.8	2.2	2.0	2.1	2.2	2.3
19	3.75	3.4	4.2	2.9	2.2	2.0	2.1	2.1	2.3
20	3.85	3.6	4.0	2.8	2.2	2.1	2.0	2.1	2.4
21	3.9	3.8	3.9	2.7	2.2	2.1	2.05	2.2	2.3
22	3.9	3.9	3.8	2.6	2.1	2.1	2.0	2.3	2.3
23	3.75	4.1	3.7	2.5	2.1	2.2	2.0	2.3	2.25
24	3.65	4.3	3.6	2.4	2.1	2.2	2.1	2.25	2.25
25	3.45	4.4	3.7	2.3	2.1	2.2	2.1	2.2	2.1
26	3.4	4.5	3.8	2.3	2.05	2.1	2.15	2.1	2.1
27	3.7	4.6	3.8	2.4	2.05	2.1	2.1	2.1	2.0
28	3.6	4.7	3.7	2.5	2.1	2.2	2.2	2.2	2.0
29	3.55	4.8	3.6	2.4	2.1	2.25	2.2	2.1	2.1
30	3.55	4.6	3.6	2.3	2.15	2.2	2.1	2.0	2.1
31	.....	4.5	.....	2.2	2.1	.....	2.1	.....	2.1

Daily discharge, in second-feet, of Little Prickly Pear Creek near Canyon Creek, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	215	460	215	30	23	23	30	17
2	.....	195	415	195	26	17	26	30	17
3	.....	175	375	175	23	17	26	34	17
4	.....	158	340	158	23	17	30	37	23
5	.....	141	310	175	20	17	30	37	23
6	.....	150	272	175	23	17	34	37	26
7	.....	158	215	195	23	23	37	45	23
8	.....	175	215	175	20	23	37	45	30
9	.....	195	195	175	23	26	37	53	30
10	.....	215	215	158	23	23	41	53	30
11	.....	235	235	141	23	26	37	45	30
12	111	298	460	141	23	30	37	45	37
13	150	310	375	125	23	30	30	37	37
14	175	285	340	111	17	23	30	30	37
15	166	250	310	111	20	23	23	30	30
16	175	220	285	98	15	17	17	34	30
17	195	190	310	86	23	17	17	30	37
18	195	158	298	86	30	17	23	30	37
19	148	175	375	98	30	17	23	23	37
20	272	215	310	86	30	23	17	23	45
21	285	260	285	74	30	23	20	30	37
22	285	285	260	63	23	23	17	37	37
23	248	340	235	53	23	30	17	37	34
24	225	415	215	45	23	30	23	34	34
25	185	460	235	37	23	30	23	30	23
26	175	510	260	37	20	23	26	23	23
27	235	560	260	45	20	23	23	23	17
28	215	610	235	53	23	30	30	30	17
29	205	665	215	45	23	34	30	23	23
30	205	560	215	37	26	30	23	17	23
31	.....	510	.....	30	23	.....	23	.....	23

NOTE.—Discharge determined from a well-defined rating curve. Discharge interpolated May 15 to 17.

Monthly discharge of Little Prickly Pear Creek near Canyon Creek, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 12-30	285	111	203	7,650	A.
May	665	141	300	18,400	B.
June	460	195	291	17,300	A.
July	215	30	110	6,760	B.
August	30	15	23.4	1,440	A.
September	34	17	23.4	1,390	A.
October	41	17	26.8	1,650	A.
November	53	17	33.7	2,010	A.
December	45	17	28.5	1,750	A.
The period				58,400	

NOTE.—Accuracy for July reduced because hydrographer and observer do not check on gage reading.

SUN RIVER BASIN.

ADJUDICATED WATER RIGHTS.

Practically the entire unappropriated flow of Sun River and its tributaries has been filed on by the United States Reclamation Service for the irrigation of 276,000 acres of land on the Sun River project. Most of this water will be obtained from the storage of flood waters.

The following table shows the adjudicated water rights on the river and its tributaries.

Summary of appropriations by creeks.

	Second-feet.
Sun River [1]	582.530
Dry Creek	30.450
Rock Camp Creek	3.375
Simms Creek	23.600
North Fork of Sun River [2]	203.395
Richardson Creek	1.250
Francis Creek	1.875
Buttolph Creek	1.000
South Fork of Sun River	120.860
Du Bra Creek	49.200
Elk Creek	18.740
Hay Coulee	1.000
Frank Goss Creek	8.340
West Creek	0.625
Smith Creek	64.250
Ford Creek	46.400
Smith Lake	6.250
Duval Creek	1.875

[1] Rights belonging to United States Reclamation Service or subsequent to United States Reclamation Service appropriations on Sun River, 30.41 second-feet.

[2] Rights subsequent to United States Reclamation Service appropriations on North Fork of Sun River, 12.00 second-feet.

	Second-feet.
Willow Creek [1]	38.300
Breed Creek	1.000
Little Willow Creek	21.520
Spring Coulee	2.000
Cutrock Creek	0.660
Barr Creek	6.500
Furman Creek	3.000
Springs, lakes, and coulees tributary to Little Willow Creek	7.580
	1,245.575
Rights belonging to United States Reclamation Service or subsequent to United States Reclamation Service appropriations	44.510
Rights prior to United States Reclamation Service appropriations	1,201.065

NORTH FORK OF SUN RIVER NEAR AUGUSTA, MONT.

Location.—In sec. 33, T. 22 N., R. 7 W., near the Hennessy Co.'s ranch, 12 miles northwest of Augusta, 21 miles southwest of Chouteau, Mont.

Records available.—October 31, 1903, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Chain.

Control.—Permanent.

Discharge measurements.—Made from cable.

Winter flow.—Affected by ice.

Diversions.—Water diverted below station for irrigation of valley lands; no diversions above station.

Accuracy.—Conditions for accurate determination of discharge excellent except during the winter months.

Discharge measurements of North Fork of Sun River near Augusta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 28	B. E. Jones	2.41	1,530
June 1	do	5.81	7,900
26	do	3.37	2,750
Aug. 29	do	1.06	466

[1] Rights belonging to United States Reclamation Service on Willow Creek, 2.10 second-feet.

Daily gage height, in feet, of North Fork of Sun River near Augusta, Mont., for 1913.

[Mrs. Nora Duncan, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.6	0.6	0.4	0.5	2.25	6.1	3.3	1.6	0.95	0.85	1.0	0.9
2	.65	.55	.35	.5	2.2	6.3	3.2	1.6	.95	.85	1.0	.8
3	.65	.....	.3	.6	2.15	6.2	3.1	1.55	.95	.85	1.0	.7
4	.6	.....	.3	.6	2.05	5.9	3.0	1.55	.9	.9	.9	.65
5	.7	.....	.4	.65	2.0	5.7	2.8	1.5	.9	.8	1.0	.7
6	.6	.....	.25	.55	2.1	5.4	2.8	1.5	.9	.8	1.0	.7
7	.6	.....	.25	.55	2.15	5.3	2.7	1.45	.8	.8	.95	.7
8	.6	.....	.2	.6	2.2	5.3	2.6	1.45	.85	.8	.95	.7
9	.6	.55	.2	.6	2.3	5.3	2.6	1.45	.85	.8	.9	.7
10	.7	.65	.3	.75	2.6	5.3	2.45	1.4	.8	.8	.9	.65
11	.6	.6	.2	.65	2.6	5.3	2.6	1.45	.8	.8	.95	.6
12	.6	.6	.25	.7	2.7	5.2	2.4	1.45	.85	.9	1.0	.55
13	.6	.6	.25	.9	2.8	5.0	2.3	1.4	.9	1.0	.95	.55
14	.6	.6	.25	1.2	3.1	4.9	2.3	1.35	.9	1.1	.9	.55
15	.7	.7	.35	1.4	3.2	4.7	2.2	1.4	.9	1.05	.9	.6
16	.6	.6	.3	1.6	2.7	4.5	2.25	1.35	.9	1.0	.95	.6
17	.55	.6	.3	1.8	2.6	4.3	2.2	.35	.8	.95	.95	.6
18	.55	.55	.3	1.9	2.6	4.2	2.05	1.35	.8	1.0	.95	.6
19	.5	.55	.3	2.15	2.5	4.1	1.95	1.35	.85	.9	.9	.55
20	.6	.6	.4	2.3	2.6	3.8	1.95	1.35	.85	.9	.9	.5
21	.5	.5	.3	2.5	2.7	3.9	1.95	1.35	.85	.9	.85	.5
22	.5	.5	.35	2.6	3.0	3.7	1.9	1.3	.85	.9	.8	.5
23	.5	.5	.35	2.3	3.6	3.7	1.85	1.3	.85	.9	.85	.5
24	.6	.5	.35	2.1	3.9	3.6	1.8	1.25	.8	.95	.8	.6
25	.8	.6	.4	2.0	4.6	3.5	1.75	1.25	.8	.95	.8	.7
26	.7	.45	.4	2.0	5.2	3.4	1.8	1.25	.85	1.0	.85	.7
27	.7	.4	.4	2.1	6.2	3.6	1.75	1.2	.8	1.0	.8	.7
28	.65	.4	.4	2.4	6.3	3.5	1.75	1.15	.8	1.05	.8	.75
29	.6	.....	.45	2.15	6.6	3.5	1.7	1.1	.8	1.05	.8	.8
30	.7	.....	.55	2.35	6.2	3.4	1.7	1.05	.85	1.0	.85	.85
31	.6	.....	.5	.....	6.2	.....	1.65	1.0	.....	.95	.....	.8

NOTE.—Gage heights, Feb. 3 to 8 and Dec. 24 to 31, distorted by ice.

Daily discharge, in second-feet, of North Fork of Sun River near Augusta, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	210	210	130	170	1,400	8,580	2,700	830	380	325	410	350
2	230	190	115	170	1,350	9,080	2,550	830	380	325	410	300
3	230	.....	100	210	1,300	8,830	2,410	790	380	325	410	250
4	210	.....	100	210	1,200	8,080	2,270	790	350	350	350	230
5	250	.....	130	230	1,160	7,590	2,010	750	350	300	410	250
6	210	.....	90	190	1,250	6,870	2,0.0	750	350	300	410	250
7	210	.....	90	190	1,300	6,630	1,890	715	300	300	380	250
8	210	.....	80	210	1,350	6,630	1,770	715	325	300	380	250
9	210	190	80	210	1,450	6,630	1,770	715	325	300	350	250
10	250	230	100	275	1,770	6,630	1,600	680	300	300	350	230
11	210	210	80	230	1,770	6,630	1,770	715	300	300	380	210
12	210	210	90	250	1,890	6,390	1,550	715	325	350	410	190
13	210	210	90	350	2,010	5,930	1,450	680	350	410	380	190
14	210	210	90	540	2,410	5,710	1,450	645	350	470	350	190
15	250	250	115	680	2,550	5,270	1,350	680	350	440	350	210
16	210	210	100	830	1,890	4,850	1,400	645	350	410	380	210
17	190	210	100	990	1,770	4,450	1,350	645	300	380	380	210
18	190	190	100	1,070	1,770	4,250	1,200	645	300	410	380	210
19	170	190	100	1,300	1,660	4,060	1,120	645	325	350	350	190
20	210	210	130	1,450	1,770	3,510	1,120	645	325	350	350	170
21	170	170	100	1,660	1,890	3,690	1,120	645	325	350	325	170
22	170	170	115	1,770	2,270	3,340	1,070	610	325	350	300	170
23	170	170	115	1,450	3,170	3,340	1,030	610	325	350	325	170
24	210	170	115	1,250	3,690	3,170	990	575	300	380	300	.....
25	300	210	130	1,160	5,060	3,010	950	575	300	380	300	.....
26	250	150	130	1,160	6,390	2,850	990	575	325	410	325	.....
27	250	130	130	1,250	8,830	3,170	950	540	300	410	300	.....
28	230	130	130	1,550	9,080	3,010	950	505	300	440	300	.....
29	210	.....	150	1,300	9,830	3,010	910	470	300	440	300	.....
30	250	.....	190	1,500	8,830	2,850	910	440	325	410	325	.....
31	210	.....	170	.....	8,830	.....	870	410	.....	380	.....	.....

NOTE.—Discharge determined from a well-defined rating curve. Discharge Feb. 3 to 8 and Dec. 24 to 31 estimated, because of ice, at 160 second-feet.

Monthly discharge of North Fork of Sun River near Augusta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	300	170	216	13,300	C.
February	250	.....	185	10,300	C.
March	190	80	112	6,890	C.
April	1,770	170	794	47,200	B.
May	9,830	1,160	3,250	200,000	B.
June	9,080	2,850	5,270	314,000	B.
July	2,700	870	1,470	90,400	A.
August	830	410	651	40,000	A.
September	380	300	328	19,500	A.
October	470	300	364	22,400	A.
November	410	300	356	21,200	A.
December	350	.....	206	12,700	B.
The year	9,830	80	1,100	798,000	

NOTE.—Accuracy for January, February, and March reduced because of possible effect of ice; accuracy for April, May, and June reduced on account of there being but one reading per day. When the snow is going off in the mountains this does not represent the mean flow. The results are probably low.

SUN RIVER AT FORT SHAW, MONT.

Location.—In the SW. ¼ sec. 1, T. 20 N., R. 2 W., at Fort Shaw, Mont.

Records available.—May 16, 1912, to December 31, 1913. A station on Sun River at Sun River, maintained previous to 1912, gave practically the same data.

Drainage area.—Not measured.

Gage.—Staff gage put in September 1, 1913, on the right bank about 1,000 feet above footbridge; gage heights beginning September 1, 1913, referred to that gage. Previous to that date a standard chain gage fastened to the footbridge near the right bank was used.

Control.—Probably permanent.

Discharge measurements.—At high and medium stages made from footbridge below gage; at low stages made by wading.

Winter flow.—Affected by ice.

Diversions.—Adjudicated rights for diverting 248 second-feet from Sun River direct and 664 second-feet from tributaries above this station. In addition to this the Fort Shaw canal of the United States Reclamation Service takes out about 200 second-feet during the irrigation season.

Storage.—Willow Creek reservoir has a capacity of 84,320 acre-feet.

Accuracy.—Conditions for obtaining accurate discharge data good; results for 1912 and 1913 only fair, owing to errors in the gage.

Discharge measurements of Sun River at Fort Shaw, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 25	B. E. Jones	61.83	1,380	July 10	Towle and White	61.99	1,780
May 30	F. Towle	65.56	11,300	17	.....do	61.52	989
June 4	B. E. Jones	65.13	8,790	Sept. 1	B. E. Jones	[a]61.31	377
30	.....do	63.01	3,300				

[a] Affected by backwater from diversion dam 200 feet below. New gage installed this date reads 2.05 feet.

Daily gage height, in feet, and discharge, in second-feet, of Sun River at Fort Shaw, Mont., for 1913.

[United States Reclamation Service engineers, observers.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height	Discharge.	Gage height.	Discharge.
1	.....	.....	62.15	1,790	65.0	8,500	62.9	3,020	61.95	692	2.05	377
2	.....	.....	61.9	1,460	65.3	9,400	62.8	2,840	61.95	692	.....	377
3	.....	.....	61.9	1,460	65.4	9,700	62.7	2,660	61.85	610	.....	377
4	60.9	495	61.8	1,340	65.1	8,800	62.6	2,480	61.85	610	.....	377
5	.....	.....	61.75	1,280	64.8	7,900	62.5	2,310	61.75	532	2.05	377
6	.....	.....	61.7	1,230	64.6	7,300	62.5	2,310	61.75	570	2.0	351
7	.....	.....	61.6	1,120	64.5	7,000	62.5	2,310	61.75	570	2.0	351
8	.....	.....	61.8	1,340	64.5	7,000	62.4	2,150	61.7	532	2.0	351
9	.....	.....	62.0	1,590	64.7	7,600	62.3	2,000	61.7	532	1.95	325
10	.....	.....	61.95	1,520	64.7	7,600	62.1	1,720	61.65	495	1.95	325
11	.....	.....	62.45	2,230	64.6	7,300	62.0	1,590	61.65	532	1.95	325
12	.....	.....	62.7	2,660	64.6	7,300	61.95	1,520	61.65	532	1.95	325
13	.....	.....	62.8	2,840	64.5	7,000	61.9	1,460	61.65	532	1.95	325
14	.....	.....	62.7	2,660	64.6	7,300	61.75	1,280	61.55	458	1.95	325
15	.....	.....	62.4	2,150	63.6	4,520	61.7	1,230	61.55	458	1.95	325
16	.....	.....	62.5	2,310	63.2	3,620	61.6	1,120	61.55	495	1.95	325
17	.....	.....	62.35	2,080	63.5	4,290	61.55	1,070	61.5	458	1.95	325
18	.....	.....	62.3	2,000	63.2	3,620	61.4	920	61.45	420	1.95	325
19	.....	.....	62.45	2,230	63.3	3,840	61.35	872	61.45	420	1.95	325
20	.....	.....	62.35	2,080	63.4	4,060	61.4	920	61.4	385	1.95	325
21	62.3	2,000	62.35	2,080	63.2	3,620	61.3	825	61.45	458	1.95	325
22	.....	1,950	62.45	2,230	63.2	3,620	61.3	825	61.4	420	1.95	325
23	.....	1,900	62.6	2,480	62.9	3,020	61.25	780	61.4	420	2.0	351
24	62.2	1,860	63.2	3,620	62.9	3,020	61.3	825	61.4	420	2.0	351
25	61.9	1,460	63.8	5,000	62.7	2,660	61.45	805	.....	420	2.0	351
26	61.9	1,460	63.9	5,250	62.9	3,020	61.8	790	61.35	420	2.0	351
27	.....	1,730	65.0	8,500	63.0	3,210	62.9	770	61.3	385	1.95	325
28	62.3	2,000	65.3	9,400	63.2	3,620	62.9	755	.....	385	1.95	325
29	62.0	1,590	65.6	10,300	63.0	3,210	62.8	740	61.3	385	1.95	325
30	62.0	1,590	65.3	9,400	62.9	3,020	62.8	725	61.3	385	1.95	325
31	.....	.....	65.1	8,800	.....	.....	62.6	710	61.3	385	.....	.....

NOTE.—Discharge determined from a well-defined curve. Results for May and June probably somewhat low, as gage was read only once a day. Discharge July 25–31 interpolated on account of dam being built. Apr. 1–3 and 5–20 discharge estimated from North Fork of Sun, South Fork of Sun, and Willow Creek.

Monthly discharge of Sun River at Fort Shaw, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	.....	.....	1,020	60,700	C.
May	10,300	1,120	3,370	207,000	C.
June	9,700	2,660	5,520	328,000	C.
July	3,020	710	1,430	87,900	C.
August	692	385	484	29,800	C.
September	377	325	340	20,200	B.
The period	.....	.....	.....	734,000	

WILLOW CREEK NEAR AUGUSTA, MONT.

Location.—In NW. ¼ SW. ¼ sec. 26, T. 21 N., R. 7 W., at the Clark Co. ranch, just below the mouth of Little Willow Creek and about 7 miles northwest of Augusta.

Records available.—June 8, 1905, to May 14, 1911; April 1, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Standard chain on right bank near observer's house.

Control.—Permanent.

Winter flow.—No ice forms at this station, as a large spring enters the creek just above the gage.

Diversions.—Adjudicated water rights above station amount to 36.2 second-feet from Willow Creek proper and 42.26 second-feet from tributaries. The United States Reclamation Service has an old right of 2.1 second-feet and has also filed on the total flow of the creek, subject to the above prior appropriations. No water is diverted from Willow Creek proper below the station, the amount used by the United States Reclamation Service being diverted from Sun River below the mouth of Willow Creek.

Storage.—Willow Creek dam, about 2 miles below the station, provides a reservoir with a capacity of 84,320 acre-feet, for use on the Fort Shaw unit of the Sun River project.

Accuracy.—Conditions for obtaining accurate discharge data are excellent.

Discharge measurements of Willow Creek near Augusta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 28	B. E. Jones	2.09	62
June 2	do	4.00	163
27	do	3.48	143
Aug. 30	do	0.88	9.7

Daily gage height, in feet, of Willow Creek near Augusta, Mont., for 1913.

[Elizabeth Ireland, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.25	1.8	3.9	2.35	1.19	0.82	0.76	1.04	0.94
2	.....	1.2	1.8	3.8	2.25	1.14	.79	.76	1.04	.89
3	.....	1.3	1.8	3.9	2.12	1.14	.79	.76	1.04	.89
4	.....	1.4	1.8	3.6	2.15	1.16	.76	.76	1.14	.89
5	.....	1.55	1.8	3.5	2.05	1.19	.76	.76	1.04	.89
6	.....	2.05	1.8	3.4	2.05	1.19	.76	.76	1.02	.89
7	.....	1.6	1.9	3.25	1.95	1.14	.76	.76	.94	.....
8	.....	1.65	1.85	3.2	1.85	1.24	.76	.79	1.04	.....
9	.....	1.4	1.8	3.1	1.86	1.34	.76	.82	1.04	.....
10	.....	1.5	1.9	3.1	1.82	1.29	.76	.84	1.04	.....
11	.....	1.55	2.25	3.1	1.76	1.14	.76	1.14	1.02	.....
12	.....	1.6	2.1	3.0	1.75	1.14	.76	1.44	.99	.....
13	.....	1.75	2.15	2.9	1.72	1.12	.76	1.29	1.04	.....
14	.....	1.75	2.1	2.8	1.70	1.09	.76	1.19	1.04	.....
15	.....	1.75	2.1	2.6	1.66	1.04	.76	1.09	1.09	.....
16	0.95	1.75	2.05	2.45	1.65	1.04	.76	1.04	1.02	.....
17	.9	1.7	2.0	2.3	1.62	1.04	.76	.99	.99	.....
18	.9	1.75	3.0	2.25	1.54	1.04	.76	.99	.99	.....
19	.85	1.85	3.2	2.25	1.49	1.02	.76	.99	.94	.....
20	.9	2.15	2.9	2.35	1.46	.99	.76	.99	.99	.....
21	.9	2.2	2.8	2.15	1.44	.94	.76	.99	.94	.....
22	.8	2.15	3.0	2.1	1.44	.94	.76	.99	.94	.....
23	.85	1.85	3.3	2.05	1.44	.92	.76	1.04	1.04	.....
24	.8	1.8	3.3	1.9	1.42	.86	.82	1.04	1.04	.....
25	.85	1.8	3.5	2.25	1.39	.84	.82	1.04	1.04	.....
26	.8	1.8	3.9	2.35	1.59	.84	.82	1.04	1.04	.....
27	.8	1.75	4.0	3.35	1.39	.84	.79	.99	1.04	.....
28	.9	2.0	4.2	2.7	1.29	.84	.79	.94	.99	.....
29	.9	1.7	4.2	2.6	1.39	.84	.76	.94	.99	.....
30	1.2	1.95	4.1	2.5	1.24	.84	.76	.89	.94	.....
31	1.35	.....	4.0	.....	1.19	.84	.....	1.09	.....	.....

Daily discharge, in second-feet, of Willow Creek near Augusta, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	23	48	166	76	21	8.0	6.5	15	11
2	.....	21	48	159	70	19	7.2	6.5	15	9.8
3	.....	25	48	166	64	19	7.2	6.5	15	9.8
4	.....	29	48	145	66	19	6.5	6.5	19	9.8
5	.....	36	48	138	60	21	6.5	6.5	15	9.8
6	.....	60	48	132	60	21	6.5	6.5	14	9.8
7	.....	38	53	123	56	19	6.5	6.5	11	.....
8	.....	40	50	120	50	23	6.5	7.2	15	.....
9	.....	29	48	114	51	27	6.5	8	15	.....
10	.....	33	53	114	49	25	6.5	8.5	15	.....
11	.....	36	70	114	46	19	6.5	19	14	.....
12	.....	38	63	108	46	19	6.5	31	13	.....
13	.....	46	66	103	44	18	6.5	25	15	.....
14	.....	46	63	98	43	17	6.5	21	15	.....
15	.....	46	63	88	41	15	6.5	17	17	.....
16	12	46	60	80	40	15	6.5	15	14	.....
17	10	43	58	73	39	15	6.5	13	13	.....
18	10	46	108	70	35	15	6.5	13	13	.....
19	8.8	50	120	70	33	14	6.5	13	11	.....
20	10	66	103	76	31	13	6.5	13	13	.....
21	10	68	98	66	31	11	6.5	13	11	.....
22	7.5	66	108	63	31	11	6.5	13	11	.....
23	8.8	50	126	60	31	11	6.5	15	15	.....
24	7.5	48	126	53	30	9	8.0	15	15	.....
25	8.8	48	138	70	29	8.5	8.0	15	15	.....
26	7.5	48	166	76	38	8.5	8.0	15	15	.....
27	7.5	46	173	129	29	8.5	7.2	13	15	.....
28	10	58	189	93	25	8.5	7.2	11	13	.....
29	10	43	189	88	29	8.5	6.5	11	13	.....
30	21	56	181	83	23	8.5	6.5	9.8	11	.....
31	27	.....	173	.....	21	8.5	.....	17	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve.

Monthly discharge of Willow Creek near Augusta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 16–31	27	7.5	11	349	B.
April	68	21	44.3	2,640	B.
May	189	48	94.6	5,820	B.
June	166	53	101	6,010	B.
July	76	21	42.5	2,610	B.
August	27	8.5	15.3	941	B.
September	8	6.5	6.79	404	B.
October	31	6.5	12.8	787	B.
November	19	11	14	833	B.
December 1–6	11	9.8	10	119	B.
The period	.....	.....	.....	20,510	

SOUTH FORK OF SUN RIVER AT AUGUSTA, MONT.

Location.—In sec. 17, T. 20 N., R. 6 W., at the highway bridge on the road from Augusta to Craig, Mont., about half a mile from Augusta.

Records available.—December 2, 1904, to December 31, 1913.

Drainage area.—Not measured.

Gage.—The original gage was spiked to the cribwork of the right abutment on the downstream side of the bridge; a new gage was installed April 17, 1907, at a different datum and was used during 1907 and 1908; records for 1909 to 1913 are referred to the old gage.

Control.—Shifting.

Discharge measurements.—High-stage measurements may be made from the highway bridge; low-stage measurements are made by wading.

Winter flow.—Affected by ice.

Diversions.—Water is diverted to irrigate the valley lands both above and below the station. During dry seasons the entire summer flow is utilized.

Discharge measurements of South Fork of Sun River at Augusta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	B. E. Jones	1.97	186	June 28	B. E. Jones	2.32	498
26	do	1.97	188	Aug. 30	do	1.02	32
June 2	do	2.48	586	Nov. 6	W. A. Lamb	1.26	63

Daily gage height, in feet, of South Fork of Sun River at Augusta, Mont., for 1913.

[W. J. Auchard, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	2.0	2.5	1.90	1.2	1.1	1.0	1.2	1.2
2	1.7	2.0	2.5	1.82	1.2	1.1	1.0	1.2	1.25
3	1.7	2.0	2.5	1.80	1.15	1.1	1.0	1.2	1.3
4	1.7	2.0	2.4	1.80	1.1	1.1	1.12	1.2	1.4
5	1.8	2.00	2.25	1.72	1.1	1.1	1.1	1.22	1.3
6	1.9	1.98	2.2	1.70	1.1	1.1	1.1	1.25	1.3
7	1.8	2.00	2.15	1.6	1.1	1.0	1.1	1.22	1.3
8	1.7	2.0	2.1	1.6	1.1	1.0	1.15	1.20	.....
9	1.7	2.0	1.95	1.6	1.1	1.0	1.15	1.2	.....
10	1.7	2.0	1.9	1.6	1.3	1.0	1.15	1.2	.....
11	1.7	2.05	1.9	1.5	1.2	1.0	1.20	1.2	.....
12	1.8	2.1	2.05	1.4	1.2	1.0	1.22	1.2	.....
13	1.8	2.1	2.0	1.5	1.2	1.0	1.25	1.2	.....
14	1.9	2.1	2.0	1.5	1.2	1.0	1.3	1.2	.....
15	2.0	2.1	1.95	1.5	1.2	1.0	1.3	1.2	.....
16	1.9	2.1	1.92	1.4	1.20	1.0	1.3	1.2	.....
17	1.9	2.1	1.85	1.4	1.18	1.0	1.3	1.2	.....
18	1.9	2.3	1.8	1.4	1.20	1.0	1.3	1.2	.....
19	2.0	2.4	1.7	1.40	1.2	1.0	1.22	1.2	.....
20	2.2	2.3	1.75	1.32	1.15	1.0	1.2	1.2	.....
21	2.0	2.3	1.7	1.28	1.1	1.0	1.2	1.25	.....
22	2.1	2.4	1.6	1.25	1.1	1.0	1.2	1.15	.....
23	2.0	2.5	1.6	1.22	1.1	1.0	1.2	1.2	.....
24	2.0	2.6	1.6	1.15	1.1	1.0	1.2	1.2	.....
25	2.0	2.7	1.7	1.1	1.1	1.0	1.2	1.2	.....
26	2.0	2.75	1.90	1.3	1.1	1.0	1.3	1.2	.....
27	2.05	2.9	2.42	1.3	1.1	1.0	1.3	1.2	.....
28	2.05	3.0	2.32	1.2	1.1	1.0	1.3	1.2	.....
29	2.05	2.8	2.20	1.2	1.1	1.0	1.3	1.2	.....
30	2.05	2.7	2.2	1.2	1.1	1.0	1.25	1.2	.....
31	.....	2.65	.....	1.2	1.1	.....	1.2	.....	.....

NOTE.—Gage heights for December possibly affected by ice.

Daily discharge, in second-feet, of South Fork of Sun River at Augusta, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	100	200	605	260	53	40	30	53	53
2	100	200	605	228	53	40	30	53	62
3	100	200	605	220	46	40	30	53	70
4	100	200	535	220	40	40	43	53	92
5	130	200	440	192	40	40	40	56	70
6	160	192	410	185	40	40	40	62	70
7	130	200	382	150	40	30	40	56	70
8	100	200	355	150	40	30	46	53	.....
9	100	200	282	150	40	30	46	53	.....
10	100	200	260	150	70	30	46	53	.....
11	100	220	260	119	53	30	53	53	.....
12	130	240	330	92	53	30	56	53	.....
13	130	240	305	119	53	30	62	53	.....
14	160	240	305	119	53	30	70	53	.....
15	200	240	282	119	53	30	70	53	.....
16	160	240	269	92	53	30	70	53	.....
17	160	240	240	92	50	30	70	53	.....
18	160	330	220	92	53	30	70	53	.....
19	200	394	185	92	53	30	56	53	.....
20	290	350	202	74	46	30	53	53	.....
21	200	350	185	67	40	30	53	62	.....
22	240	428	150	62	40	30	53	46	.....
23	200	502	150	56	40	30	53	53	.....
24	200	584	150	46	40	30	53	53	.....
25	200	669	185	40	40	30	53	53	.....
26	200	730	260	70	40	30	70	53	.....
27	220	895	549	70	40	30	70	53	.....
28	220	1,020	483	53	40	30	70	53	.....
29	220	835	410	53	40	30	70	53	.....
30	220	757	410	53	40	30	62	53	.....
31	.....	730	.....	53	40	.....	53	.....	.....

NOTE.—Discharge determined as follows: Apr. 1 to May 17 from a fairly well-defined rating curve; May 18 to 31 by indirect method for shifting channels; June 1 to Dec. 7, from a well-defined rating curve.

Monthly discharge of South Fork of Sun River at Augusta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	290	100	164	9,760	B.
May	1,020	192	394	24,200	C.
June	650	150	334	19,900	B.
July	260	40	114	7,010	B.
August	70	40	45.9	2,820	B.
September	40	30	32.0	1,900	B.
October	70	30	54.2	3,330	B.
November	62	46	53.6	3,190	B.
December, 1-7	92	53	69.6	966	C.
The period	.....	.....	.....	73,100	

NOTE.—Accuracy, June to December, reduced because observer did not read the gage very closely.

MARIAS RIVER BASIN.

MARIAS RIVER NEAR SHELBY, MONT.

Location.—In sec. 20, T. 31 N., R. 2 W., at the highway bridge near James A. Johnson's ranch, 7 miles south of Shelby, Mont.

Records available.—April 4, 1902, to June 30, 1906; March 21, 1911, to December 31, 1913.

Drainage area.—2,610 square miles.

Gages.—Bristol automatic and a staff gage set when the station was reestablished in 1911, at practically the same datum as the standard chain gage which was read during 1905–6 and which was fastened to the upstream guard rail of the bridge.

Control.—Likely to shift after freshets.

Discharge measurements.—Made from highway bridge, lower chord of which is about 15 feet above low water.

Winter flow.—Affected by ice.

Cooperation.—Several discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Marias River near Shelby, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 10	R. O. Crawford	3.83	1,110	June 19	W. A. Lamb	4.93	2,220
May 13	L. B. Crossan	5.00	2,680	30	R. O. Crawford	5.03	2,380
June 7	C. S. Heidel	6.40	4,640	July 28	C. S. Heidel	3.58	781
13	J. B. Stewart	5.95	3,570	Oct. 28	W. A. Lamb	[a] 3.60	699

[a] Gage height affected by wind action.

Daily gage height, in feet, of Marias River near Shelby, Mont., for 1913.

[A. Bryant, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	4.15	.....	4.2	4.35	7.3	5.0	3.35	3.2	2.85	3.5	3.35
2	3.9	4.2	.....	.....	4.35	7.2	4.7	3.35	3.15	2.85	3.5	3.3
3	3.95	4.15	.....	4.5	4.3	7 2	4.5	3.3	3.15	2.9	3.45	3.3
4	3.9	4.0	.....	4.6	.....	7.1	4.5	3.3	3.1	2.9	3.45	3.3
5	3.9	4.0	4.4	3.9	4 2	6 8	4.4	3.3	3.05	2.9	3.45	3.3
6	3.95	.....	4.4	4.0	4.15	6.6	4.25	3.3	3.05	2.95	3.4	3.3
7	3.95	4.15	.....	.....	4.1	6.4	4.15	3.25	3.0	3.0	3.4	3.2
8	3.9	4.2	4.3	3.95	4.3	6.3	4.0	3.3	3.0	3.0	3.4	3.2
9	.....	4.15	4.35	3.8	4.3	6.2	4.0	3.35	2.95	3.0	3.4	3.3
10	4.0	4.3	4.35	3.95	4.45	6.2	4.0	3.7	2.9	3.0	3.4	3.3
11	4.0	4.4	.....	4.3	4.45	6.3	4.0	3.75	2.9	3.0	3.4	3.2
12	4.0	4.5	4.2	4.35	4.8	6.1	3.95	3.75	2.9	3.0	3.4	3.2
13	4.15	4.5	.....	4.35	5.1	5.9	3.9	3.7	2.9	3.2	3.4	3.2
14	4.0	.....	4.0	.....	5.2	5.8	3.85	3.65	2.9	3.4	3.4	.....
15	4.15	4.45	4.0	4.8	5.2	5.6	3.75	3.9	2.9	3.6	3.4	.....
16	4.2	4.45	.....	4.6	5.2	5.4	3.7	3.85	2.85	3.65	3.4	.....
17	4.2	4.45	4.0	4.7	5.2	5.2	3.65	3.7	2.85	3.6	3.4	.....
18	4.15	.....	4.0	5.0	5.0	5.0	3.6	3.85	2.85	3.5	3.35	.....
19	4.15	.....	4.0	5.0	5.0	5.0	3.55	3.8	2.85	3.5	3.35	.....
20	4.2	.....	.....	.....	5.2	5.2	3.5	3.7	2.85	3.45	3.3	.....
21	4.2	.....	3.1	5.4	5.1	5.0	3.45	3.6	2.8	3.4	3.3	.....
22	4.2	.....	.....	5.4	5.2	5.0	3.45	3.5	2.8	3.4	3.3	.....
23	4.25	.....	3.85	5.4	5.5	4.8	3.45	3.45	2.85	3.4	3.35	.....
24	4.3	.....	.....	4.8	5.8	4.7	3.5	3.45	2.85	3.4	3.4	.....
25	4.3	.....	3.8	4.8	6.5	4.6	3.45	3.35	2.9	3.4	3.4	.....
26	4.25	.....	3.8	4.6	6.4	4.6	4.3	3.3	2.9	3.5	3.4	.....
27	4.0	.....	3.8	4.6	6.8	5.1	3.6	3.25	2.9	3.6	3.4	.....
28	4.0	.....	3.85	4.45	7.5	5.3	3.55	3.25	2.85	3.6	3.4	.....
29	4.15	.....	3.9	4.45	7.6	5.1	3.5	3.2	2.85	3.55	3.4	.....
30	4.0	.....	.....	4.4	7.6	5.0	3.45	3.2	2.85	3.5	3.35	.....
31	4.15	.....	.....	.....	7.5	.....	3.4	3.2	.....	3.5	.....	.....

NOTE.—Gage heights affected by ice Jan. 1 to Apr. 5.

Daily discharge, in second-feet, of Marias River near Shelby, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,160	1,870	6,030	2,300	585	480	265	620	505
2	1,160	1,870	5,880	1,920	585	445	265	620	470
3	1,480	1,810	5,880	1,680	550	445	290	580	470
4	1,590	1,750	5,730	1,680	550	410	290	580	470
5	1,160	1,700	5,280	1,570	550	380	290	580	470
6	1,260	1,640	4,980	1,400	550	380	320	540	470
7	1,240	1,590	4,680	1,300	515	350	350	540	410
8	1,210	1,810	4,460	1,150	550	350	350	540	410
9	1,060	1,810	4,230	1,150	585	320	350	540	470
10	1,210	1,990	4,160	1,150	870	290	350	540	470
11	1,590	1,990	4,230	1,150	915	290	350	540	410
12	1,640	2,420	3,860	1,100	915	290	350	540	410
13	1,640	2,810	3,520	1,050	870	290	480	540	410
14	1,930	2,940	3,380	1,000	825	290	620	540	.....
15	2,220	2,940	3,100	915	1,050	290	780	540	.....
16	1,990	2,940	2,820	870	1,000	265	825	540	.....
17	2,140	2,940	2,560	825	870	265	770	540	.....
18	2,550	2,680	2,300	780	1,000	265	680	505	.....
19	2,580	2,680	2,300	740	960	265	680	505	.....
20	2,870	2,940	2,560	700	870	265	630	470	.....
21	3,160	2,810	2,300	660	780	240	590	470	.....
22	3,190	2,940	2,300	660	700	240	580	470	.....
23	3,210	3,360	2,040	660	660	265	570	505	.....
24	3,790	3,780	1,920	700	660	265	560	540	.....
25	3,800	4,830	1,800	660	585	290	550	540	.....
26	2,170	4,680	1,800	1,460	550	290	630	540	.....
27	2,170	5,280	2,430	780	515	290	710	540	.....
28	1,990	6,330	2,690	740	515	265	700	540	.....
29	1,990	6,480	2,430	700	480	265	660	540	.....
30	1,930	6,480	2,300	660	480	265	620	505	.....
31	.....	6,330	.....	620	480	.....	620	.....	.....

NOTE.—Discharge determined as follows: to Apr. 13, from a rating curve fairly well defined above, and well defined below, 1,800 second-feet; Apr. 14 to 25, by indirect method for shifting channels; Apr. 26 to June 7, from a fairly well-defined rating curve; June 8 to 12 by indirect method for shifting channels; June 13 to Dec. 13, from a fairly well-defined rating curve, Apr. 1 to 4, estimated. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Marias River near Shelby, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	3,800	1,060	2,040	121,000	C.
May	6,480	1,590	3,170	195,000	B.
June	6,030	1,800	3,460	206,000	B.
July	2,300	620	1,060	65,200	B.
August	1,050	480	696	42,800	B.
September	480	240	310	18,400	B.
October	825	265	519	31,900	B.
November	620	470	538	32,000	B.
December 1–13	505	410	450	11,600	B.
The period	.....	.....	.....	724,000	

TWO MEDICINE RIVER AT FAMILY, MONT.

Location.—In the NE. ¼ sec. 2, T. 31 N., R. 9 W., at the Holy Family Mission, 16 miles southeast of Browning, Mont., and about 6 miles above the mouth of Badger Creek, the nearest tributary.

Records available.—April, 1907, to December 31, 1913.

Drainage area.—368 square miles.

Gage.—Overhanging chain gage installed September 18, 1913, on left bank of stream directly back of the mission buildings. The datum of original gage, which was at same site as present gage, was lowered 0.95 foot July 21, 1908. The original chain gage and bench marks were destroyed by flood of June 2, 1913, and on June 10 a staff gage was installed at a different datum on the left bank about 125 feet above site of chain gage. On July 23 this staff gage was removed to location of the chain gage and was set to read 1.85 feet higher than staff gage installed June 10. The present chain gage, installed September 18, was set to read 1.00 foot higher than the staff gage installed July 23 at same site.

Control.—Gravel.

Discharge measurements.—Low-water measurements made by wading at section near the gage; high-water measurements must be made from the old wagon bridge about 3 miles above the mission.

Winter flow.—Affected by ice.

Diversions and storage.—Water is diverted at a point about 2 miles above the gage by a ditch which supplies water for about 100 acres of land on the farm at the Holy Family Mission. The United States Reclamation Service has under construction a project which will use about 200 second-feet of water for irrigating land north of the stream for the Blackfeet Indians. The water will be diverted near the mouth of Little Badger Creek, a small tributary entering from the south above the station. A storage reservoir will be built at Two Medicine Lake near the headwaters of the stream to augment the low-water flow.

Accuracy.—Results good except for winter months.

Discharge measurements of Two Medicine River at Family, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 10	B. E. Jones	[a] 1.88	177	Sept. 18	W. A. Lamb	[d] 1.75	67
June 10[b]	J. B. Stewart	[c] 2.90	1,850	Oct. 22	do	[d] 2.50	178
18[b]	W. A. Lamb	[c] 1.61	1,210	Dec. 22	do	[d] 1.53	38
July 23	do	[d e] 2.79	274				

[a] Gage height on old chain gage.
[b] Measured from bridge 3 miles above gage.
[c] Height on gage established June 10.
[d] Height on gage established Sept. 18.
[e] Height referred to gage established June 10 is −0.06 feet.

Daily gage height, in feet, of Two Medicine River at Family, Mont., for 1913.

[Hugh Neubert, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.3	9.0	1.35	2.65	2.25	1.65	1.95	2.05
2	.....	2.6	9.6	1.35	2.6	2.15	1.65	1.95	2.05
3	.....	2.6	.....	1.15	2.6	2.15	1.65	2.0	2.05
4	.....	2.8	.....	1.15	2.6	2.15	1.65	1.95	2.05
5	.....	2.9	.....	.95	2.8	2.25	1.65	1.85	2.05
6	.....	2.9	.....	.75	2.8	2.25	1.75	1.8	2.05
7	.....	2.95	.....	.75	2.8	2.2	2.2	1.75	2.05
8	.....	2.85	.....	.75	2.9	2.2	2.35	1.75	2.05
9	.....	2.75	.....	.75	3.0	2.2	2.35	1.75	2.05
10	1.88	2.8	2.95	.75	3.0	1.95	2.55	1.75	2.05
11	2.25	2.8	2.95	.6	2.95	1.95	3.0	1.75	2.05
12	2.40	3.9	2.75	.6	3.0	2.25	3.05	1.65	2.05
13	2.34	3.8	2.55	.5	3.0	2.15	3.15	1.65	2.05
14	2.23	3.8	2.35	.5	.....	2.25	3.15	1.65	2.05
15	2.34	3.8	1.95	.4	.....	2.55	3.1	1.65	1.95
16	3.00	3.9	1.85	.2	.....	2.75	3.05	1.65	1.95
17	3.65	3.7	1.75	.2	3.6	.....	3.05	2.45	1.85
18	3.8	3.6	1.75	.1	3.4	1.75	3.0	2.45	1.85
19	3.9	3.7	1.55	.05	3.0	1.8	2.95	2.45	1.85
20	4.0	3.8	1.55	−.05	3.0	1.8	2.95	2.35	1.85
21	4.0	3.8	1.55	−.05	2.6	1.7	2.95	2.35	.....
22	3.6	4.4	1.55	−.05	2.4	2.05	2.95	2.35	1.53
23	3.3	4.8	1.55	2.8	2.4	2.3	2.95	2.25	.....
24	3.4	4.9	1.35	2.8	2.35	1.9	3.0	2.2	.....
25	3.7	5.2	1.35	2.8	2.35	1.85	3.05	2.15	.....
26	4.0	5.5	1.45	2.8	2.3	1.9	3.05	2.15	.....
27	4.0	6.5	1.55	2.8	2.35	1.85	3.05	2.15	.....
28	3.8	7.4	1.55	2.8	2.35	1.85	2.75	2.15	.....
29	3.8	8.2	1.75	2.8	2.35	1.8	2.75	2.15	.....
30	3.8	8.4	1.85	2.75	2.35	1.75	2.25	2.15	.....
31	.....	9.0	.....	2.7	2.35	.....	2.15	.....	.....

NOTE.—Gage record obtained as follows: To June 2, original chain gage; June 10 to July 22, from staff gage installed June 10; after July 22, referred to chain gage installed Sept. 18. Gage heights July 23 to Sept. 16, were observed on staff gage at same location as chain gage installed Sept. 18, and have been referred to that gage.

Daily discharge, in second-feet, of Two Medicine River at Family, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	350	6,220	985	225	132	55	88	102
2	.....	480	6,800	985	210	118	55	88	102
3	.....	480	7,180	873	210	118	55	95	102
4	.....	595	6,220	873	210	118	55	88	102
5	.....	655	5,280	764	270	132	55	75	102
6	.....	655	3,380	660	270	132	65	70	102
7	.....	688	1,830	660	270	125	125	65	102
8	.....	625	1,830	660	305	125	150	65	102
9	.....	565	1,960	660	340	125	150	65	102
10	161	595	1,960	660	340	88	198	65	102
11	302	595	1,960	584	322	88	340	65	102
12	375	1,400	1,830	584	340	132	360	55	102
13	345	1,320	1,700	535	340	118	402	55	102
14	294	1,320	1,580	535	410	132	402	55	102
15	345	1,320	1,330	487	480	198	380	55	88
16	720	1,400	1,270	392	550	255	360	55	88
17	1,190	1,230	1,210	392	625	160	360	172	88
18	1,320	1,150	1,210	346	520	65	340	172	88
19	1,400	1,230	1,100	323	340	70	322	172	88
20	1,490	1,320	1,100	278	340	70	322	150	88
21	1,490	1,320	1,100	278	210	60	322	150	66
22	1,150	1,860	1,100	278	160	102	322	150	43
23	925	2,240	1,100	270	160	140	322	132	.....
24	1,000	2,330	985	270	150	80	340	125	.....
25	1,230	2,620	985	270	150	75	360	118	.....
26	1,490	2,900	1,040	270	140	80	360	118	.....
27	1,490	3,940	1,100	270	150	75	360	118	.....
28	1,320	4,700	1,100	270	150	75	255	118	.....
29	1,320	5,460	1,210	270	150	70	255	118	.....
30	1,320	5,660	1,270	255	150	65	132	118	.....
31	.....	6,220	.....	240	150	.....	118	.....	.....

NOTE.—Discharge determined as follows: Apr. 10 to June 2, from the curve for 1912, which is well defined up to 1,600 second-feet; June 10 to July 22 and July 23 to Dec. 22, from two curves fairly well defined throughout; June 3–9 estimated from information furnished by the observer.

Monthly discharge of Two Medicine River at Family, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 10–31	1,490	161	985	41,000	B.
May	6,220	350	1,850	114,000	B.
June	7,180	985	2,260	134,000	D.
July	985	240	490	30,100	B.
August	625	140	279	17,200	A.
September	255	60	111	6,600	B.
October	402	55	248	15,200	A.
November	172	55	101	6,010	B.
December	102	43	939	4,100	B.
The period	.....	.....	.....	368,000	

BADGER CREEK NEAR FAMILY, MONT.

Location.—In the NE. ¼ sec. 19, T. 31 N., R. 8 W., near the road crossing 4 miles east of Family, Mont.

Records available.—April 20, 1907, to December 31, 1913.

Drainage area.—224 square miles.

Gage.—Chain. The original staff gage, established April 20, 1907, and bench marks were washed out in June, 1908, and a new gage was established July 22, 1908, about 400 feet farther upstream and at a different datum; as the bench mark was also destroyed the relation between the two gages could not be determined. The gage was again washed out on May 25, 1909, and was reset at a different datum and 400 feet below the old Piegan Mission crossing.

Control.—Two channels at both medium and low stages; at high stages the stream flows in several channels.

Discharge measurements.—High-water measurements made from a cable 4 miles above the gage; low-water measurements can be made by wading at the ford above the gage.

Diversions.—The United States Reclamation Service proposes to divert the natural flow of Badger Creek to irrigate land in the eastern part of the Blackfeet Indian Reservation north of Birch Creek.

Accuracy.—High-water measurements are only fair; low-water records good.

Discharge measurements of Badger Creek near Family, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 10	B. E. Jones	[a] 3.93	141	July 23	W. A. Lamb	4.05	207
June 11	J. B. Stewart	5.34	1,090	Oct. 22	do	3.88	162
18	W. A. Lamb	4.99	690	Dec. 22	do	[a] 3.28	33

[a] Ice present.

Daily gage height, in feet, of Badger Creek near Family, Mont., for 1913.

[Oliver J. Racine, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.5	5.65	4.6	3.85	3.8	3.7	3.85
2	.....	4.5	5.6	4.55	3.8	3.8	3.7	3.85
3	.....	4.45	5.65	4.55	3.8	3.8	3.65	3.9
4	.....	4.4	5.6	.....	3.85	3.8	.....	3.85
5	.....	4.4	5.6	4.55	3.8	3.8	3.7	3.85
6	.....	4.4	5.6	4.4	3.8	3.8	3.75	3.8
7	.....	4.3	5.6	4.45	3.85	3.8	3.7	3.8
8	.....	4.35	5.55	4.4	3.9	3.75	3.8	3.8
9	.....	4.3	5.45	4.35	3.8	3.75	3.8	3.8
10	.....	4.3	5.35	4.35	3.9	3.7	3.7	3.8
11	.....	5.05	5.3	4.3	3.9	3.7	3.7	3.8
12	.....	4.9	5.3	4.25	3.9	3.7	3.8	3.8
13	4.8	4.9	5.25	4.3	3.9	3.7	3.75	3.75
14	4.8	4.9	5.2	4.35	3.85	3.7	3.8	3.75
15	4.75	4.85	5.2	4.4	3.85	3.7	3.8	3.8
16	4.75	4.9	5.2	4.35	3.8	3.7	3.8	3.8
17	4.75	5.05	4.95	4.2	3.9	3.7	3.85	3.8
18	4.7	5.0	4.95	4.15	3.85	3.7	3.9	3.8
19	4.7	5.05	4.05	4.15	3.85	3.7	3.9	3.8
20	4.7	5.15	4.15	4.1	3.85	3.7	3.9	3.8
21	4.7	5.2	4.2	4.1	3.85	3.7	3.9	3.8
22	4.7	5.1	4.75	4.1	3.85	3.7	3.9	.....
23	4.65	5.35	4.8	4.1	3.9	3.7	3.9	.....
24	4.6	5.45	4.7	4.1	3.9	3.7	3.9	.....
25	4.6	5.55	4.75	4.1	3.9	3.7	3.95	.....
26	4.6	5.7	4.85	4.05	3.9	3.7	4.0	.....
27	4.6	5.85	4.75	4.05	3.9	3.7	4.05	.....
28	4.6	5.75	4.7	4.0	3.9	3.7	4.05	.....
29	4.55	5.75	4.6	3.95	3.85	3.7	4.0	.....
30	4.55	5.7	4.6	3.95	3.8	3.7	4.0	.....
31	.....	5.7	.....	3.9	3.85	.....	3.95	.....

Daily discharge, in second-feet, of Badger Creek near Family, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	366	1,500	416	158	147	129	158
2	.....	366	1,430	391	147	147	129	158
3	.....	344	1,500	391	147	147	122	168
4	.....	322	1,430	391	158	147	126	158
5	.....	322	1,430	391	147	147	129	158
6	.....	322	1,430	322	147	147	138	147
7	.....	283	1,430	344	158	147	129	147
8	.....	302	1,360	322	168	138	147	147
9	.....	283	1,230	302	147	138	147	147
10	141	283	1,100	302	168	129	129	147
11	274	761	1,040	283	168	129	129	147
12	408	621	1,040	266	168	129	147	147
13	542	621	978	283	168	129	138	138
14	542	621	920	302	158	129	147	138
15	508	582	920	322	158	129	147	147
16	508	621	920	302	147	129	147	147
17	508	761	666	249	168	129	158	147
18	474	711	666	234	158	129	168	147
19	474	761	206	234	158	129	168	147
20	474	866	234	219	158	129	168	147
21	474	920	249	219	158	129	168	147
22	474	811	508	219	158	129	168	.....
23	445	1,100	542	219	168	129	168	.....
24	416	1,230	474	219	168	129	168	.....
25	416	1,360	508	219	168	129	180	.....
26	416	1,560	582	206	168	129	192	.....
27	416	1,780	508	206	168	129	206	.....
28	416	1,640	474	192	168	129	206	.....
29	391	1,640	416	180	158	129	192	.....
30	391	1,560	416	180	147	129	192	.....
31	.....	1,560	.....	168	158	.....	180	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Apr. 10 from current-meter measurement. Discharge interpolated for days for which gage heights are missing. Discharge Nov. 22–30 estimated at 135 second-feet.

Monthly discharge of Badger Creek near Family, Mont., for 1913.

[Drainage area, 224 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 10–30	542	141	434	1.94	1.51	18,100	B.
May	1,780	283	816	3.64	4.20	50,100	B.
June	1,500	206	870	3.88	4.33	51,800	B.
July	416	168	274	1.22	1.41	16,800	B.
August	168	147	159	.710	.82	9,780	B.
September	147	129	134	.598	.67	7,970	B.
October	206	122	157	.701	.81	9,650	B.
November	168	.....	145	.647	.72	8,630	C.
The period	.....	.....	.....	.....	.....	173,000	

CUT BANK CREEK AT CUT BANK, MONT.

Location.—In the SW. ¼ SW. ¼ sec. 1, T. 33 N., R. 6 W., half a mile west of Cut Bank, at the Great Northern Railway bridge, 12 miles above the mouth of Two Medicine River.

Records available.—August 4, 1905, to December 31, 1913.

Drainage area.—971 square miles.

Gage.—A staff gage installed August 31, 1911, at a new section 200 yards above the original gage, which was an overhanging chain gage on left bank.

Control.—Gravel; shifts in flood.

Discharge measurements.—At high stages made from a cable 300 yards below gage; low-stage measurements made by wading.

Winter flow.—Affected by ice.

Diversions.—The intake of the Great Northern Railway's pumping station is situated 100 feet below the gage; the average quantity pumped is about 14,000 gallons an hour for 18 hours a day, equivalent to a continuous flow of 0.4 second-foot.

Accuracy.—Results as a whole are good.

Discharge measurements of Cut Bank Creek at Cut Bank, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 27	W. A. Lamb	4.81	300	Aug. 1	J. M. Ray	4.40	141
28	J. B. Stewart	4.90	386	Oct. 27	W. A. Lamb	4.28	98
June 12	do	5.50	824	Dec. 22[a]	do	4.40	18
19	W. A. Lamb	5.05	437				

[a] Ice at gage.

Daily gage height, in feet, of Cut Bank Creek at Cut Bank, Mont., for 1913.

[Gladys Ferris and Edward Freed, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.70	5.7	5.10	4.40	4.20	4.00	4.30
2	.....	4.65	5.75	5.05	4.40	4.20	4.00	4.25
3	.....	4.65	5.7	5.00	4.40	4.20	4.00	4.25
4	.....	4.70	5.7	4.90	4.38	4.18	4.10	4.25
5	.....	4.68	5.60	4.90	4.38	4.18	4.10	4.20
6	.....	4.62	5.55	4.90	4.35	4.18	4.12	4.20
7	.....	4.65	5.48	4.90	4.30	4.15	4.12	4.20
8	.....	4.70	5.40	4.85	4.30	4.15	4.12	4.20
9	.....	4.70	5.40	4.70	4.35	4.12	4.10	4.20
10	.....	4.68	5.38	4.70	4.35	4.10	4.10	4.20
11	5.65	4.68	5.40	4.70	4.40	4.10	4.10	4.20
12	.....	4.68	5.38	4.70	4.40	4.10	4.15	4.15
13	.....	4.75	5.32	4.70	4.50	4.10	4.15	4.15
14	.....	4.88	5.28	4.68	4.50	4.10	4.20	4.15
15	.....	4.88	5.20	4.65	4.50	4.10	4.25	4.20
16	.....	4.90	5.15	4.65	4.50	4.10	4.25	4.20
17	3.85	4.90	5.12	4.60	4.45	4.10	4.30	4.20
18	3.80	4.90	5.05	4.58	4.45	4.10	4.30	4.20
19	3.75	4.95	5.00	4.55	4.40	4.08	4.30	4.20
20	3.75	4.92	5.10	4.55	4.35	4.08	4.30	4.20
21	3.80	4.90	5.18	4.55	4.30	4.05	4.30	4.20
22	3.85	4.92	5.10	4.58	4.30	4.05	4.30	4.18
23	3.70	4.98	5.02	4.58	4.30	4.05	4.30	4.15
24	3.65	5.20	5.00	4.55	4.25	4.00	4.30	4.15
25	3.65	5.32	5.00	5.80	4.25	4.00	4.30	4.15
26	3.60	5.50	5.08	4.55	4.28	4.00	4.30	4.20
27	4.8	5.65	5.20	4.55	4.20	4.00	4.30	4.20
28	4.9	5.8	5.28	4.55	4.20	4.00	4.30	.....
29	4.90	5.9	5.15	4.48	4.20	4.00	4.30	.....
30	4.88	5.85	5.35	4.48	4.20	4.00	4.30	.....
31	.....	5.8	.....	4.55	4.20	.....	4.30	.....

NOTE.—Gage heights Apr. 17–26 referred to the old chain gage. Gage height July 25 probably erroneous.

Daily discharge, in second-feet, of Cut Bank Creek at Cut Bank, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	255	1,060	485	135	80	40	105
2	.....	232	1,120	450	135	80	40	92
3	.....	232	1,060	415	135	80	40	92
4	.....	255	1,060	355	129	76	60	92
5	.....	246	935	355	129	76	60	80
6	.....	219	880	355	120	76	64	80
7	.....	232	805	355	105	70	64	80
8	.....	255	725	330	105	70	64	80
9	.....	255	725	255	120	64	60	80
10	.....	246	708	255	120	60	60	80
11	995	246	725	255	135	60	60	80
12	930	246	708	255	135	60	70	70
13	860	280	657	255	170	60	70	70
14	790	345	624	246	170	60	80	70
15	725	345	560	232	170	60	92	80
16	660	355	522	232	170	60	92	80
17	596	355	500	210	152	60	105	80
18	543	355	450	202	152	60	105	80
19	494	385	415	190	135	56	105	80
20	494	367	485	190	120	56	105	80
21	543	355	545	190	105	50	105	80
22	596	367	485	202	105	50	105	76
23	445	403	429	202	105	50	105	70
24	406	560	415	190	92	40	105	70
25	406	657	415	305	92	40	105	70
26	367	825	471	190	100	40	105	80
27	305	995	560	190	80	40	105	80
28	355	1,180	624	190	80	40	105	80
29	355	1,330	522	163	80	40	105	70
30	345	1,260	682	163	80	40	105	70
31	.....	1,180	.....	190	80	.....	105	.....

NOTE.—Discharge determined as follows: Apr. 11, from gage height corrected for effect of ice; Apr. 11–16, interpolated; Apr. 17–26, from rating curve for the chain gage, applicable Mar. 8 to Nov. 19, 1910, and poorly defined for 1913; Apr. 27 to Nov. 27, from a fairly well-defined rating curve; Nov. 28–30, estimated. Gage height July 25 probably erroneous; discharge estimated.

Monthly discharge of Cut Bank Creek at Cut Bank, Mont., for 1913.

[Drainage area, 971 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 11–30	995	305	560	0.577	0.43	22,200	C.
May	1,330	219	478	.492	.57	29,400	B.
June	1,120	415	662	.682	.76	39,400	B.
July	485	163	260	.268	.31	16,000	B.
August	170	80	121	.125	.14	7,440	B.
September	80	40	58.5	.060	.07	3,480	B.
October	105	40	83.6	.086	.10	5,140	B.
November	105	70	79.2	.082	.09	4,710	B.
The period	.....	.....	.....	.....	.....	128,000	

BIRCH CREEK AT SWIFT DAM, NEAR DUPUYER, MONT.

Location.—At Swift dam, about 20 miles west of Dupuyer, Mont.

Records available.—March 26 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff on left bank, immediately below dam, was used during the high water, June 5 to July 16; before and after this period a vertical staff on the right bank about one-fourth mile below.

Control.—Gravelly and shifting.

Discharge measurements.—Made from a foot log at high stages and by wading during normal periods.

Winter flow.—Probably affected by ice.

Diversions.—None above station.

Regulation.—Flow affected by operation of Swift dam during the high-water period of 1913.

Discharge measurements of Birch Creek at Swift dam, near Dupuyer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec-ft.*
Mar. 13	R. O. Crawford	0.34	49	July 10	L. B. Crossan	New 1.10	212
Apr. 5	C. S. Heidel	.33	49			1.00	
16	L. B. Crossan	.90	170	25	Heidel and Crossan	New .87	125
May 2	R. O. Crawford	.90	165			.80	
8	L. B. Crossan	.85	139	Aug. 28	L. B. Crossan	New .78	104
15	do	1.45	324			.66	
June 5	C. S. Heidel	New 2.25	815	Sept. 10	do	.58	83
		2.40		Oct. 18	W. S. Merrill	.70	99
13	R. O. Crawford	New 1.88	519	Dec. 4	do	.55	71
		1.90					
24	Crawford and Crossan	New 1.33	282				
		1.35					

NOTE.—The gage heights designated "New" refer to the newer or upper gage from which daily gage heights were taken June 5 to July 16.

Daily gage height, in feet, of Birch Creek at Swift dam, near Dupuyer, Mont., for 1913.

[W. J. Bridgeman et al., observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.32	1.0	2.75	1.35	0.70	0.64	0.50	0.73	0.54
2	.....	.35	.95	2.7	1.3	.78	.62	.50	.76	.58
3	.....	.35	.95	2.6	1.3	.75	.61	.50	.71	.58
4	.....	.35	.95	.....	1.2	.72	.60	.52	.71	.56
5	.....	.38	.83	2.2	1.15	.77	.60	.53	.72	.52
6	.....	.38	.81	2.1	1.2	.72	.59	.58	.70	.52
7	.....	.34	.86	2.0	1.15	.67	.59	.57	.68	.52
8	.....	.35	.83	2.1	1.1	.82	.60	.54	.68	.52
9	.....	.41	.86	2.1	1.1	1.0	.58	.53	.68	.52
10	.....	.45	1.3	2.1	1.1	1.1	.58	.54	.70	.50
11	.....	.53	1.4	2.0	1.05	.94	.58	.64	.69	.50
12	.....	.68	1.4	1.25	1.0	.89	.57	.97	.69	.50
13	.....	.81	1.45	1.9	1.0	.86	.56	1.05	.68	.50
14	.....	.91	1.45	1.85	1.0	.90	.56	.94	.67	.49
15	.....	.91	1.5	1.7	.98	.86	.55	.81	.63	.48
16	.....	.91	1.3	1.6	.96	.82	.54	.77	.64	.48
17	.....	.91	1.35	1.6	.89	.80	.54	.72	.66	.48
18	.....	1.0	1.4	1.6	.84	.86	.53	.70	.64	.47
19	.....	1.2	1.3	1.6	.84	.81	.56	.68	.61	.46
20	.....	1.35	1.4	1.6	.86	.79	.53	.68	.62	.40
21	.....	1.35	1.55	1.5	.84	.78	.54	.71	.60	.38
22	.....	1.3	1.75	1.4	.85	.74	.56	.72	.60	.40
23	.....	1.15	2.0	1.4	.82	.72	.55	.78	.60	.49
24	.....	1.05	2.25	1.35	.81	.70	.54	.98	.60	.50
25	.....	1.05	2.35	1.35	.79	.70	.53	.92	.60	.48
26	0.25	1.15	2.5	1.3	.82	.69	.54	.86	.58	.48
27	.25	1.25	2.8	1.6	.76	.68	.54	.86	.56	.48
28	.30	1.2	2.85	1.5	.76	.67	.54	.78	.55	.48
29	.30	1.15	2.85	1.45	.78	.66	.52	.78	.57	.45
30	.30	1.05	2.85	1.4	.74	.66	.52	.76	.54	.46
31	.30	.....	2.75	.....	.72	.64	.....	.74	.....	.48

NOTE.—Gage heights June 5 to July 16 read on upper gage, about one-fourth mile above regular gage. This upper gage was established June 5, because of the unsatisfactory overflow conditions at the regular gage; but at low water the upper-gage section is very poor because it is wide and irregular, so the readings could not be taken there except at medium and high stages.

Daily discharge, in second-feet, of Birch Creek at Swift dam, near Dupuyer, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	46	180	1,110	290	108	96	70	115	77
2	.....	50	168	1,060	270	126	92	70	121	84
3	.....	50	168	970	270	119	90	70	110	84
4	.....	50	142	870	235	112	88	74	110	81
5	.....	54	138	770	218	123	88	75	112	74
6	.....	54	132	670	235	112	86	84	108	74
7	.....	49	145	590	218	102	86	83	104	74
8	.....	50	138	670	200	135	88	77	104	74
9	.....	57	145	670	200	180	84	75	104	74
10	.....	63	268	670	200	208	84	77	108	70
11	.....	75	304	590	185	165	84	96	106	70
12	.....	104	304	560	170	152	83	172	106	70
13	.....	132	324	530	170	145	81	194	104	70
14	.....	158	324	505	170	155	81	165	102	69
15	.....	158	344	435	164	145	79	132	94	67
16	.....	158	268	390	158	135	77	123	96	67
17	.....	158	286	390	152	130	77	112	100	67
18	.....	180	304	390	140	145	75	108	96	66
19	.....	236	261	390	140	132	81	104	90	64
20	.....	286	304	390	145	128	75	104	92	56
21	.....	286	364	350	140	126	77	110	88	54
22	.....	268	451	310	142	117	81	112	88	56
23	.....	222	570	310	135	112	79	126	88	69
24	.....	194	710	290	132	108	77	175	88	70
25	.....	194	775	290	128	108	75	160	88	67
26	39	222	890	270	135	106	77	145	84	67
27	39	252	1,160	390	121	104	77	145	81	67
28	44	236	1,210	350	121	102	77	126	79	67
29	44	222	1,210	330	126	100	74	126	83	63
30	44	194	1,210	310	117	100	74	121	77	64
31	44	.....	1,110	.....	112	96	.....	117	.....	67

NOTE.—Discharge determined from two well-defined rating curves, one applicable June 5 to July 16, and the other for the remainder of the year. The use of two curves is due to the fact that two gages are read and not to a change in channel. (See footnote to daily gage heights.) Discharge interpolated June 4.

Monthly discharge of Birch Creek at Swift dam, near Dupuyer, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 26-31	44	39	42.3	503	A.
April	286	46	149	8,870	A.
May	1,210	132	462	28,400	A.
June	1,110	270	527	31,400	A.
July	290	112	172	10,600	A.
August	208	96	127	7,810	A.
September	96	74	81.4	4,840	A.
October	194	70	114	7,010	A.
November	121	77	97.5	5,800	A.
December	84	54	69.1	4,250	B.
The period	.....	.....	.....	109,000	

NOTE.—Accuracy for December reduced because a discharge measurement Jan. 3, 1914, plotted 0.05 foot from the curve, at a discharge of 56 second-feet, caused by presence of ice.

BIRCH CREEK NEAR DUPUYER, MONT.

Location.—In sec. 28, T. 29 N., R. 8 W., at Shield's ranch, 12 miles northwest of Dupuyer, Mont., and about 25 miles above the junction of Birch Creek with Two Medicine River.

Records available.—July 25, 1907, to December 31, 1913.

Drainage area.—186 square miles. (Revised from 155 square miles.)

Gage.—Chain gage and a Bristol automatic. A temporary staff gage was put in July 23, 1908, about 200 feet below the site of the original gage, which had been washed out by the high water of June, 1908. The temporary gage was used until October 1, 1908, when a permanent chain gage was installed at a point about one-fourth mile farther upstream. A Bistol automatic gage was installed April 1, 1911, but the chain gage is still read daily.

Control.—Shifts at high stages.

Discharge measurements.—Made from a car and cable three-fourths miles below the gage; low-stage measurements made by wading just below the cable section.

Winter flow.—Affected by ice.

Diversions.—A number of ditches divert water for irrigation. The largest of these, owned by the Conrad Investment Co., diverts water about half a mile below the station.

Cooperation.—Gage heights and discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Birch Creek near Dupuyer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 15	R. O. Crawford	[a] 5.67	55	June 27	L. B. Crossan	6.10	550
Feb. 17	do	[a] 6.56	100	July 2	do	5.59	310
Mar. 5	do	[a] 6.05	71	8	do	5.40	247
11	do	[a] 5.97	87	14	R. O. Crawford	5.16	201
Apr. 4	do	[a] 6.00	95	22	L. B. Crossan	5.00	173
16	do	5.06	202	Aug. 7	do	4.85	143
25	L. B. Crossan	5.11	205	12	do	5.08	186
May 2	do	5.01	199	19	R. M. Templeton	5.05	180
7	do	4.93	184	19	L. B. Crossan	5.05	186
16	R. O. Crawford	5.55	342	26	do	4.84	130
20	L. B. Crossan	5.43	304	Sept. 5	R. O. Crawford	4.73	107
22	do	5.78	438	10	do	4.70	95
23	R. O. Crawford	6.09	583	17	L. B. Crossan	4.63	79
24	L. B. Crossan	6.17	630	27	Templeton and Merrill	4.67	96
June 5	C. S. Heidel	6.71	839	Oct. 15	W. S. Merrill	5.00	170
12	R. O. Crawford	6.31	671	Dec. 4	do	4.83	76
20	L. B. Crossan	5.89	440	11	Templeton and Merrill	4.60	92
23	do	5.70	345				

[a] Ice present.

Daily gage height, in feet, of Birch Creek near Dupuyer, Mont., for 1913.

[L. G. Kepple, observer.]

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

NOTE.—Jan. 1 to Apr. 8 and Dec. 2-31, gage heights affected by ice.

Daily discharge, in second-feet, of Birch Creek near Dupuyer, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	221	1,080	335	143	122	90	143	112
2	.....	233	1,200	315	143	112	90	143	.....
3	.....	221	940	295	176	112	90	132	.....
4	.....	186	860	280	176	112	112	132	.....
5	.....	175	784	275	143	112	101	132	.....
6	.....	175	740	270	188	112	101	143	.....
7	.....	186	740	260	176	112	101	132	.....
8	.....	198	760	245	176	112	101	122	.....
9	94	198	790	220	250	112	90	122	.....
10	94	221	760	225	294	112	90	122	.....
11	119	310	710	230	224	101	101	122	.....
12	136	325	720	220	200	101	122	132	.....
13	167	342	610	225	200	101	188	122	.....
14	200	325	610	200	200	90	200	122	.....
15	210	325	550	200	188	90	165	122	.....
16	200	342	485	200	188	90	165	122	.....
17	190	325	455	188	176	90	143	122	.....
18	210	325	425	176	176	90	132	122	.....
19	247	342	425	176	176	101	132	122	.....
20	285	325	400	176	154	90	132	112	.....
21	330	342	395	176	154	90	143	112	.....
22	330	490	350	176	154	90	143	112	.....
23	295	590	355	165	143	90	143	112	.....
24	215	640	320	154	143	101	165	101	.....
25	215	800	305	154	143	101	188	101	.....
26	215	910	305	154	132	90	188	101	.....
27	265	1,080	560	154	132	90	176	101	.....
28	270	1,200	410	154	122	90	165	101	.....
29	221	1,200	365	154	122	90	154	112	.....
30	233	1,080	360	143	122	90	154	112	.....
31	.....	1,080	.....	143	122	.....	143	.....	.....

NOTE.—Discharge determined as follows: Apr. 9–16, from a poorly defined rating curve; Apr. 17–28, by indirect method for shifting channels; Apr. 29 to June 2, from a fairly well-defined rating curve; June 3 to July 13, by indirect method for shifting channels; July 14 to Dec. 1, from a fairly well-defined rating curve; Apr. 1–8, estimated at 85 second-feet. Discharge interpolated for days for which gage heights are missing. A measurement Jan. 1, 1914, which showed a discharge of 103 second-feet, was used in making the estimates for December.

Monthly discharge of Birch Creek near Dupuyer, Mont., for 1913.

[Drainage area, 186 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	.....	.....	[a]60	0.323	0.37	3,690	D.
February	.....	.....	[a]72	.387	.40	4,000	D.
March	.....	.....	[a]76	.409	.47	4,670	D.
April	330	.....	181	.973	1.09	10,800	C.
May	1,200	175	475	2.55	2.94	29,200	B.
June	1,200	305	592	3.18	3.55	35,200	B.
July	335	143	208	1.12	1.29	12,800	B.
August	294	122	169	.909	1.05	10,400	B.
September	122	90	99.9	.537	.60	5,940	B.
October	200	90	136	.731	.84	8,360	B.
November	143	101	120	.645	.72	7,140	B.
December	.....	.....	[b]95	.511	.59	5,840	C.
The year	1,200	.....	191	1.03	13.91	138,000	

[a] Estimated by Mr. Crawford, hydrographer for the Valier-Montana Land & Water Co.
[b] Estimated by the engineers of the United States Geological Survey.

BIRCH CREEK AT HALL'S RANCH, NEAR DUPUYER, MONT.

Location.—At Hall's ranch, about 4 miles below the headgates of the "B" canal of the Valier Carey project. The station called "Birch Creek near Dupuyer" is situated a short distance above these headgates.

Record available.—May 16 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Channel.—Gravelly and shifting.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—Greater part of flow diverted above station for irrigation.

Discharge measurements of Birch Creek at Hall's ranch, near Dupuyer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 3	C. S. Heidel	[a] 1.10	64	July 11	L. B. Crossan	.50	22.7
15	L. B. Crossan	1.60	186	25	do	.60	31.4
May 3	R. O. Crawford and L. B. Crossan	1.65	188	Aug. 7	do	.70	46
6	L. B. Crossan	1.42	168	12	do	1.06	103
16	R. O. Crawford	2.00	352	Sept. 5	R. O. Crawford	0.25	5.42
21	L. B. Crossan	1.84	274	12	Crossan and Crawford	.23	5.88
June 6	C. S. Heidel	1.95	313	17	L. B. Crossan	.15	4.39
20	L. B. Crossan	.41	16.6	27	Templeton and Merrill	[b] 0.81	3.57
26	do	.31	8.7	Oct. 15	W. S. Merrill	1.48	154
				Dec. 3	do	1.20	103

[a] Ice present. [b] Back water from a small irrigation dam affected gage height.

Daily gage height, in feet, of Birch Creek at Hall's ranch, near Dupuyer, Mont., for 1913.

[John Hall and John Ryan, observers.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		2.8	0.45	0.5	0.4		1.40	1.20
2		2.75	.35	.55	.3		1.37	1.15
3		2.5	.3	.6	.3	0.57	1.35	1.10
4		2.2	.3	.6	.25	.64	1.33	1.15
5		2.1	.3	.8	.25	.62	1.31	1.18
6		1.8	.3	.8	.2	.60	1.30	1.20
7		1.5	.2	.95	.1	.60	1.30	1.18
8		1.7	.2	1.0	.1	1.10	1.29	1.15
9		1.6	.8	1.1	.1	1.11	1.29	1.12
10		2.0	.6	1.2	.1	1.11	1.29	1.10
11		1.75	.5	1.1	.1	1.40	1.30	1.10
12		1.6	.5	1.1	.1	1.42	1.30	1.09
13		1.45	.4	1.2	.0	1.50	1.25	1.08
14		1.4	.35	1.25	.0	1.60	1.22	1.08
15		1.0	.4	1.2	.1	1.48	1.20	1.16
16	2.0	.75	.4	1.3	.1	1.38	1.20	1.26
17	2.3	.6	.4	1.1	.15	1.31	1.20	1.35
18	2.0	.4	.3	1.2	.2	1.20	1.20	1.35
19	1.95	.3	.3	.9	.2	1.27	1.20	1.35
20	2.0	.4	.3	.85	.3	1.27	1.19	1.36
21	1.85	.4	.3	.8	.25	1.27	1.19	1.36
22	1.7	.3	.3	.8	.3	1.27	1.20	1.54
23	2.2	.3	.3	.7	.35	1.27	1.22	1.82
24	2.3	.4	.4	.65	.35	1.37	1.21	2.05
25	2.5	.4	.5	.6	.35	1.50	1.20	1.97
26	2.7	.3	.6	.6	.35	1.45	1.23	1.86
27	3.0	.3	.6	.5		1.40	1.25	1.79
28	3.3	.6	.6	.45		1.38	1.27	1.72
29	3.15	.6	.65	.4		1.37	1.29	1.68
30	3.1	.4	.5	.4		1.38	1.29	1.65
31	2.9		.5	.4		1.39		1.62

NOTE.—Gage heights Dec. 22 to 31 affected by ice.

Daily discharge, in second-feet, of Birch Creek at Hall's ranch, near Dupuyer, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	660	19	23	15	10	140	100
2	.....	635	12	28	8	15	134	92
3	.....	530	8	32	8	17	130	85
4	.....	410	8	32	6	24	126	92
5	.....	370	8	58	6	22	122	97
6	.....	270	8	58	5	20	120	100
7	.....	190	5	81	3	20	120	97
8	.....	240	5	89	3	85	118	92
9	.....	215	58	105	3	86	118	88
10	.....	330	32	125	3	86	118	85
11	.....	255	23	105	3	140	120	85
12	.....	215	23	105	3	144	120	84
13	.....	178	15	125	2	160	110	82
14	.....	165	12	135	2	180	104	82
15	.....	89	15	125	3	156	100	94
16	330	51	15	145	3	136	100	112
17	450	32	15	105	4	122	100	130
18	330	15	8	125	4	118	100	130
19	315	8	8	73	4	114	100	130
20	330	15	8	66	4	114	98	132
21	285	15	8	58	4	114	98	132
22	240	8	8	58	4	114	100	.....
23	410	8	8	44	4	114	104	.....
24	450	15	15	38	4	134	102	.....
25	530	15	23	32	4	160	100	.....
26	610	8	32	32	4	150	106	.....
27	760	8	32	23	4	140	110	.....
28	910	32	32	19	4	136	114	.....
29	835	32	38	15	4	134	118	.....
30	810	15	23	15	4	136	118	.....
31	710	.....	23	15	.....	138	.....	.....

NOTE.—Discharge determined as follows: To Sept. 17, from a rating curve well defined below 400 second-feet; Sept. 18 to Oct. 2, estimated from measurements; Oct. 3 to Dec. 21, from a fairly well defined rating curve; Dec. 22–31, estimated at 90 second-feet from the discharge Dec. 21, and a measurement Jan. 1, 1914, which gave a discharge of 64 second-feet.

Monthly discharge of Birch Creek at Hall's ranch, near Dupuyer, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 16–31	910	240	519	16,500	C.
June	660	8	168	10,000	B.
July	58	5	17.6	1,080	B.
August	145	15	67.4	4,140	B.
September	15	2	4.4	262	C.
October	180	10	104	6,400	B.
November	140	98	112	6,660	B.
December	.....	.....	97.5	6,000	C.
The period	.....	.....	.....	51,000	

NOTE.—Accuracy for July and August reduced on account of the large daily fluctuation as shown by comparison of observer's and hydrographer's readings for those months.

DUPUYER CREEK NEAR VALIER, MONT.

Location.—In the NE. ¼ NW. ¼ sec. 33, T. 29 N., R. 6 W., at Cowell ranch, about 11 miles northwest of Valier; about 1,000 feet above a large diversion dam at the head of the canal from Dupuyer Creek to Lake Francis reservoir. The Birch Creek canal enters Dupuyer Creek below the gaging station and above the diversion dam.

Records available.—July 17 to 31, 1912; August 15, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—A standard chain gage an a Bristol automatic at the same section.

Control.—Shifts slightly.

Discharge measurements.—Made from a cable at high stages and by wading at medium and low stages.

Winter flow.—Affected by ice.

Diversions.—Numerous water appropriations recorded but many of the rights have never been used.

Accuracy.—Conditions good for obtaining accurate discharge data.

Cooperation.—Gage heights and most of the discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Dupuyer Creek near Valier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 28	R. O. Crawford	[a] 3.96	22	June 19	L. B. Crossan	2.92	68
Feb. 18	do	[a] 4.34	28	27	do	3.62	263
Mar. 3	do	[a] 3.93	28	July 1	Crossan and Crawford	3.08	98
Apr. 5	C. S. Heidel	[a] 3.94	95	7	L. B. Crossan	2.86	56
7	do	[a] 3.57	107	15	R. O. Crawford	2.72	40
17	R. O. Crawford	3.19	112	18	L. B. Crossan	2.66	31
26	L. B. Crossan	3.01	80	Aug. 8	do	2.64	31
May 3	do	3.04	86	15	do	2.74	42
9	do	2.97	75	18	do	2.70	35
15	R. O. Crawford	3.03	90	30	do	2.45	11.8
20	L. B. Crossan	3.32	152	Sept. 12	Crossan and Crawford	2.41	10.5
23	do	3.41	178	18	L. B. Crossan	2.32	9.49
June 6	C. S. Heidel	3.36	156	Oct. 1	W. S. Merrill	2.47	13.8
10	L. B. Crossan	3.30	150	Dec. 16	do	2.72	28

[a] Ice present.

Daily gage height, in feet, of Dupuyer Creek near Valier, Mont., for 1913.

[C. E. Crocker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.9	3.9	3.8	2.97	3.5	3.1	2.58	2.45	2.42	2.81	2.61
2	3.45	3.9	3.9	3.7	3.05	3.5	3.05	2.57	2.43	2.42	2.80	2.52
3	3.45	3.8	.....	3.7	3.05	3.5	2.99	2.57	2.42	2.41	2.78	.....
4	3.4	3.8	4.0	3.7	3.05	3.45	.....	2.55	2.40	.....	2.89	2.69
5	3.45	3.8	4.1	3.7	3.05	3.4	2.84	2.60	.....	2.68	2.84	.....
6	.....	4.1	4.1	3.8	.....	3.35	2.90	2.60	2.39	2.61	2.84	2.72
7	3.5	4.2	4.0	3.6	2.91	3.35	2.88	2.55	2.41	2.56	2.89	2.80
8	3.45	4.2	4.2	3.6	3.00	3.3	2.83	.....	2.40	2.60	2.80	2.78
9	.....	4.2	4.0	.....	2.98	3.35	2.84	2.72	2.40	2.62	2.72	.....
10	3.6	4.2	4.0	3.6	2.98	3.3	2.77	2.79	2.40	.....	2.76	2.83
11	3.6	.....	4.2	3.1	2.98	3.25	2.78	2.74	2.40	2.81	.....	2.80
12	3.6	4.1	.....	.....	2.95	3.25	2.76	2.68	2.40	2.93	2.72	2.74
13	3.45	3.9	3.8	3.15	3.05	3.2	2.74	2.66	.....	2.99	2.85	2.79
14	3.6	3.8	3.6	3.2	3.05	3.15	2.74	2.94	2.39	2.95	2.75	2.83
15	3.9	4.2	3.8	3.25	3.05	3.15	2.73	2.78	2.39	2.87	2.80	2.80
16	3.8	4.2	3.7	3.2	3.0	2.99	2.71	2.68	2.38	2.82	2.71	2.72
17	3.8	4.2	3.7	3.2	3.0	2.99	2.69	2.63	2.38	2.80	2.67	.....
18	.....	.....	3.6	3.15	3.1	2.97	2.68	2.65	2.37	2.76	2.65	2.52
19	3.8	4.2	3.5	3.15	3.45	2.92	2.63	2.62	2.38	2.74	2.68	2.58
20	3.8	4.1	3.6	3.2	3.3	3.05	2.63	2.62	.....	2.77	2.65	.....
21	3.8	4.1	3.7	3.2	3.25	2.94	2.62	.....	2.40	.....	.....	2.77
22	3.9	4.2	3.7	3.2	3.25	2.89	2.62	2.59	2.40	2.72	2.70	.....
23	3.9	4.0	3.7	3.1	3.35	2.89	2.63	.....	2.54	2.80	2.62	.....
24	.....	4.0	3.6	3.05	3.5	2.84	2.61	2.56	2.51	2.79	2.72	.....
25	3.9	3.9	3.5	3.05	3.5	.....	2.60	2.53	2.52	2.76	2.79	.....
26	3.9	3.8	3.45	3.0	3.6	2.94	2.63	2.51	2.51	2.78	2.68	.....
27	.....	3.8	3.45	3.1	3.6	3.6	2.66	2.51	.....	2.80	2.82	.....
28	3.9	3.8	3.45	3.15	3.7	3.45	2.62	2.50	2.45	2.78	2.83	.....
29	3.9	.....	3.6	3.05	3.7	3.25	2.60	2.48	.....	2.80	2.40	.....
30	3.9	.....	3.8	3.05	3.6	3.15	2.62	2.48	2.42	2.81	2.73	.....
31	4.0	.....	3.7	.....	3.6	.....	2.60	2.48	.....	2.78	.....	.....

NOTE.—Gage heights Jan. 1 to Apr. 10 and Nov. 27 to Dec. affected by ice. The results of the Bristol automatic gage in operation at this station were not very satisfactory and have not been used in obtaining daily gage heights.

Daily discharge, in second-feet, of Dupuyer Creek near Valier, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	95	75	210	98	24	15	13	49
2	95	89	210	89	24	14	13	48
3	95	89	210	78	24	13	13	46
4	95	89	192	66	22	12	24	61
5	95	89	174	54	26	12	34	54
6	100	76	159	62	26	12	27	54
7	107	64	159	59	22	13	23	61
8	107	80	144	52	30	12	26	48
9	107	76	159	54	38	12	28	38
10	107	76	144	44	47	12	38	43
11	98	76	132	46	41	12	49	40
12	104	71	132	43	34	12	67	38
13	109	89	120	41	32	12	78	55
14	120	89	109	41	69	12	71	42
15	132	89	109	40	46	12	58	48
16	120	80	78	37	34	11	51	37
17	120	80	78	35	29	11	48	33
18	109	98	75	34	31	11	43	31
19	109	192	66	29	28	11	41	34
20	120	144	89	29	28	12	44	31
21	120	132	69	28	26	12	41	34
22	120	132	61	28	25	12	38	36
23	98	159	61	29	24	21	48	28
24	89	210	54	27	23	19	47	38
25	89	210	61	26	20	20	43	47
26	80	254	69	29	19	19	46	34
27	98	254	254	32	19	17	48	30
28	109	304	192	28	18	15	46	30
29	89	304	132	26	17	14	48	30
30	89	254	109	28	17	13	49	30
31	.....	254	.....	26	17	.....	46	.....

NOTE.—Discharge determined from a well-defined rating curve, which is the same as that used for 1912; discharge estimated Apr. 1–10 and Nov. 27 to 30; discharge interpolated for days for which gage heights are missing.

Monthly discharge of Dupuyer Creek near Valier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 23.0	1,410	D.
February	.....	.....	[a] 23.0	1,280	D.
March	.....	.....	[a] 36.0	2,210	D.
April	132	80	104	6,190	B.
May	304	64	138	8,480	A.
June	254	54	127	7,560	A.
July	98	26	43.2	2,660	A.
August	69	17	28.4	1,750	A.
September	21	11	13.5	803	A.
October	78	13	41.6	2,560	A.
November	61	28	40.9	2,430	B.
December	.....	.....	[b] 30.0	1,840	D.
The year	304	.....	54.1	39,200	

[a] Estimate by Mr. Crawford, hydrographer for the Valier-Montana Land & Water Co.
[b] Estimated by engineers of the United States Geological Survey. A measurement made Jan. 9, 1914, which showed a discharge of 32 second-feet, was used in making the estimate for December.

DRY FORK OF MARIAS RIVER NEAR VALIER, MONT.

Location.—In the SW. ¼ sec. 36, T. 29 N., R. 5 W., about 9 miles southeast of Valier and 5 miles south of the dam of the Lake Francis reservoir.

Records available.—March 19, 1911, to December 31, 1913.

Drainage area.—About 120 square miles.

Gages.—Bristol automatic and an inclined staff gage on the left bank. The Bristol gage has a range of 8 feet.

Control.—Shifting; bed of stream composed of sand and gravel.

Discharge measurements.—At low and medium stages made by wading; during high stages it may be necessary to use floats.

Winter flow.—Affected by ice.

Diversions.—Appropriations amounting to nearly 1,200 second-feet have been filed on Dry Fork and its branches.

Cooperation.—Gage heights and discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Dry Fork of Marias River near Valier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 30	R. O. Crawford	.....	[a] 10	May 10	L. B. Crossan	2.25	21
Feb. 20	.....do	[b] 2.75	18.6	19	.....do	2.46	41
Mar. 7	.....do	[b] 2.96	15.3	June 11	.....do	1.85	3.6
28	.....do	[b] 2.52	3.1	18	.....do	1.70	.98
Apr. 2	L. B. Crossan	[b] 3.52	60	21	R. O. Crawford	1.99	6.4
2	C. S. Heidel	[b] 3.52	59	July 7	L. B. Crossan	1.90	2.6
8	L. B. Crossan	2.81	110	12	.....do	1.80	.93
14	.....do	2.64	72	21	.....do	1.72	.29
19	L. B. Crossan	2.31	24	Aug. 16	.....do	1.90	2.66
28	.....do	2.13	13.4	Sept. 24	.....do	1.65	a.2
May 5	.....do	2.40	33.0	Oct. 9	W. S. Merrill	1.78	1.04

[a] Discharge estimated. [b] Ice present.

Daily gage height, in feet, of Dry Fork of Marias River near Valier, Mont., for 1913.

[W. R. Hunt, observer.]

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.84	3.85	2.18	1.97	2.06	1.67	1.62	1.60	1.80	1.83
2	.....	2.94	3.45	2.24	1.93	2.02	1.69	1.64	1.60	1.80	1.82
3	.....	2.89	3.55	2.34	1.87	1.95	1.69	1.63	1.60	1.81	1.79
4	.....	2.89	3.25	2.40	1.84	1.93	1.69	1.63	1.60	1.82	1.75
5	.....	2.84	3.1	2.34	1.81	1.92	1.67	1.63	1.63	1.82	1.72
6	.....	2.99	3.45	2.29	1.81	1.90	1.66	1.65	1.70	1.85	1.69
7	.....	3.15	3.05	2.24	1.79	1.89	1.66	1.65	1.73	1.85	1.71
8	.....	3.4	2.81	2.22	1.80	1.90	1.70	1.65	.....	1.87	1.70
9	.....	3.35	2.71	2.23	1.81	1.88	1.78	1.66	1.78	1.86	1.70
10	.....	3.25	2.67	2.23	1.82	1.88	1.91	1.62	1.81	1.85	1.65
11	.....	3.2	2.68	2.24	1.84	1.81	.....	1.59	1.80	1.85	1.65
12	.....	3.4	2.67	2.24	1.80	1.80	.....	1.62	1.98	1.84	1.68
13	.....	2.84	2.64	2.25	1.80	1.80	.....	1.64	2.22	1.85	1.69
14	.....	2.94	2.60	2.27	1.79	1.80	.....	1.65	2.39	1.86	1.69
15	2.54	3.00	2.51	2.27	1.77	1.76	.....	1.64	2.24	1.90	1.70
16	2.79	2.94	2.42	2.26	1.76	1.75	1.88	1.64	2.12	1.90	1.70
17	2.99	2.79	2.37	2.29	1.74	1.73	1.80	1.64	2.05	1.86	1.70
18	2.59	2.64	2.36	2.34	1.73	1.74	1.79	1.64	1.96	1.81	1.72
19	2.49	2.59	2.32	2.56	1.72	1.75	1.76	1.65	1.90	1.80	1.75
20	2.79	2.54	2.33	2.86	1.82	1.73	1.71	1.65	1.94	1.82	1.80
21	2.64	2.54	2.31	2.62	1.97	1.72	1.68	1.65	1.95	1.81	1.80
22	2.59	2.54	2.28	2.52	1.94	1.71	1.67	1.66	1.90	1.82	1.82
23	2.54	2.49	2.22	2.47	1.88	1.71	1.65	1.68	1.86	1.80	1.85
24	2.54	2.44	2.20	.....	1.84	1.69	1.63	1.65	1.84	1.80	1.97
25	2.59	2.34	2.18	.....	1.80	1.73	1.62	1.60	1.81	1.80	2.10
26	2.44	2.44	2.18	.....	1.91	1.71	1.61	1.61	1.82	1.80	2.28
27	2.59	2.59	2.17	2.03	2.68	1.71	1.61	1.62	1.80	1.81	2.30
28	2.64	2.59	2.16	2.00	2.66	1.71	1.61	1.62	1.81	1.85	2.37
29	.....	2.64	2.16	2.01	2.31	1.71	1.62	1.60	1.80	1.88	2.43
30	.....	3.1	2.19	2.04	2.15	1.66	1.63	1.60	1.80	1.84	2.37
31	.....	3.5	.....	2.01	.....	1.64	1.63	.....	1.79	.....	2.40

NOTE.—Gage heights, Feb. 15 to Apr. 6 and Nov. 28 to Dec. 31, distorted by ice. Observer's records used up to Apr. 6; after that date mean daily Bristol record is used, applying proper corrections to reduce it to the datum of the staff gage.

Daily discharge, in second-feet, of Dry Fork of Marias River near Valier, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	50	15.4	6.8	8.7	0.5	.....	.....	1.2
2	60	19.5	5.4	6.8	.6	.....	.....	1.2
3	80	28	3.7	4.3	.6	.....	.....	1.4
4	100	33	3.1	3.7	.6	.....	.....	1.5
5	120	28	2.5	3.4	.5	.....	.3	1.5
6	140	23	2.5	2.8	.5	.....	.6	2.0
7	170	19.5	2.2	2.6	.5	.....	.8	2.0
8	108	18.0	2.3	2.8	.6	.....	1.0	2.3
9	86	18.8	2.5	2.5	1.1	.....	1.1	2.2
10	78	18.8	2.7	2.5	3.1	.....	1.4	2.0
11	80	19.5	3.1	1.4	.....	.....	1.2	2.0
12	78	19.5	2.3	1.2	.....	.....	5.2	1.8
13	72	20	2.3	1.2	.....	.....	18.0	2.0
14	64	22	2.2	1.2	.....	.....	32	2.2
15	48	22	1.9	1.0	.....	.....	19.5	2.8
16	36	21	1.8	.9	2.5	.....	11.8	2.8
17	30	23	1.6	.8	1.2	.....	8.2	2.2
18	29	28	1.5	.8	1.1	.....	4.6	1.4
19	26	56	1.5	.9	1.0	.....	2.8	1.2
20	27	120	2.0	.8	.7	.....	4.0	1.5
21	25	68	6.4	.7	.5	.....	4.3	1.4
22	22	51	4.0	.7	.5	.....	2.8	1.5
23	18	44	2.6	.7	.4	.....	2.2	1.2
24	16.5	35	1.8	.6	.3	.....	1.8	1.2
25	15.3	26	1.3	.8	.....	.....	1.4	1.2
26	15.3	18.0	3.1	.7	.....	.....	1.5	1.2
27	14.7	9.4	80	.7	.....	.....	1.2	1.4
28	14.1	7.8	76	.7	.....	.....	1.4	1.2
29	14.1	8.3	25	.7	.....	.....	1.2	1.2
30	15.9	9.9	13.6	.4	.....	.....	1.2	1.2
31	.....	8.3	.....	.4	.....	.....	1.1	.....

NOTE.—Discharge determined as follows: Apr. 7 to May 19 and June 26 to Nov. 27, from a rating curve well defined between 3 and 310 second-feet and fairly well defined at other stages; May 20 to June 18, from a fairly well defined rating curve; June 19–25, by indirect method for shifting channels; Apr. 1–6 and Nov. 28–30, estimated. Discharge interpolated May 24–26. Discharge Aug. 11–15 estimated at 5.0 second-feet; Aug. 25–31 at zero flow; Sept. 1–30, at 0.2 second-foot; Oct. 1–4, at zero flow.

Monthly discharge of Dry Fork of Marias River near Valier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 1.0	61	D.
February	.....	.....	[a] 8.5	472	D.
March	.....	.....	[a] 13.8	848	D.
April	170	14.1	55.1	3,280	B.
May	120	7.8	27.7	1,700	B.
June	80	1.3	8.92	531	B.
July	8.7	.4	1.85	114	B.
August	.....	.0	1.35	83	B.
September	.....	.0	[b] .2	12	C.
October	32	.0	4.28	263	B.
November	2.8	1.2	1.66	99	B.
December	.....	.....	[b] 1.5	92	D.
The year	170	.0	10.4	7,560	

[a] Estimated by Mr. Crawford, hydrographer for the Valier-Montana Land and Water Co.
[b] Estimated by the engineers of the United States Geological Survey.

TETON RIVER AT STRABANE, MONT.

Location.—In the SE. ¼ NE. ¼ sec. 35, T. 25 N., R. 7 W., on the highway bridge half a mile north of Peeble's ranch, 16 miles above Chouteau, Mont., at Strabane, post office.

Records available.—November 26, 1904, to December 31, 1906; January 16, 1908, to December 31, 1913.

Drainage area.—140 square miles.

Gage.—Standard chain gage fastened to upstream side of bridge near the center of the river, installed March 23, 1911; previous to that date several different gages and datums were used.

Control.—Shifts at high stages; current swift. Several channels at both low and high stages, but the main channel carries about 80 per cent of the flow at high stages and 85 per cent at low stages. The results show the total flow of all the channels.

Discharge measurements.—At flood stages made from bridge at the gage; at low stages by wading at various sections.

Winter flow.—Not affected by ice.

Diversions and storage.—Practically no water is diverted above the station, but the ordinary flow below the station is appropriated and used for irrigation. An irrigation project now being constructed under the Carey Act will store the flood water of Teton River in the reservoir about 5 miles north of the gaging station. The capacity of the reservoir is 106,700 acre-feet, and it can be increased to 210,000 acre-feet by raising the top of the dam 20 feet. The reservoir will serve 55,400 acres of land on the north side of the river. The water will be diverted half a mile above the gage.

Accuracy.—Accurate determination of discharge during high stages difficult because of shifting channel.

Discharge measurements of Teton River at Strabane, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	C. S. Heidel	2.84	32	July 31	C. S. Heidel	3.94	123
May 30	B. E. Jones	5.47	1,090	Aug. 27	B. E. Jones	3.79	104
June 11	C. S. Heidel	5.27	837	27	....do	3.79	104
24	B. E. Jones	4.52	359	Oct. 23	C. S. Heidel	3.73	78

Daily gage height, in feet, of Teton River at Strabane, Mont., for 1913.

[Jas. Peebles, jr., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	2.65	.....	2.75	3.5	5.6	4.75	3.95	3.75	3.65	3.75	3.7
2	2.7	2.7	.....	2.8	3.5	5.75	4.6	3.95	3.75	3.65	3.75	3.7
3	2.7	2.7	2.7	2.75	3.5	5.7	4.6	3.95	3.7	3.7	3.75	3.7
4	2.65	2.7	2.7	2.75	3.5	5.6	4.5	3.95	3.7	3.7	3.75	3.7
5	2.65	2.65	2.7	2.75	3.55	5.6	4.5	3.95	3.75	3.7	3.75	3.7
6	2.65	2.65	2.7	2.7	3.55	5.55	4.5	3.95	3.7	3.7	3.75	3.7
7	2.7	2.6	2.75	2.7	3.55	5.55	4.5	3.95	3.75	3.7	3.75	3.7
8	.....	2.6	2.8	2.82	3.5	5.45	4.45	3.9	3.75	3.7	3.75	3.7
9	.....	2.6	2.85	2.88	3.5	5.45	4.4	3.95	3.75	3.7	3.75	3.7
10	.....	2.65	2.9	2.9	3.55	5.35	4.35	4.0	3.75	3.7	3.75	3.7
11	2.65	2.65	2.9	2.9	3.6	5.3	4.3	4.0	3.75	3.7	3.75	3.65
12	2.65	2.65	2.85	2.95	3.6	5.3	4.3	3.95	3.75	3.75	3.75	3.65
13	2.65	2.7	2.85	3.05	3.7	5.2	4.25	3.95	3.7	3.8	3.75	3.65
14	2.6	2.7	2.8	3.1	3.9	5.1	4.25	3.95	3.7	3.8	3.75	3.65
15	2.6	2.7	2.8	3.25	3.8	4.9	4.2	3.95	3.7	3.8	3.75	3.65
16	2.6	2.75	2.8	3.25	3.8	4.9	4.15	3.95	3.7	3.8	3.75	3.65
17	2.6	2.8	2.8	3.25	3.8	4.85	4.15	3.95	3.7	3.8	3.75	3.65
18	2.6	2.85	2.85	3.25	3.9	4.85	4.15	3.9	3.7	3.8	3.7	3.65
19	2.55	2.85	2.85	3.25	3.9	4.85	4.15	3.9	3.7	3.8	3.7	3.6
20	2.55	2.85	2.85	3.3	4.0	4.85	4.15	3.9	3.7	3.75	3.7	3.6
21	2.55	2.8	2.85	3.3	4.0	4.8	4.15	3.85	3.7	3.7	3.7	3.6
22	2.55	2.8	2.8	3.35	4.2	4.7	4.15	3.85	3.75	3.7	3.7	3.5
23	2.55	2.75	2.8	3.4	4.2	4.7	4.15	3.8	3.7	3.7	3.7	3.5
24	2.6	2.7	2.8	3.45	4.3	4.5	4.1	3.8	3.7	3.7	3.7	3.49
25	2.6	2.7	2.85	3.4	4.95	4.5	4.1	3.8	3.7	3.7	3.7	3.48
26	2.6	2.7	2.8	3.45	5.15	4.65	4.05	3.8	3.65	3.75	3.7	3.48
27	2.6	.....	2.75	3.45	5.6	5.0	4.05	3.75	3.65	3.75	3.7	3.48
28	2.65	.....	2.7	3.45	5.7	5.0	4.0	3.75	3.7	3.75	3.7	3.48
29	2.65	.....	2.7	3.45	5.7	4.85	4.0	3.75	3.7	3.75	3.7	3.48
30	2.65	.....	2.7	3.5	5.55	4.7	3.95	3.75	3.7	3.75	3.7	3.50
31	2.6	.....	2.7	.....	5.55	.....	3.9	3.8	.....	3.75	.....	3.50

NOTE.—Jan. 8–10 and Feb. 27 to Mar. 2, river was gorged with ice below gage and no observations were reported by the observer.

Daily discharge, in second-feet, of Teton River at Strabane, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	24	22	24	27	104	1,180	478	128	89	74	89	81
2	24	24	24	30	104	1,350	400	128	89	74	89	81
3	24	24	24	27	104	1,290	400	128	81	81	89	81
4	22	24	24	27	104	1,180	356	128	81	81	89	81
5	22	22	24	27	112	1,180	356	128	89	81	89	81
6	22	22	24	24	112	1,130	356	128	81	81	89	81
7	24	19	27	24	112	1,130	356	128	89	81	89	81
8	24	19	30	31	104	1,030	320	117	89	81	89	81
9	23	19	34	36	104	1,030	300	128	89	81	89	81
10	22	22	37	37	112	938	280	140	89	81	89	81
11	22	22	37	37	120	890	255	140	89	81	89	74
12	22	22	34	41	120	890	255	128	89	89	89	74
13	22	24	34	50	137	795	240	128	81	97	89	74
14	19	24	30	54	176	710	240	128	81	97	89	74
15	19	24	30	70	155	565	230	128	81	97	89	74
16	19	27	30	70	155	565	205	128	81	97	89	74
17	19	30	30	70	155	535	205	128	81	97	89	74
18	19	34	34	70	176	535	205	117	81	97	81	74
19	17	34	34	70	176	535	205	117	81	97	81	67
20	17	34	34	76	200	535	205	117	81	89	81	67
21	17	30	34	76	200	505	195	107	81	81	81	67
22	17	30	30	83	252	450	195	107	89	81	81	55
23	17	27	30	90	252	450	195	97	81	81	81	55
24	19	24	30	97	284	356	185	97	81	81	81	54
25	19	24	34	90	600	356	185	97	81	81	81	53
26	19	24	30	97	752	425	152	97	74	89	81	53
27	19	24	27	97	1,180	635	152	89	74	89	81	53
28	22	24	24	97	1,290	635	140	89	81	89	81	53
29	22	.....	24	97	1,290	535	140	89	81	89	81	53
30	22	.....	24	104	1,130	450	128	89	81	89	81	55
31	19	.....	24	.....	1,130	.....	117	97	.....	89	.....	55

NOTE.—Discharge determined as follows: Jan. 1 to July 7 from a fairly well defined rating curve; July 8–25, by indirect method for shifting channels; July 26 to Dec. 31, from a fairly well defined rating curve. Discharge interpolated Jan. 8–10 and Feb. 27 to Mar. 2.

Monthly discharge of Teton River at Strabane, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	24	17	20.6	1,270	C.
February	34	19	25.0	1,390	C.
March	37	24	29.4	1,810	C.
April	104	24	60.9	3,620	B.
May	1,290	104	355	21,800	B.
June	1,350	356	760	45,200	B.
July	478	117	246	15,100	B.
August	140	89	116	7,130	B.
September	89	74	83.2	4,950	B.
October	97	74	86.2	5,300	B.
November	89	81	85.5	5,090	B.
December	81	53	69.1	4,250	B.
The year	1,350	17	162	117,000	

NOTE—Accuracy for January, February, and March reduced because of the possible effect of ice.

TETON RIVER NEAR CHOUTEAU, MONT.

Location.—At the highway bridge about half a mile above the mouth of Deep Creek and 1 mile south of Chouteau, Mont.

Records available.—November 30, 1904, to July 31, 1906; May 27 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, fastened to pier on the downstream side near the left bank.

Control.—Gravel; shifting.

Discharge measurements.—At high stages measurements made from bridge at the gage; at low stages by wading near gage.

Winter flow.—Affected by ice.

Diversions.—Water is diverted both above and below the gage and the total flow has been filed on for irrigation.[1]

Accuracy.—Owing to the shifting of the channel several discharge measurements are required each year to insure good results.

Discharge measurements of Teton River near Chouteau, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 27	B. E. Jones	5.07	574	July 30	C. S. Heidel	2.48	8.2
June 11	C. S. Heidel	5.00	712	Aug. 26	B. E. Jones	2.36	3.4
26	B. E. Jones	3.85	218	Oct. 22	C. S. Heidel	2.90	37

Daily gage height, in feet, of Teton River near Chouteau, Mont., for 1913.

[C. D. Yeager, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.65	4.1	2.38	2.35	2.55	2.95	3.0
2	.....	5.7	4.0	2.38	2.35	2.55	2.95	3.0
3	.....	5.75	4.0	2.35	2.35	2.6	2.95	3.0
4	.....	5.8	3.95	2.35	2.35	2.65	3.0	3.02
5	.....	5.1	3.95	2.35	2.35	2.7	3.0	3.02
6	.....	4.9	3.9	2.32	2.35	2.75	3.0	3.02
7	.....	4.8	3.9	2.32	2.35	2.8	3.0	.....
8	.....	5.0	3.8	2.32	2.35	2.9	3.0	.....
9	.....	5.1	3.75	2.30	2.35	3.0	3.0	.....
10	.....	5.15	3.7	2.30	2.38	3.2	3.0	.....
11	.....	5.0	3.6	2.30	2.35	3.3	3.1	.....
12	.....	4.95	3.5	2.30	2.35	3.35	3.05	.....
13	.....	4.9	3.4	2.30	2.35	3.2	3.0	.....
14	.....	4.8	3.3	2.30	2.35	3.1	3.0	.....
15	.....	4.65	3.25	2.30	2.35	3.0	3.0	.....
16	.....	4.4	3.1	2.30	2.35	2.9	3.0	.....
17	.....	4.3	3.15	2.33	2.35	2.9	3.0	.....
18	.....	4.2	3.0	2.33	2.35	2.9	3.0	.....
19	.....	4.2	2.9	2.32	2.35	3.0	3.0	.....
20	.....	4.2	2.8	2.30	2.4	2.85	3.0	.....
21	.....	4.1	2.7	.....	2.4	2.85	3.0	.....
22	.....	4.1	2.65	.....	2.4	2.9	3.0	.....
23	.....	4.0	2.6	.....	2.45	2.9	3.0	.....
24	.....	3.9	2.6	.....	2.45	2.9	3.0	.....
25	.....	3.95	2.6	.....	2.45	2.9	3.0	.....
26	.....	4.0	2.6	2.35	2.45	2.9	3.0	.....
27	5.05	4.7	2.55	2.35	2.5	2.9	3.0	.....
28	5.3	4.4	2.5	2.35	2.5	2.9	3.0	.....
29	5.7	4.3	2.5	2.35	2.5	2.9	3.0	.....
30	5.55	4.2	2.45	2.35	2.5	2.95	3.0	.....
31	5.6	.....	2.4	2.35	.....	2.95	.....	.....

[1] See also description of Teton River near Strabane.

Daily discharge, in second-feet, of Teton River near Chouteau, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	929	304	4.2	3.0	12	44	49
2	.....	968	268	4.2	3.0	12	44	49
3	.....	1,010	268	3.0	3.0	15	44	49
4	.....	1,050	252	3.0	3.0	18	49	51
5	.....	713	252	3.0	3.0	22	49	51
6	.....	627	235	1.8	3.0	26	49	51
7	.....	588	235	1.8	3.0	30	49	.....
8	.....	694	205	1.8	3.0	39	49	.....
9	.....	752	191	1.0	3.0	49	49	.....
10	.....	786	177	1.0	4.2	73	49	.....
11	.....	713	151	1.0	3.0	88	60	.....
12	.....	689	127	1.0	3.0	97	54	.....
13	.....	665	106	1.0	3.0	73	49	.....
14	.....	617	88	1.0	3.0	60	49	.....
15	.....	546	80	1.0	3.0	49	49	.....
16	.....	429	60	1.0	3.0	39	49	.....
17	.....	385	66	2.2	3.0	39	49	.....
18	.....	343	49	2.2	3.0	39	49	.....
19	.....	343	39	1.8	3.0	49	49	.....
20	.....	343	30	1.0	5.0	34	49	.....
21	.....	304	22	1.0	5.0	34	49	.....
22	.....	304	18	1.5	5.0	39	49	.....
23	.....	268	15	2.0	7.5	39	49	.....
24	.....	235	15	2.5	7.5	39	49	.....
25	.....	252	15	3.0	7.5	39	49	.....
26	.....	268	15	3.0	7.5	39	49	.....
27	564	569	12	3.0	10	39	49	.....
28	699	429	10	3.0	10	39	49	.....
29	900	385	10	3.0	10	39	49	.....
30	850	343	7.5	3.0	10	44	49	.....
31	889	.....	5.0	3.0	.....	44	.....	.....

NOTE.—Discharge determined as follows: May 27 to June 9 by indirect method for shifting channels; June 10 to Dec. 6 from a fairly well defined rating curve; Aug. 21–25, interpolated.

Monthly discharge of Teton River near Chouteau, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 27-31	909	564	782	7,760	C.
June	1,050	235	552	32,800	C.
July	304	5.0	107	6,580	B.
August	4.2	1.0	2.13	131	C.
September	10	3.0	4.77	284	C.
October	97	12	41.8	2,570	B.
November	60	44	49.0	2,920	B.
December 1-6	51	49	50	595	B.
The period	.....	.....	.....	53,600	

NOTE.—Accuracy for August and September reduced on accout of smallness of the discharge which tends to increase the percentage of error.

SPRING CREEK NEAR STRABANE, MONT.

Location.—About 200 feet above the highway bridge half a mile south of Strabane post office.

Records available.—May 30 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, nailed to a post near the left bank.

Control.—Shifts gradually during summer months as a result of growth of moss.

Discharge measurements.—Made by wading at the bridge below the gage.

Winter flow.—Affected by ice only during extremely cold periods.

Diversions.—None.

Accuracy.—Results should be good if sufficient discharge measurements are made each year to show the extent of the shift.

Discharge measurements of Spring Creek near Strabane, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 30	B. E. Jones	4.05	13.5	July 31	C. S. Heidel	3.73	1.2
June 11	C. S. Heidel	3.84	3.6	Aug. 27	B. E. Jones	3.75	.77
23	B. E. Jones	3.82	2.5	Oct. 22	C. S. Heidel	3.91	5.0

Daily gage height, in feet, of Spring Creek near Strabane, Mont., for 1913.

[Jas. Peebles, jr., observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.0	4.22	3.74	3.75	3.8	3.9	3.87
2	.....	4.0	4.1	3.74	3.75	3.8	3.9	3.87
3	.....	4.0	4.0	3.73	3.75	3.8	3.9	3.87
4	.....	3.95	3.9	3.73	3.75	3.8	3.9	3.87
5	.....	3.9	3.9	3.73	3.74	3.8	3.9	3.87
6	.....	3.9	3.9	3.73	3.74	3.9	3.9	3.87
7	.....	3.9	3.9	3.73	3.74	3.9	3.9	3.85
8	.....	3.9	3.88	3.78	3.74	3.9	3.91	3.85
9	.....	3.9	3.88	3.78	3.74	3.9	3.91	3.85
10	.....	3.9	3.88	3.74	3.74	3.9	3.91	3.85
11	.....	3.83	3.86	3.74	3.74	3.9	3.91	3.84
12	.....	3.83	3.84	3.74	3.74	3.9	3.9	3.84
13	.....	3.83	3.83	3.73	3.74	3.88	3.9	3.84
14	.....	3.82	3.82	3.73	3.74	3.88	3.9	3.84
15	.....	3.82	3.81	3.73	3.75	3.88	3.9	3.84
16	.....	3.82	3.81	3.73	3.75	3.87	3.9	3.84
17	.....	3.82	3.8	3.73	3.75	3.86	3.9	3.85
18	.....	3.82	3.8	3.73	3.75	3.86	3.9	3.85
19	.....	3.81	3.78	3.73	3.75	3.86	3.9	3.85
20	.....	3.81	3.78	3.73	3.75	3.88	3.9	3.85
21	.....	3.81	3.77	3.73	3.75	3.90	3.89	3.85
22	.....	3.81	3.77	3.73	3.81	3.91	3.89	3.85
23	.....	3.81	3.76	3.72	3.8	3.91	3.88	3.85
24	.....	3.82	3.76	3.72	3.8	3.91	3.88	3.86
25	.....	3.82	3.76	3.72	3.8	3.92	3.88	3.86
26	.....	4.05	3.76	3.72	3.79	3.92	3.88	3.86
27	.....	4.32	3.75	3.75	3.79	3.92	3.88	3.87
28	.....	4.32	3.75	3.75	3.79	3.91	3.88	3.87
29	.....	4.30	3.75	3.75	3.8	3.91	3.88	3.87
30	.....	4.28	3.75	3.75	3.8	3.91	3 87	3.86
31	4.0	.....	3.75	3.75	.....	3.91	.....	3.86

Daily discharge, in second-feet, of Spring Creek near Strabane, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		10	28	1.2	0.8	1.7	4.7	3.7
2		10	17	1.2	.8	1.7	4.7	3.7
3		10	10	1.0	.8	1.7	4.7	3.7
4		7.6	5.4	1.0	.8	1.7	4.7	3.7
5		5.4	5.4	1.0	.7	1.7	4.7	3.7
6		5.4	5.4	1.0	.7	4.7	4.7	3.7
7		5.4	5.4	1.0	.7	4.7	4.7	3.0
8		5.4	4.7	2.0	.7	4.7	5.1	3.0
9		5.4	4.7	2.0	.7	4.7	5.1	3.0
10		5.4	4.7	1.2	.7	4.7	5.1	3.0
11		3.1	4.0	1.0	.7	4.7	5.1	2.7
12		3.1	3.3	1.0	.7	4.7	4.7	2.7
13		3.1	3.1	.8	.7	4.0	4.7	2.7
14		2.8	2.8	.8	.7	4.0	4.7	2.7
15		2.8	2.6	.8	.8	4.0	4.7	2.7
16		2.8	2.6	.8	.8	3.7	4.7	2.7
17		2.8	2.3	.8	.8	3.3	4.7	3.0
18		2.8	2.3	.7	.8	3.3	4.7	3.0
19		2.6	1.9	.7	.8	3.3	4.7	3.0
20		2.6	1.9	.7	.8	4.0	4.7	3.0
21		2.6	1.8	.7	.8	4.7	4.4	3.0
22		2.6	1.8	.7	2.0	5.1	4.4	3.0
23		2.6	1.6	.6	1.7	5.1	4.0	3.0
24		2.8	1.6	.6	1.7	5.1	4.0	3.3
25		2.8	1.6	.6	1.7	5.5	4.0	3.3
26		13.4	1.6	.5	1.5	5.5	4.0	3.3
27		38	1.4	.8	1.5	5.5	4.0	3.7
28		38	1.4	.8	1.5	5.1	4.0	3.7
29		36	1.4	.8	1.7	5.1	4.0	3.7
30		34	1.4	.8	1.7	5.1	3.7	3.3
31	10		1.4	.8		5.1		3.3

NOTE.—Discharge determined as follows: Previous to Aug. 1, from a fairly well defined rating curve; Aug. 1-26, by indirect method for shifting channels; after Aug. 26, from a fairly well defined rating curve.

Monthly discharge of Spring Creek near Strabane, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June	38	2.6	9.04	538	B.
July	28	1.4	4.34	267	B.
August	2.0	.5	.92	56.6	B.
September	2.0	.7	1.03	61.3	B.
October	5.5	1.7	4.13	254	B.
November	5.1	3.7	4.54	270	B.
December	3.7	2.7	3.19	196	B.
The period				1,640	

NOTE.—The shift during August was gradual, so that the records for that period are considered good.

DEEP CREEK NEAR CHOUTEAU, MONT.

Location.—In the SW. ¼ NW. ¼ sec. 15, T. 23 N., R. 5 W., at Hugh Robinson's ranch, 5 miles southwest of Chouteau, Mont.
Records available.—March 24, 1911, to December 31, 1913.
Drainage area.—Not measured.
Gage.—Overhanging chain on right bank.
Control.—Gravel bar about 50 feet below gage. Channel clean and fairly permanent; bed composed of gravel.
Discharge measurements.—Made by wading.
Winter flow.—Affected by ice.
Diversions.—A few small ditches divert water from the creek.
Accuracy.—Records good.

Discharge measurements of Deep Creek near Chouteau, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 28	B. E. Jones	7.19	542
June 25	do	6.22	144
Aug. 28	do	5.56	28
Nov. 7	W. A. Lamb	5.71	48

Daily gage height, in feet, of Deep Creek near Chouteau, Mont., for 1913.

[Hugh Robinson, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		6.01	6.06	7.2	6.38	5.66	5.49	5.33	5.67
2		5.88	6.16	7.15	6.33	5.66	5.49	5.33	5.67
3		6.04	6.16	7.15	6.23	5.66	5.49	5.33	5.67
4		5.96	6.11	7.15	6.23	5.64	5.49	5.33	5.63
5		6.26	6.16	7.0	6.17	5.61	5.44	5.48	5.63
6		6.26	6.11	6.95	6.17	5.64	5.44	5.68	5.63
7		6.26	6.11	6.8	6.12	5.64	5.44	5.58	5.63
8		6.16	6.06	6.9	6.07	5.61	5.44	5.63	5.60
9		6.11	6.06	6.85	6.07	5.71	5.44	5.53	5.6
10		6.08	6.06	6.85	6.02	5.70	5.44	5.58	5.6
11		6.08	6.06	6.8	6.02	5.70	5.44	5.68	5.6
12		6.16	6.16	6.65	5.97	5.67	5.44	6.13	5.65
13		6.06	6.16	6.75	5.97	5.65	5.44	6.13	5.6
14		6.06	6.21	6.65	5.97	5.65	5.39	6.03	5.55
15		6.06	6.16	6.55	5.92	5.65	5.39	5.83	5.5
16		6.01	6.16	6.45	5.92	5.65	5.34	5.72	5.6
17		5.96	6.11	6.40	5.87	5.63	5.29	5.67	5.7
18		5.96	6.21	6.38	5.82	5.65	5.29	5.62	5.6
19		5.96	6.65	6.38	5.82	5.63	5.29	5.67	5.55
20		6.06	6.50	6.48	5.77	5.63	5.29	5.72	5.55
21		6.06	6.31	6.33	5.77	5.60	5.31	5.72	5.6
22		6.16	6.26	6.28	5.76	5.65	5.31	5.72	5.6
23		6.11	6.50	6.23	5.76	5.63	5.33	5.72	5.55
24		6.01	6.55	6.23	5.71	5.60	5.33	5.67	5.55
25		6.01	6.7	6.18	5.71	5.60	5.28	5.73	5.55
26		5.96	6.8	6.33	5.71	5.57	5.33	5.67	5.55
27		5.96	7.0	7.15	5.71	5.55	5.33	5.73	5.65
28		6.06	7.2	7.15	5.71	5.54	5.33	5.73	5.56
29		6.06	7.3	6.70	5.66	5.54	5.33	5.73	5.61
30	6.14	6.06	7.45	6.46	5.66	5.52	5.31	5.67	5.61
31	6.04		7.25		5.66	5.52		5.67	

Daily discharge, in second-feet, of Deep Creek near Chouteau, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	98	109	515	190	40	23	14	41
2	.....	72	132	491	176	40	23	14	41
3	.....	105	132	491	150	40	23	14	41
4	.....	88	120	491	150	37	23	14	36
5	.....	158	132	421	135	34	20	23	36
6	.....	158	120	399	135	37	20	42	36
7	.....	158	120	335	123	37	20	31	36
8	.....	132	109	377	111	34	20	36	33
9	.....	120	109	356	111	45	20	27	33
10	.....	114	109	356	100	44	20	31	33
11	.....	114	109	335	100	44	20	42	33
12	.....	132	132	278	90	41	20	125	38
13	.....	109	132	316	90	38	20	125	33
14	.....	109	145	278	90	38	16	103	28
15	.....	109	132	244	80	38	16	63	24
16	.....	98	132	212	80	38	14	47	33
17	.....	88	120	196	71	36	12	41	44
18	.....	88	145	190	62	38	12	35	33
19	.....	88	278	190	62	36	12	41	28
20	.....	109	227	221	54	36	12	47	28
21	.....	109	171	176	54	33	12	47	33
22	.....	132	158	163	52	38	12	47	33
23	.....	120	227	150	52	36	14	47	28
24	.....	98	244	150	45	33	14	41	28
25	.....	98	296	137	45	33	11	48	28
26	.....	88	335	176	45	30	14	41	28
27	.....	88	421	491	45	28	14	48	38
28	.....	109	515	491	45	28	14	48	29
29	.....	109	565	296	40	28	14	48	34
30	128	109	644	215	40	26	12	41	34
31	105	.....	540	.....	40	26	.....	41	.....

NOTE.—Discharge determined from a rating curve well defined above 20 second-feet.

Monthly discharge of Deep Creek near Chouteau, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	158	72	110	6,550	A.
May	644	109	221	13,600	A.
June	515	137	305	18,100	A.
July	190	40	85.9	5,280	A.
August	45	26	35.8	2,200	A.
September	23	11	16.6	988	B.
October	125	14	45.5	2,800	A.
November	44	24	33.4	1,990	A.
The period	.....	.....	.....	51,510	

WILLOW CREEK NEAR CHOUTEAU, MONT.

Location.—In sec. 14, T. 23 N., R. 6 W., at McPhee's ranch, 12 miles southwest of Chouteau, Mont.

Record available.—April 2, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage on left bank. Low-water section reads to 5.00 feet; high-water section reads 5.00 to 9.00 feet.

Control.—Fairly permanent.

Discharge measurements.—Made by wading at the gage, except at extreme high stages, when they may be made from a bridge half a mile below the gage.

Winter flow.—Affected by ice; probably little flow.

Diversions.—Several diversions above the station, mostly to water hay land; not much water used except during very dry spells.

Accuracy.—Conditions good for obtaining accurate discharge data.

Discharge measurements of Willow Creek near Chouteau, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 28	B. E. Jones	2.75	127
June 25	do	1.82	20.0
Aug. 28	do	1.37	.93
Nov. 7	W. A. Lamb	1.69	13.4

NOTE.—Aug. 28, the point of zero flow was estimated at gage height 1.25 feet.

Daily gage height, in feet, of Willow Creek near Chouteau, Mont., for 1913.

[S. A. McPhee, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.30	2.10	2.70	2.10	1.5	1.32	1.45	1.72	1.58
2	2.25	2.10	2.60	2.02	1.50	1.32	1.48	1.72	1.60
3	2.15	2.12	2.50	2.00	1.88	1.32	2.50	1.70	1.62
4	2.10	2.15	2.40	1.95	1.45	1.30	1.5	1.68	1.62
5	2.25	2.15	2.30	1.9	1.45	1.3	.....	1.68	1.62
6	2.60	2.12	2.25	1.85	1.45	1.3	.....	1.65	1.60
7	2.60	2.12	2.22	1.8	1.42	1.3	1.55	1.65	.....
8	2.50	2.02	2.22	1.75	1.68	1.3	1.58	1.65	.....
9	2.45	2.08	2.20	1.7	1.62	1.3	1.60	1.68	.....
10	2.48	2.05	2.1	1.65	1.62	1.3	1.62	1.70	.....
11	2.30	2.05	2.1	1.65	1.60	1.3	1.68	1.72	.....
12	2.30	2.10	2.05	1.62	1.60	1.3	1.68	1.70	.....
13	2.28	2.08	2.05	1.62	1.58	1.30	1.75	1.70	.....
14	2.30	2.10	2.02	1.60	1.58	1.28	1.75	1.68	.....
15	2.35	2.05	1.95	1.6	1.65	1.25	1.85	1.68	.....
16	2.18	2.00	1.88	1.60	1.70	1.25	1.88	1.68	.....
17	.....	2.08	1.85	1.58	1.68	.....	1.80	1.70	.....
18	2.20	2.08	1.82	1.58	1.65	.....	1.80	1.7	.....
19	2.18	2.90	1.80	1.55	1.6	.....	1.82	1.7	.....
20	2.25	2.65	1.9	1.52	1.55	.....	1.85	1.7	.....
21	2.20	2.55	1.75	1.50	1.5	.....	1.88	1.7	.....
22	2.15	2.55	1.72	1.55	1.50	.....	1.75	1.7	.....
23	2.00	3.50	1.70	1.52	1.48	1.25	1.75	1.7	.....
24	1.98	2.60	1.7	1.60	1.45	1.25	1.72	1.70	.....
25	2.00	2.60	1.8	1.6	1.45	1.28	1.72	1.68	.....
26	2.00	2.50	2.1	1.65	1.42	1.30	1.75	1.65	.....
27	2.05	2.60	3.25	1.60	1.40	1.35	1.75	1.65	.....
28	2.02	2.70	3.12	1.52	1.38	1.40	1.78	1.62	.....
29	2.05	3.30	2.7	1.55	1.38	1.42	1.78	1.60	.....
30	2.08	3.00	2.2	1.52	1.35	1.45	1.75	1.58	.....
31	.....	2.80	.....	1.52	1.35	.....	1.72	.....	.....

Daily discharge, in second-feet, of Willow Creek near Chouteau, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	68	46	123	46	5	0.6	3.0	15	8.2
2	62	46	107	38	5	.6	4.2	15	9
3	52	48	93	36	26	.6	5	14	10
4	46	52	80	32	3.0	.5	5	13	10
5	62	52	68	27	3.0	.5	5	13	10
6	107	48	62	24	3.0	.5	7	12	9
7	107	48	59	20	1.8	.5	7	12	.....
8	93	38	59	17	13	.5	8	12	.....
9	86	44	57	14	10	.5	9	13	.....
10	90	41	46	12	10	.5	10	14	.....
11	68	41	46	12	9	.5	13	15	.....
12	68	46	41	10	9	.5	13	14	.....
13	66	44	41	10	8.2	.5	17	14	.....
14	68	46	38	9	8.2	.4	17	13	.....
15	74	41	32	9	12	.2	24	13	.....
16	55	36	26	9	14	.2	26	13	.....
17	56	44	24	8.2	13	.1	20	14	.....
18	57	44	21	8.2	12	.1	20	14	.....
19	55	158	20	7	9	.1	21	14	.....
20	62	115	27	5.8	7	.1	24	14	.....
21	57	100	17	5	5	.1	26	14	.....
22	52	100	15	7	5	.1	17	14	.....
23	36	93	14	5.8	4.2	.2	17	14	.....
24	34	107	14	9	3.0	.2	15	14	.....
25	36	107	20	9	3.0	.4	15	13	.....
26	36	93	46	12	1.8	.5	17	12	.....
27	41	107	226	9	1.0	.8	17	12	.....
28	38	123	199	5.8	.9	1.0	19	10	.....
29	41	237	123	7	.9	1.8	19	9	.....
30	44	176	57	5.8	.8	3.0	17	8.2	.....
31	.....	140	.....	5.8	.8	.....	15	.....	.....

NOTE.—Discharge determined from a rating curve fairly well defined between 1.0 second-feet and 2.85 second-feet. Discharge estimated Sept. 17–22. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Willow Creek near Chouteau, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	107	34	60.6	3,610	B.
May	237	36	79.4	4,880	B.
June	226	14	60.0	3,570	B.
July	46	5	14.0	861	B.
August	26	0.8	6.70	412	B.
September	3	.1	.54	32	C.
October	26	3	14.6	898	B.
November	15	8.2	13.0	774	B.
December 1–6	10	8.2	9.37	112	B.
The period	.....	.....	.....	15,100	

MUDDY CREEK NEAR BYNUM, MONT.

Location.—In the NW. ¼ SE. ¼ sec. 22, T. 26 N., R. 6 W., just above the mouth of Blackleaf Creek and 2 miles above Bynum.
Records available.—May 24, 1912, to December 31, 1913.
Drainage area.—Not measured.
Gage.—Overhanging chain gage on the left bank.
Control.—Shifts at all stages.
Discharge measurements.—Made by wading near the gage.
Winter flow.—Affected by ice.
Diversions.—Summer flow is appropriated and used; flood waters have been filed on by the Teton Cooperative Reservoir Co.
Accuracy.—Frequent discharge measurements are necessary to insure good results.

Discharge measurements of Muddy Creek near Bynum, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	C. S. Heidel	2.52	26.8	July 31	C. S. Heidel	2.01	1.5
May 29	B. E. Jones	2.73	89	Aug. 27	B. E. Jones	1.96	.22
June 11	C. S. Heidel	2.28	11.4	Oct. 23	C. S. Heidel	2.00	.73
24	B. E. Jones	2.25	3.4				

Daily gage height, in feet, of Muddy Creek near Bynum Mont., for 1913.

[H. Fligger, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.5	.....	2.45	2.3	2.0	1.95	2.0	2.0	2.0
2	.....	2.5	2.35	2.4	2.3	2.0	1.9	2.0	2.0	2.0
3	.....	2.4	2.35	2.4	2.3	2.0	1.9	2.0	2.05	2.0
4	.....	2.4	2.4	.....	2.3	2.0	1.9	2.0	2.05	2.0
5	.....	2.4	2.4	2.45	2.2	2.0	1.9	.....	2.0	2.0
6	.....	2.45	2.3	2.4	2.2	2.0	1.9	2.05	2.0	2.0
7	.....	2.45	2.35	2.4	2.1	2.0	1.9	2.1	2.0	2.0
8	.....	2.5	2.35	2.4	2.1	1.95	1.9	2.05	2.0	2.0
9	.....	.....	.....	2.3	2.1	1.9	1.9	2.05	2.0	2.0
10	.....	2.45	2.35	2.3	2.0	1.9	1.9	2.05	2.0	2.0
11	.....	.....	2.3	2.3	2.1	1.9	1.9	2.05	2.0	2.0
12	.....	2.45	2.3	2.3	2.1	1.9	1.9	2.05	2.05	2.0
13	.....	2.45	2.3	2.25	2.1	1.9	1.9	2.05	2.05	2.0
14	.....	2.45	2.25	2.25	2.1	1.8	1.9	2.05	2.05	2.0
15	.....	2.45	2.25	2.25	2.1	1.8	1.95	2.0	2.05	2.0
16	.....	2.45	2.3	2.3	.....	1.8	1.95	2.0	2.05	2.0
17	.....	2.4	2.3	2.2	2.0	.....	1.9	2.0	2.0	2.0
18	.....	2.35	2.35	2.3	2.0	1.8	1.9	2.0	2.0	2.0
19	.....	2.4	2.8	2.2	2.05	1.8	1.9	2.0	2.0	2.0
20	.....	2.4	2.7	2.3	2.0	1.7	1.9	2.0	2.0	2.0
21	.....	2.4	2.5	2.3	2.0	1.7	1.9	2.0	2.0	2.0
22	.....	2.3	2.45	2.2	2.0	1.8	1.95	2.0	2.0	2.0
23	.....	2.35	2.4	2.2	2.0	1.8	2.0	.....	2.0	2.0
23	.....	2.3	2.35	2.2	2.0	1.8	2.0	2.0	2.0	2.0
25	.....	2.3	2.3	2.3	1.9	1.8	2.0	2.0	2.0	2.0
26	.....	2.3	2.3	2.2	1.9	1.8	2.0	2.0	2.0	2.0
27	.....	2.3	2.3	3.2	1.9	1.8	2.0	2.0	2.05	2.0
28	.....	2.3	2.3	3.05	1.9	1.9	2.0	2.0	2.05	2.0
29	.....	2.3	2.65	2.6	1.9	1.9	2.0	2.0	2.05	2.0
30	.....	2.3	2.5	2.5	1.9	1.9	2.0	2.0	2.0	2.0
31	2.5	.....	2.5	.....	2.0	1.9	.....	2.0	.....	2.0

Daily discharge, in second-feet, of Muddy Creek near Bynum, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1	24	6	29	28	16	18	5	12	3
2	24	8	23	28	17	12	5	4	1
3	12	8	23	28	18	8	8	11	1
4	12	12	28	28	19	12	92	4	3
5	12	12	32	15	20	12	64	10	1
6	18	5	24	15	21	12	27	10	1
7	18	8	24	6	22	5	20	3	1
8	24	8	24	6	23	8	15	3	1
9	27	8	13	6	23	5	10	3	1
10	18	8	13	1	25	5	7	9	1
11	18	5	13	6	26	5	7	4	1
12	18	5	13	6	27	5	8	320	1
13	18	5	8	6	28	5	8	290	1
14	18	4	8	6	29	5	67	100	1
15	18	4	8	6	30	5	37	70	1
					31		37		1

NOTE.—Discharge determined as follows: Apr. 1 to May 18, from a poorly-defined rating curve; May 19 to June 30, by indirect method for shifting channels; July 1–31, from a poorly-defined rating curve; Aug. 1 to Dec. 31, only monthly means estimated on account of the shifting channel. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Muddy Creek near Bynum, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	27	5	13.4	797	C.
May	92	4	16.9	1,040	C.
June	320	3	37.9	2,260	D.
July	28	1	6.8	418	D.
August			[a].6	37	D.
September			[a].3	18	D.
October			[a]1.0	61	D.
November			[a]1.0	60	D.
December			[a].7	43	D.
The period				4,730	

[a] Estimated from discharge measurements and gage heights.

BLACKLEAF CREEK NEAR BYNUM, MONT.

Location.—In the NW. ¼ SE. ¼ sec. 22, T. 26 N., R. 6 W., about 200 feet above the mouth of the creek and 2 miles above Bynum.

Records available.—May 24, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Overhanging chain gage on the left bank.

Control.—Shifts at all stages.

Discharge measurements.—Made by wading near the gage.

Winter flow.—Affected by ice.

Diversions.—All the summer flow is used and flood waters have been filed on by the Teton Cooperative Reservoir Co.

Accuracy.—Frequent discharge measurements are necessary to insure good results.

Discharge measurements of Blackleaf Creek near Bynum, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	C. S. Heidel	2.71	30	July 31	C. S. Heidel	1.80	.62
May 29	B. E. Jones	2.80	50	Aug. 27	B. E. Jones	1.66	.16
June 11	C. S. Heidel	2.12	6.8	Oct. 23	C. S. Heidel	1.90	1.97
24	B. E. Jones	2.04	4.9				

Daily gage height, in feet, of Blackleaf Creek near Bynum, Mont., for 1913.

[A. Baudendistel, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		2.6		2.35	2.5	1.75	1.7	1.8	1.85	1.85
2		2.7	2.50	2.3	2.45	1.75	1.7	1.8	1.9	1.85
3		3.1	2.6	2.2	2.4	1.7	1.7	1.8	1.95	1.85
4		3.0	2.45		2.4	1.7	1.7	1.8	1.95	1.85
5		2.95	2.35	2.2	2.35	1.75	1.7		1.95	1.85
6		3.0	2.35	2.15	2.25	1.7	1.7	1.9	1.9	1.85
7		3.3	2.35	2.1	2.3	1.75	1.7	2.0	1.9	1.9
8			2.35	2.1	2.25	1.75	1.7	2.05	1.9	1.95
9		2.7		2.15	2.25	1.8	1.7	2.0	1.9	1.95
10		2.7	2.25	2.1	2.2	1.8	1.7	2.0	1.9	1.95
11			2.25	2.1	2.15	1.8	1.7	2.0	1.9	1.95
12		2.75	2.25	2.15	2.15	1.8	1.75	2.5	1.9	1.95
13		2.75	2.25	2.1		1.8	1.75	2.7	1.9	1.95
14		2.65	2.25	2.15	2.05	1.8	1.7	2.4	1.9	1.95
15		2.65	2.2	2.1	2.0	1.8	1.7	2.05	1.9	1.95
16		2.6	2.2	2.15		1.8	1.65	2.0	1.9	1.95
17		2.6	2.2	2.0	2.0		1.7	1.95	1.9	1.95
18		2.45	2.3	1.95	2.0	1.8	1.7	1.95	1.9	1.95
19		2.45	3.05	1.9	1.95	1.8	1.75	1.95	1.9	1.95
20		2.45	2.9	1.85	1.95	1.75	1.75	1.95	1.95	1.95
21		2.45	2.75	1.9	1.85	1.7	1.75	1.95	1.95	1.95
22		2.45	2.7	1.85	1.85	1.75	1.75	1.9	1.95	1.95
23		2.4	2.3		1.85	1.75	1.85		1.95	1.95
24		2.35	2.25	1.95	1.8	1.75	1.85	1.9	1.9	1.95
25		2.3	2.4	2.15	1.8	1.75	1.85	1.9	1.9	1.95
26		2.35	2.35	2.15	1.8	1.7	1.8	1.9	1.9	1.95
27		2.15	2.4	3.15	1.8	1.7	1.8	1.9	1.9	1.95
28		2.15	2.35	2.8	1.8	1.65	1.8	1.85	1.9	1.95
29		2.25	2.95	2.6	1.75	1.65	1.8	1.85	1.9	1.95
30		2.35	2.5	2.65	1.75	1.7	1.8	1.85	1.85	1.95
31	2.6		2.4		1.8	1.7		1.85		1.95

Daily discharge, in second-feet, of Blackleaf Creek near Bynum, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		23	14	16	25	0.4	0.2	.6	1.3	1.3
2		30	17	14	22	.4	.2	.6	2.0	1.3
3		68	23	9.5	19	.2	.2	.6	3.0	1.3
4		57	14	9.5	19	.2	.2	.6	3.0	1.3
5		52	10	9.5	16	.4	.2	1.3	3.0	1.3
6		57	10	8.0	12	.2	.2	2.0	2.0	1.3
7		91	10	6.5	14	.4	.2	4.0	2.0	2.0
8		60	10	6.5	12	.4	.2	5.2	2.0	3.0
9		30	8	8.0	12	.6	.2	4.0	2.0	3.0
10		30	6.5	6.5	9.5	.6	.2	4.0	2.0	3.0
11		32	6.5	6.5	8.0	.6	.2	4.0	2.0	3.0
12		34	6.5	8.0	8.0	.6	.4	25	2.0	3.0
13		34	6.5	6.5	6.6	.6	.4	40	2.0	3.0
14		26	6.5	8.0	5.2	.6	.2	19	2.0	3.0
15		26	5.0	6.5	4.0	.6	.2	5.2	2.0	3.0
16		23	5.0	8.0	4.0	.6	.1	4.0	2.0	3.0
17		23	5.0	4.0	4.0	.6	.2	3.0	2.0	3.0
18		14	8.0	3.0	4.0	.6	.2	3.0	2.0	3.0
19		14	64	2.0	3.0	.6	.4	3.0	2.0	3.0
20		14	49	1.3	3.0	.4	.4	3.0	3.0	3.0
21		14	37	2.0	1.3	.2	.4	3.0	3.0	3.0
22		14	34	1.3	1.3	.4	.4	2.0	3.0	3.0
23		12	10	2.2	1.3	.4	1.3	2.0	3.0	3.0
24		10	9.2	3.0	.6	.4	1.3	2.0	2.0	3.0
25		8	16	8.0	.6	.4	1.3	2.0	2.0	3.0
26		10	14	8.0	.6	.2	.6	2.0	2.0	3.0
27		4	18	90	.6	.2	.6	2.0	2.0	3.0
28		4	16	50	.6	.1	.6	1.3	2.0	3.0
29		6.5	66	32	.4	.1	.6	1.3	2.0	3.0
30		10	25	36	.4	.2	.6	1.3	1.3	3.0
31	23		19		.6	.2		1.3		3.0

NOTE.—Discharge determined from two rating curves, both fairly well defined above 3 second-feet and applicable to May 18 and after May 28, respectively. Discharge May 19–28 obtained by indirect method or shifting channels. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Blackleaf Creek near Bynum, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	91	4.0	27.8	1,650	B.
May	66	5.0	17.7	1,090	C.
June	90	1.3	12.7	756	B.
July	25	.4	7.05	433	B.
August	.6	.1	.40	24.6	C.
September	1.3	.1	.41	24.4	C.
October	40	.6	4.91	302	B.
November	3.0	1.3	2.19	130	C.
December	3.0	1.3	2.64	162	C.
The period				4,570	

MUSSELSHELL RIVER BASIN.

NORTH FORK OF MUSSELSHELL RIVER NEAR MARTINSDALE, MONT.

Location.—In sec. 6, T. 8 N., R. 12 E., half a mile above the junction of the North and South Forks, at the ranch of Martin J. Settle, 4 miles north of Martinsdale.

Drainage area.—Not measured.

Records available.—May 10, 1907, to December 31, 1913.

Gage.—Chain on left bank just above observer's private wagon bridge.

Control.—Composed of gravel; may shift somewhat during high water, as current is swift.

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

Winter flow.—Affected by ice.

Storage.—Under a Carey Act project the flood waters of the North Fork, the normal flow of which is practically all appropriated, will be stored at a point about 20 miles above the station and used to irrigate land between Martinsdale and Harlowton.

Accuracy.—Records obtained during open season very good.

Discharge measurements of North Fork of Musselshell River near Martinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	C. S. Heidel	4.60	200	Aug. 29	C. S. Heidel	3.23	12
May 20	do	4.34	159	Nov. 7	do	3.52	35
July 12	do	3.70	58				

Daily gage height, in feet, of North Fork of Musselshell River near Martinsdale, Mont., for 1913.

[Arthur H. Settle, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.1	4.5	4.1	3.4	3.3	3.4	3.5
2	.....	4.1	4.5	4.2	3.4	3.3	3.4	3.5
3	.....	4.0	4.4	4.1	3.4	3.3	3.4	3.5
4	.....	4.0	4.3	4.2	3.4	3.3	3.5	3.5
5	.....	3.9	4.3	4.0	3.4	3.2	3.5	3.5
6	.....	3.9	4.2	4.0	3.4	3.2	3.5	3.5
7	.....	3.9	4.1	4.0	3.3	3.2	3.5	3.5
8	.....	4.0	4.0	3.9	3.3	3.2	3.5	3.5
9	.....	4.1	4.0	3.9	3.4	3.3	3.5	3.5
10	.....	4.2	3.9	3.8	3.5	3.3	3.5	3.5
11	.....	4.5	3.9	3.65	3.4	3.3	3.6	3.5
12	.....	4.5	4.5	3.7	3.4	3.3	3.7	3.5
13	.....	4.4	4.5	3.7	3.3	3.3	3.6	3.4
14	.....	4.5	4.5	3.6	3.0	3.3	3.5	3.6
15	.....	4.3	4.5	3.6	3.0	3.3	3.5	3.7
16	.....	4.3	4.5	3.65	3.0	3.3	3.5	3.5
17	4.9	4.2	4.5	3.65	3.0	3.2	3.5	3.5
18	4.8	4.3	4.5	3.5	3.0	3.3	3.5	3.4
19	5.5	4.5	4.5	3.5	3.0	3.3	3.5	3.4
20	5.6	4.4	4.8	3.5	3.0	3.3	3.5	3.4
21	4.9	4.3	4.5	3.5	3.0	3.3	3.5	3.5
22	4.9	4.3	4.5	3.5	3.3	3.4	3.5	3.5
23	4.5	4.4	4.5	3.5	3.3	3.4	3.5	.....
24	4.3	4.5	4.5	3.5	3.2	3.3	3.5	.....
25	4.2	4.6	4.5	3.4	3.2	3.3	3.5	.....
26	4.1	4.6	4.3	3.4	3.2	3.4	3.5	.....
27	4.2	4.6	4.4	3.3	3.2	3.3	3.5	.....
28	4.4	4.7	4.6	3.3	3.2	3.3	3.5	.....
29	4.3	4.6	4.1	3.3	3.2	3.4	3.5	.....
30	4.2	4.8	4.1	3.5	3.2	3.4	3.5	.....
31	.....	4.7	.....	3.5	3.2	.....	3.5	.....

Daily discharge, in second-feet, of North Fork of Musselshell River near Martinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	117	187	117	25	17	25	34
2	.....	117	187	134	25	17	25	34
3	.....	100	169	117	25	17	25	34
4	.....	100	151	134	25	17	34	34
5	.....	84	151	100	25	10	34	34
6	.....	84	134	100	25	10	34	34
7	.....	84	117	100	17	10	34	34
8	.....	100	100	84	17	10	34	34
9	.....	117	100	84	25	17	34	34
10	.....	134	84	70	34	17	34	34
11	.....	187	84	51	25	17	45	34
12	668	187	187	57	25	17	57	34
13	668	169	187	57	17	17	45	25
14	565	187	187	45	2	17	34	45
15	400	151	187	45	2	17	34	57
16	200	151	187	51	2	17	34	34
17	262	134	187	51	2	10	34	34
18	243	151	187	34	2	17	34	25
19	384	187	187	34	2	17	34	25
20	405	169	243	34	2	17	34	25
21	262	151	187	34	2	17	34	34
22	262	151	187	34	17	25	34	34
23	187	169	187	34	17	25	34	.....
24	151	187	187	34	10	17	34	.....
25	134	205	187	25	10	17	34	.....
26	117	205	151	25	10	25	34	.....
27	134	205	169	17	10	17	34	.....
28	169	224	205	17	10	17	34	.....
29	151	205	117	17	10	25	34	.....
30	134	243	117	34	10	25	34	.....
31	.....	224	.....	34	10	.....	34	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Apr. 12–16 estimated from observer's notes and high-water marks. Nov. 23–30, discharge estimated at 25 second-feet.

Monthly discharge of North Fork of Musselshell River near Martinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 12–30	.....	.....	289	10,900	C.
May	243	84	157	9,650	B.
June	243	84	163	9,700	B.
July	134	17	58.2	3,580	B.
August	34	2	14.2	873	B.
September	25	10	17.2	1,020	B.
October	57	25	34.6	2,130	B.
November	57	.....	31.5	1,870	C.
The period	.....	.....	.....	39,700	

MUSSELSHELL RIVER AT HARLOWTON, MONT.

Location.—In sec. 26, T. 8 N., R. 15 E., at the highwaybridge 1 mile south of Harlowton.

Records available.—July 11, 1907, to December 31, 1913. A station was maintained at Shawmut from August 12, 1902, to June 30, 1907.

Drainage area.—Not measured.

Gages.—Standard chain gage on the upstream side of the public highway bridge installed May 24, 1909, at a datum 0.52 foot higher than that previously used. All gage heights for 1909 were corrected to the new datum.

Control.—Bed of stream composed of sand and gravel; will probably shift in flood.

Discharge measurements.—Made from bridge or by wading.

Diversions.—A large part of the valley is irrigated and many small ditches take water from the Musselshell; practically the entire flow of the stream is appropriated. A minimum discharge of 2 second-feet has been recorded during the irrigation season at this station.

Discharge measurements of Musselshell River at Harlowton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	2.19	693	Aug. 28	C. S. Heidel	0.40	31
May 19	do	2.08	631	Nov. 7	do	.84	106
July 11	do	1.30	238				

Daily gage height, in feet, of Musselshell River at Harlowton, Mont., for 1913.

[W. G. Yamamoto, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	0.71	1.7	2.8	1.8	0.70	0.39	0.58	0.85
2	.74	1.65	2.7	1.8	.64	.36	.60	.85
3	.81	1.6	2.6	1.8	.62	.35	.65	.85
4	.85	1.6	2.5	1.8	.62	.31	.65	.85
5	.85	1.45	2.45	1.8	.62	.29	.68	.84
6	.94	1.4	2.3	1.75	.62	.26	.68	.82
7	1.20	1.4	2.2	1.6	.62	.25	.68	.82
8	1.3	1.45	2.2	1.5	.62	.22	.72	.82
9	1.5	1.6	2.1	1.4	.62	.22	.79	.82
10	1.8	1.8	2.0	1.35	.62	.25	.85	.82
11	2.1	2.1	2.0	1.3	.60	.26	.85	.84
12	2.3	2.2	2.5	1.25	.60	.31	.88	.85
13	2.45	2.2	2.4	1.2	.59	.35	.89	.85
14	2.5	2.1	2.1	1.15	.56	.38	.94	.85
15	2.5	2.0	2.1	1.1	.55	.36	.96	.85
16	2.1	1.95	2.05	1.1	.52	.35	1.00	.85
17	2.0	1.9	2.05	1.05	.52	.35	.96	.84
18	2.1	1.9	2.05	1.0	.52	.35	.94	.82
19	2.1	2.0	2.05	1.0	.52	.35	.94	.81
20	2.1	1.95	2.05	.98	.55	.35	.88	.80
21	2.0	1.95	2.05	.91	.54	.36	.89	.78
22	2.0	1.9	2.0	.85	.52	.39	.91	.78
23	1.9	1.95	1.9	.8	.52	.42	.92	.79
24	1.8	2.0	1.8	.76	.52	.46	.90	.86
25	1.6	2.2	1.7	.74	.52	.49	.90	.90
26	1.5	2.35	1.85	.70	.48	.51	.90	.96
27	1.4	2.5	1.95	.70	.46	.52	.88	1.00
28	1.5	2.7	1.95	.72	.42	.55	.88	1.05
29	1.8	2.8	1.9	.75	.39	.55	.86	1.1
30	1.8	2.8	1.9	.76	.35	.56	.85	1.05
31	.....	2.8	.....	.70	.36	.....	.....	.....

Daily discharge, in second-feet, of Musselshell River at Harlowton, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	79	406	1,200	456	77	31	56	108
2	85	383	1,110	456	66	28	59	108
3	99	360	1,020	456	63	28	68	108
4	108	360	932	456	63	24	68	108
5	108	297	891	456	63	22	73	106
6	130	277	772	431	63	20	73	102
7	206	277	699	360	63	20	73	102
8	240	297	699	317	63	17	81	102
9	317	360	631	277	63	17	95	102
10	456	456	568	258	63	20	108	102
11	631	631	568	240	59	20	108	106
12	772	699	932	223	59	24	115	108
13	891	699	850	206	58	28	118	108
14	932	631	631	190	53	30	130	108
15	932	568	631	175	52	28	136	108
16	631	539	600	175	47	28	146	108
17	568	510	600	160	47	28	136	106
18	631	510	600	146	47	28	130	102
19	631	568	600	146	47	28	130	99
20	631	539	600	141	52	28	115	97
21	568	539	600	123	50	28	118	93
22	568	510	568	108	47	31	123	93
23	510	539	510	97	47	34	125	95
24	456	568	456	89	47	39	120	111
25	360	699	406	85	47	43	120	.....
26	317	811	483	77	42	46	120	.....
27	277	932	539	77	39	47	115	.....
28	317	1,110	539	81	34	52	115	.....
29	456	1,200	510	87	31	52	111	.....
30	456	1,200	510	89	28	53	108	.....
31	.....	1,200	.....	77	28	.....	108	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Nov. 25–30 estimated at 100 second-feet.

Monthly discharge of Musselshell River at Harlowton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	932	79	445	26,500	B.
May	1,200	277	602	37,000	B.
June	1,200	406	675	40,200	B.
July	456	77	217	13,300	B.
August	77	28	51.9	3,190	B.
September	53	17	30.7	1,830	B.
October	146	56	106	6,520	B.
November	111	.....	103	6,130	B.
The period	.....	.....	.....	135,000	

CHECKERBOARD CREEK NEAR DELPINE, MONT.

Location.—In the SW. ¼ SW. ¼ sec. 4, T. 9 N., R. 9 E., 2½ miles above the junction of Checkerboard Creek with Musselshell River, 8 miles from Delpine post office, and 21 miles from Martinsdale, Mont.

Records available.—May 26, 1909, to December 31, 1911; May 21 to December 31, 1913.

Drainage area.—Not measured.

Gage.—A vertical staff set April 9, 1911, about 40 feet downstream from the original staff gage, at a better section and at a different datum.

Control.—Gravel.

Discharge measurements.—Made from foot log or by wading.

Winter flow.—Affected by ice.

Diversions.—It is proposed to divert the water from this creek over a small divide into the rservoir on the North Fork of Musselshell River. The creek is about 12 miles long and has no tributaries.

Discharge measurements of Checkerboard Creek near Delpine, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 17	C. S. Heidel	2.94	33	Aug. 30	C. S. Heidel	2.20	5.4
May 21	do	2.80	25.9	Nov. 8	do	2.17	3.6
July 13	do	2.35	10.2				

Daily gage height, in feet, and discharge, in second-feet, of Checkerboard Creek near Delpine, Mont., for 1913.

[J. A. Porter, observer.]

Day.	April.		May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1					3.05	39	2.45	12		7.5
2					3.05	39	2.45	12		7.5
3					3.0	36		12		7.5
3					3.0	36		11		7.5
5					2.95	34		11		7.5
6					2.85	28	2.4	11		7.5
7					2.8	26	2.35	9.5		7.5
8					2.8	26	2.35	9.5		7.5
9					2.75	24	2.35	9.5		7.5
10					2.7	22	2.3	8.0	2.28	7.6
11					2.7	22	2.3	8.0	2.28	7.6
12					2.9	31	2.35	9.5	2.25	7.0
13	4.1	110			2.65	20	2.35	9.5	2.25	7.0
14					2.65	20	2.35	9.5	2.25	7.0
15						19	2.35	9.5	2.25	7.0
16					2.6	18	2.32	8.6	2.25	7.0
17					2.8	26	2.32	8.6	2.25	7.0
18					2.75	24	2.32	8.6	2.25	7.0
19					2.5	14	2.30	8.0	2.25	7.0
20					2.5	14	2.30	8.0	2.25	7.0
21			2.8	26	2.45	12	2.30	8.0	2.25	7.0
22			2.95	34	2.5	14	2.30	8.0	2.25	7.0
23			2.9	31	2.5	14	2.30	8.0	2.25	7.0
24			2.9	31	2.45	12	2.30	8.0	2.25	7.0
25			3.0	36	2.6	18	2.30	8.0	2.12	4.4
26			3.1	42	2.5	14	2.22	6.4	2.12	4.4
27			3.3	53	2.5	14		7.0	2.20	6.0
28			3.5	65	2.45	12		7.0	2.20	6.0
29			3.55	68		12		7.0	2.20	6.0
30			3.5	65		12		7.0		6.0
31			3.0	36				7.0		6.0

NOTE.—Gage height Apr. 13 estimated from flood marks.
Discharge determined from a fairly well defined rating curve. Discharge estimated July 27 to Aug. 9, and interpolated for other days for which gage heights are missing.

Monthly discharge of Checkerboard Creek near Delpine, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 21-31	68	26	44.3	967	B.
June	39	12	21.7	1,290	B.
July	12	6.4	8.86	545	C.
August	7.6	4.4	6.85	421	C.

SOUTH FORK OF MUSSELSHELL RIVER NEAR MARTINSDALE, MONT.

Location.—In the S. ½ sec. 12, T. 8 N., R. 11 E., near the public highway, 1¼ miles northeast of Martinsdale, near the blacksmith's shop of the Martinsdale Sheep Co., at a point about 1½ miles above the original site, which was near the ranch of M. J. Settle.

Records available.—June 19, 1907, to April 28, 1908 (old station); April 28, 1908, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff nailed to tree on the right bank. The datum of this gage bears no determined relation to the datum of the gage at the original station.

Control.—Bed of stream is chiefly gravel, is clean, and nonshifting.

Discharge measurements.—Made by wading near the gage or from a bridge 150 feet below.

Winter flow.—Affected by ice.

Diversions.—Many small ditches take water from the creek and during the irrigating season all the water is diverted.

Accuracy.—Open season records good.

Discharge measurements of South Fork of Musselshell River near Martinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	4.22	382	Aug. 29	C. S. Heidel	1.02	3.6
May 20	do	3.52	245	Nov. 7	do	1.69	27
July 12	do	2.30	77				

Daily gage height, in feet, of South Fork of Musselshell River near Martinsdale, Mont., for 1913.

[Fred Gerdts, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3.35	5.2	2.9	1.45	1.05	1.2	1.85
2	.....	3.2	5.0	2.95	1.2	1.05	1.1	1.9
3	.....	3.0	4.9	2.8	1.15	1.05	1.1	1.8
4	.....	2.9	4.7	3.05	1.15	1.1	1.1	1.75
5	.....	2.8	4.6	2.85	1.15	1.1	1.3	1.7
6	.....	2.8	4.4	2.75	1.25	1.05	1.5	1.9
7	.....	3.05	4.2	2.65	1.25	1.05	1.6	1.7
8	.....	3.5	4.0	2.55	1.2	1.25	1.6	1.7
9	.....	3.6	3.9	2.4	1.2	1.25	1.65	1.8
10	.....	3.7	3.8	2.4	1.4	1.25	1.65	1.8
11	.....	4.6	3.6	2.3	1.5	1.3	1.75	1.8
12	.....	4.5	4.6	2.35	1.45	1.3	2.1	1.75
13	.....	4.4	4.0	2.2	1.4	1.25	2.2	1.7
14	.....	4.0	3.8	2.2	1.4	1.2	2.2	1.7
15	.....	3.9	3.8	2.1	1.4	1.2	2.1	1.7
16	3.6	3.8	3.8	2.0	1.4	1.15	2.0	1.75
17	3.6	3.7	3.7	1.9	1.5	1.15	2.0	1.75
18	4.0	3.7	3.6	1.95	1.5	1.1	1.85	1.8
19	4.2	3.7	4.1	1.7	1.5	1.1	1.8	1.9
20	4.3	3.6	3.7	1.65	1.5	1.15	1.8	1.9
21	3.8	3.4	3.45	1.6	1.55	1.15	1.85	.....
22	4.4	3.4	3.35	1.45	1.5	1.05	1.8	.....
23	3.35	3.8	3.1	1.45	1.45	1.1	1.8	.....
24	3.1	4.1	3.15	1.45	1.45	1.1	1.8	.....
25	3.0	4.8	3.25	1.45	1.4	1.15	1.85	.....
26	2.9	5.2	3.25	1.4	1.1	1.15	1.8	.....
27	3.5	5.4	3.35	1.45	1.05	1.15	1.85	.....
28	3.8	5.6	3.2	1.35	1.05	1.15	1.9	.....
29	3.7	5.6	3.05	1.3	1.05	1.2	1.9	.....
30	3.45	5.4	2.95	1.7	1.05	1.3	1.9	.....
31	.....	5.2	.....	1.55	1.0	.....	1.85	.....

Daily discharge, in second-feet, of South Fork of Musselshell River near Martinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	218	789	148	17	4.4	8.0	40
2	.....	193	693	155	8	4.4	5.5	43
3	.....	162	647	134	6.8	4.4	5.5	36
4	.....	148	561	170	6.8	5.5	5.5	33
5	.....	134	522	141	6.8	5.5	11	30
6	.....	134	453	128	9.5	4.4	19	43
7	.....	170	395	115	9.5	4.4	24	30
8	.....	243	345	104	8	9.5	24	30
9	.....	261	322	87	8	9.5	27	36
10	.....	280	300	87	15	9.5	27	36
11	.....	522	261	77	19	11	33	36
12	.....	486	522	82	17	11	58	33
13	.....	453	345	67	15	9.5	67	30
14	.....	345	300	67	15	8	67	30
15	.....	322	300	58	15	8	58	30
16	261	300	300	50	15	6.8	50	33
17	261	280	280	43	19	6.8	50	33
18	345	280	261	46	19	5.5	40	.....
19	395	280	369	30	19	5.5	36	.....
20	423	261	280	27	19	6.8	36	.....
21	300	226	234	24	22	6.8	40	.....
22	453	226	218	17	19	4.4	36	.....
23	218	300	177	17	17	5.5	36	.....
24	177	369	185	17	17	5.5	36	.....
25	162	603	201	17	15	6.8	40	.....
26	148	789	201	15	5.5	6.8	36	.....
27	243	891	218	17	4.4	6.8	40	.....
28	300	1,000	193	13	4.4	6.8	43	.....
29	280	1,000	170	11	4.4	8	43	.....
30	234	891	155	30	4.4	11	43	.....
31	.....	789	.....	22	3.2	.....	40	.....

NOTE.—Discharge determined from a fairly well defined rating curve. Discharge Nov. 18–30 estimated at 25 second-feet.

Monthly discharge of South Fork of Musselshell River near Martinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 16–30	453	148	280	8,330	B.
May	1,000	134	405	24,900	B.
June	789	155	340	20,200	B.
July	170	11	65.0	4,000	B.
August	22	3.2	12.4	762	B.
September	11	4.4	6.96	414	B.
October	67	5.5	35.0	2,150	B.
November	43	.....	30.2	1,800	C.
The period	.....	.....	.....	62,600	

AMERICAN FORK NEAR HARLOWTON, MONT.

Location.—At the Shaw & Elliott ranch, 5 miles southeast of Harlowton, Mont., a few miles above the junction of the American Fork with the Musselshell.

Records available.—July 28, 1907, to December 31, 1911, and May 19, 1913, to December 31, 1913.

Gage.—Chain fastened to upper rail of small wagon bridge.

Channel.—Bed composed of sand and clay; shifts only at extremely high stages.

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

Winter flow.—Affected by ice.

Storage.—The basin of the American Fork affords some good storage sites and by holding back the spring flood waters, which are derived from the melting snow on the mountains, much more land can be put under irrigation.

Accuracy.—Open-season records good.

Discharge measurements of American Fork near Harlowton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	1.24	3.26	Aug. 29	C. S. Heidel	[a] 0.75	0
May 19	do	1.92	41	Nov. 7	do	1.16	2.51
July 12	do	1.42	11.4				

[a] Gage height of zero flow is probably about 0.95.

Daily gage height, in feet, of American Fork near Harlowton, Mont., for 1913.

[G. M. Glennie, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.8	2.3	1.15	0.9	1.15	1.2
2	.....	2.8	2.2	1.1	1.1	1.15	1.2
3	.....	2.7	2.15	1.1	1.1	1.05	1.2
4	.....	2.7	2.2	1.1	1.0	1.0	1.2
5	.....	2.45	2.05	1.25	.95	1.05	1.1
6	.....	2.7	2.0	1.1	.9	1.15	1.15
7	.....	2.7	2.15	1.1	.8	1.25	1.15
8	.....	2.7	2.15	1.05	.8	1.25	1.15
9	.....	2.1	2.0	1.15	.8	1.3	1.15
10	.....	1.95	1.5	1.2	.85	1.3	1.2
11	.....	2.0	1.4	1.1	.95	1.2	1.2
12	.....	3.2	1.4	1.1	.95	1.15	1.2
13	.....	3.1	1.35	1.1	.9	1.35	1.15
14	.....	3.2	1.4	1.05	1.05	1.35	1.2
15	.....	3.05	1.25	1.1	1.0	1.25	1.2
16	.....	3.0	1.25	1.1	1.05	1.2	1.15
17	.....	3.1	1.3	1.1	.95	1.25	1.15
18	.....	2.5	1.25	1.1	.9	1.2	1.2
19	1.9	2.35	1.25	1.15	.9	1.2	1.2
20	1.85	2.25	1.2	1.1	.8	1.25	1.25
21	1.8	2.3	1.1	1.05	.9	1.2	1.2
22	1.65	2.2	1.2	1.1	1.05	1.2	1.2
23	1.65	2.1	1.0	1.05	1.2	1.15	.....
24	1.7	2.15	1.2	1.1	1.05	1.2	.....
25	3.1	2.15	1.1	.9	.9	1.25	.....
26	3.1	2.6	1.15	.8	1.15	1.2	.....
27	3.2	2.65	1.15	.75	1.05	1.2	.....
28	3.4	2.5	1.15	.75	1.15	1.2	.....
29	3.0	2.5	1.2	.7	1.1	1.2	.....
30	3.0	2.35	1.3	.6	1.05	1.25	.....
31	3.0	.....	1.2	.85	.....	1.2	.....

Daily discharge, in second-feet, of American Fork near Harlowton, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	197	93	2.2	0.0	2.2	3.0
2	.....	197	77	1.3	1.3	2.2	3.0
3	.....	173	70	1.3	1.3	.8	3.0
4	.....	173	77	1.3	.3	.3	3.0
5	.....	121	57	4.1	.0	.8	1.3
6	.....	173	51	1.3	.0	2.2	2.2
7	.....	173	70	1.3	.0	4.1	2.2
8	.....	173	70	.8	.0	4.1	2.2
9	.....	63	51	2.2	.0	5.2	2.2
10	.....	46	13	3.0	.0	5.2	3.0
11	.....	51	8.7	1.3	.0	3.0	3.0
12	.....	313	8.7	1.3	.0	2.2	3.0
13	.....	281	7.0	1.3	.0	7.0	2.2
14	.....	313	8.7	.8	.8	7.0	3.0
15	.....	266	4.1	1.3	.3	4.1	3.0
16	.....	251	4.1	1.3	.8	3.0	2.2
17	.....	281	5.2	1.3	.0	4.1	2.2
18	.....	131	4.1	1.3	.0	3.0	3.0
19	41	102	4.1	2.2	.0	3.0	3.0
20	37	85	3.0	1.3	.0	4.1	4.1
21	32	93	1.3	.8	.0	3.0	3.0
22	22	77	3.0	1.3	.8	3.0	3.0
23	22	63	.3	.8	3.0	2.2	.....
24	25	70	3.0	1.3	.8	3.0	.....
25	281	70	1.3	.0	.0	4.1	.....
26	281	151	2.2	.0	2.2	3.0	.....
27	313	162	2.2	.0	.8	3.0	.....
28	386	131	2.2	.0	2.2	3.0	.....
29	251	131	3.0	.0	1.3	3.0	.....
30	251	102	5.2	.0	.8	4.1	.....
31	251	.....	3.0	.0	.....	3.0	.....

NOTE.—Discharge determined from a rating curve fairly well-defined above 1.3 second-feet.

Monthly discharge of American Fork near Harlowton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 19–31	386	22	169	4,360	B.
June	313	46	154	9,160	B.
July	93	0.3	23.0	1,410	B.
August	4.1	0	1.17	72	C.
September	3.0	0	.56	33	C.
October	7.0	.3	3.29	202	C.
November 1–22	4.1	1.3	2.72	119	B.
The period	.....	.....	.....	15,400	

LEBO CREEK NEAR HARLOWTON, MONT.

Location.—Near the Shaw & Elliott ranch, 5 miles southeast of Harlowton, half a mile above the junction of the creek with American Fork.

Records available.—July 28, 1907, to December 31, 1911, and May 19, 1913, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff on the right bank, nailed to the pile of the small wagon bridge; its datum is the same as that of the gage on the American Fork.

Control.—Channel contains growth of grass.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—The water of the stream is used for irrigation.

Accuracy.—Records only fair as gage heights are affected by backwater caused by grass in the stream bed.

Lebo Creek is about 20 miles long, is fed by springs, and its flow is nearly uniform.

Discharge measurements of Lebo Creek near Harlowton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	1.47	32	Aug. 29	C. S. Heidel	1.05	13.1
May 19	do	1.45	30	Nov. 7	do	1.22	19.6
July 12	do	1.18	14.1				

Daily gage height, in feet, of Lebo Creek near Harlowton, Mont., for 1913.

[G. M. Glennie, Observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.1	1.15	0.9	1.15	1.15	1.25
2	.....	1.1	1.3	.85	1.05	1.15	1.3
3	.....	1.1	1.2	.85	1.0	1.15	1.3
4	.....	1.1	1.2	.85	1.05	1.1	1.25
5	.....	1.4	1.2	.9	1.05	1.1	1.15
6	.....	1.55	1.2	.9	1.05	1.2	1.3
7	.....	1.65	1.1	.85	1.1	1.2	1.3
8	.....	1.65	1.15	.85	1.05	1.2	1.25
9	.....	1.4	1.2	.85	1.05	1.3	1.25
10	.....	1.1	1.15	.85	1.05	1.3	1.25
11	.....	1.0	1.1	.85	1.15	1.2	1.25
12	.....	2.4	1.1	.85	1.1	1.5	1.25
13	.....	2.2	1.1	.95	1.15	1.3	1.25
14	.....	2.4	1.1	1.1	1.1	1.2	1.25
15	.....	1.8	1.1	1.0	1.05	1.2	1.3
16	.....	1.5	1.05	1.1	1.1	1.2	1.25
17	.....	1.55	1.1	1.0	1.15	1.2	1.3
18	.....	1.5	1.0	1.1	1.0	1.2	1.3
19	1.45	1.45	1.0	1.1	1.05	1.2	1.25
20	1.6	1.4	1.0	1.05	1.0	1.2	1.25
21	1.3	1.4	1.0	1.0	1.05	1.2	1.3
22	1.25	1.2	1.0	1.05	1.1	1.2	1.3
23	1.1	1.25	.9	1.05	1.2	1.2	.....
24	1.1	1.35	.8	1.05	1.15	1.2	.....
25	1.05	1.35	.85	1.1	1.1	1.3	.....
26	1.0	1.55	.8	1.05	1.1	1.3	.....
27	1.1	1.7	.8	1.0	1.05	1.3	.....
28	1.05	1.4	.85	1.05	1.1	1.25	.....
29	1.1	1.4	.9	1.05	1.1	1.25	.....
30	1.1	1.5	.9	1.1	1.15	1.3	.....
31	1.0	.....	.9	1.1	.....	1.3	.....

Daily discharge, in second-feet, of Lebo Creek near Harlowton, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	17	12	7.0	16	16	20
2	.....	17	18	6.2	14	16	22
3	.....	17	14	6.2	12	16	22
4	.....	17	14	6.4	14	15	20
5	.....	29	14	7.4	14	15	16
6	.....	35	14	7.6	14	18	22
7	.....	40	11	6.6	15	18	22
8	.....	40	12	6.8	14	18	20
9	.....	29	14	6.8	14	22	20
10	.....	17	12	7.0	14	22	20
11	.....	14	11	7.0	16	18	20
12	.....	81	11	7.0	15	30	20
13	.....	69	11	9.5	16	22	20
14	.....	80	11	15	15	18	20
15	.....	45	11	12	14	18	22
16	.....	31	9.5	15	15	18	20
17	.....	33	11	12	16	18	22
18	.....	30	8.0	15	12	18	22
19	31	28	8.0	15	14	18	20
20	37	25	8.0	14	12	18	20
21	25	25	8.0	12	14	18	22
22	23	17	8.0	14	15	18	22
23	17	18	6.2	14	18	18	.....
24	17	22	4.2	14	16	18	.....
25	16	21	5.4	15	15	22	.....
26	14	29	4.4	14	15	22	.....
27	17	35	4.6	12	14	22	.....
28	16	22	5.6	14	15	20	.....
29	17	22	6.8	14	15	20	.....
30	17	25	6.8	15	16	22	.....
31	14	.....	7.0	15	.....	22	.....

NOTE.—Discharge determined as follows: May 19 to June 11, from a poorly-defined rating curve; June 12–30, by indirect method for shifting channels; July 1–22, from a poorly-defined rating curve; July 23 to Aug. 13, by indirect method for shifting channels; Aug. 14 to Nov. 22, from a fairly well-defined rating curve.

Monthly discharge of Lebo Creek near Harlowton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 19–31	37	14	20.1	518	C.
June	81	14	31.0	1,840	C.
July	18	4.2	9.73	598	C.
August	15	6.2	11.0	676	C.
September	18	12	14.6	869	B.
October	30	15	19.2	1,180	B.
November 1–22	22	16	20.6	899	B.
The period	.....	.....	.....	6,580	

FLATWILLOW CREEK NEAR FLATWILLOW, MONT.

Location.—In sec. 23, T. 12 N., R. 25 E., at Flatwillow Ranch Co.'s ranch, 8 miles above Flatwillow and 30 miles north of Roundup.

Records available.—May 3, 1911, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage, marked to tenths of feet, nailed to a timber driven into bed of stream and braced to the banks; below the wagon bridge near the ranch buildings.

Channel.—Likely to shift; current very sluggish.

Discharge measurements.—At high stages made from a footbridge behind house; at low water made by wading below house.

Winter flow.—Affected by ice.

Diversions.—Much water is diverted above the gage during the irrigating season. A canal to divert water into the storage reservoir of the Flatwillow Carey project heads about a mile above the station.

Discharge measurements of Flatwillow Creek near Flatwillow, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 19	C. S. Heidel	5.5	161	Aug. 27	C. S. Heidel	2.45	20
May 17	do	4.9	132	Nov. 6	do	2.92	37
July 10	do	4.1	93				

Daily gage height, in feet, of Flatwillow Creek near Flatwillow, Mont., for 1913.

[J. D. Brinegar, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.4	5.9	5.2	3.0	2.6	2.5	3.1	2.8
2	.....	5.4	5.7	5.1	2.9	2.6	2.5	3.1	2.9
3	.....	5.4	5.6	4.8	2.9	2.5	2.5	3.0	3.0
4	.....	5.4	5.4	4.7	2.8	2.5	2.6	3.0	2.9
5	.....	5.4	5.3	4.4	2.7	2.5	2.7	2.9	2.9
6	4.4	5.2	5.0	4.5	2.6	2.5	2.8	2.9	2.9
7	4.5	5.0	5.1	4.2	2.6	2.5	2.7	2.9	2.9
8	4.6	4.8	4.9	4.1	2.6	2.4	2.7	2.9	3.0
9	4.6	4.7	4.9	4.0	2.7	2.4	2.8	2.9	2.8
10	4.8	4.7	4.8	4.1	2.8	2.4	2.8	2.9	3.0
11	4.9	4.8	4.9	4.1	2.8	2.4	2.7	2.9	3.0
12	4.9	4.9	6.5	4.1	2.7	2.4	2.7	2.9	3.0
13	4.9	5.0	7.6	4.0	2.6	2.4	2.8	2.8	3.0
14	5.2	5.5	5.3	3.8	2.6	2.4	2.8	2.8	2.9
15	5.3	5.5	5.4	3.7	2.6	2.4	2.8	2.8	2.9
16	5.3	4.9	5.2	3.6	2.6	2.4	2.7	2.9	2.9
17	5.4	4.9	5.3	3.4	2.6	2.4	2.7	2.9	2.9
18	5.5	5.6	5.1	3.5	2.6	2.4	2.7	2.9	2.9
19	5.6	5.9	5.1	3.7	2.6	2.4	2.8	2.9	2.9
20	5.8	5.9	4.9	3.7	2.6	2.4	2.8	3.0	2.9
21	6.0	6.0	4.9	4.0	2.6	2.5	2.8	3.0	3.0
22	6.0	5.9	4.7	4.2	2.6	2.6	2.8	3.0	3.0
23	5.9	5.8	4.7	4.0	2.5	2.7	2.8	2.9	3.0
24	6.0	5.7	4.6	3.8	2.5	2.7	2.8	2.8	3.0
25	6.0	5.7	4.6	3.4	2.5	2.7	2.8	2.9	3.0
26	5.9	5.8	4.5	3.2	2.5	2.7	2.9	3.0	3.0
27	5.7	5.8	4.5	3.1	2.5	2.7	2.9	3.0	3.0
28	5.5	6.0	4.4	3.1	2.5	2.7	3.0	2.9	3.0
29	5.5	6.9	5.1	3.1	2.5	2.6	3.0	3.0	3.1
30	5.5	6.4	5.4	3.1	2.5	2.6	3.0	2.9	3.2
31	.....	6.0	.....	3.0	2.6	.....	3.1	.....	3.2

NOTE.—Dec. 21 to 31, gage heights affected by ice.

Daily discharge, in second-feet, of Flatwillow Creek near Flatwillow, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	161	191	149	40	25	22	44	32
2	.....	161	179	143	36	25	22	44	36
3	.....	161	173	125	36	22	22	40	40
4	.....	161	161	119	32	22	25	40	36
5	.....	161	155	104	28	22	28	36	36
6	104	149	137	109	25	22	32	36	36
7	109	137	143	94	25	22	28	36	36
8	114	125	131	89	25	19	28	36	40
9	114	119	131	84	28	19	32	36	32
10	125	119	125	89	32	19	32	36	40
11	131	125	131	89	32	19	28	36	40
12	131	131	230	89	28	19	28	36	40
13	131	137	307	84	25	19	32	32	40
14	149	167	155	74	25	19	32	32	36
15	155	167	161	69	25	19	32	32	36
16	155	131	149	64	25	19	28	36	36
17	161	131	155	56	25	19	28	36	36
18	167	173	143	60	25	19	28	36	36
19	173	191	143	69	25	19	32	36	36
20	185	191	131	69	25	19	32	40	36
21	197	197	131	84	25	22	32	40	.....
22	197	191	119	94	25	25	32	40	.....
23	191	185	119	84	22	28	32	36	.....
24	197	179	114	74	22	28	32	32	.....
25	197	179	114	56	22	28	32	36	.....
26	191	185	109	48	22	28	36	40	.....
27	179	185	109	44	22	28	36	40	.....
28	167	197	104	44	22	28	40	36	.....
29	167	258	143	44	22	25	40	40	.....
30	167	223	161	44	22	25	40	36	.....
31	.....	197	.....	40	25	.....	44	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Dec. 21 to 31, discharge estimated at 36 second-feet.

Monthly discharge of Flatwillow Creek near Flatwillow, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 6–30	197	104	158	7,840	B.
May	258	119	167	10,300	B.
June	307	104	148	8,810	B.
July	149	40	80.1	4,930	B.
August	40	22	26.4	1,620	B.
September	28	19	22.4	1,330	B.
October	44	22	31.2	1,920	B.
November	44	32	37.1	2,210	B.
December	.....	.....	36.5	2,240	C.
The period	.....	.....	.....	41,200	

MILK RIVER BASIN.

SOUTH FORK OF MILK RIVER NEAR BROWNING, MONT.

Location.—In the SW. ¼ sec. 29, T 37 N., R. 9 W., at Richard Croff's ranch, just above Kennedy Coulee, about 40 miles northeast of Browning, Mont., and about 6 miles south of t international boundary line.

Records available.—April 28, 1905, to December 31, 1913.

Drainage area.—288 square miles. (Measurement revised.)

Gage.—Overhanging chain and Stevens automatic, installed April 13, 1913.

Control.—Permanent.
Discharge measurements.—Made from a cable or by wading.
Winter flow.—Affected by ice.
Flood discharge.—River overflows its banks at gage height of 12 feet; high-water marks show that the flood of June, 1908, reached a stage of 15.4 feet on the gage. The flood width was 850 feet and the cross section about 2,600 square feet.
Diversions.—No diversions and no storage above the station.
Accuracy.—Records excellent except during the winter months.
Cooperation.—This station is maintained in cooperation with the Irrigation Office, Department of the Interior, Canada, during 1913.

Discharge measurements of South Fork of Milk River near Browning, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 20	W. A. Lamb	4.43	445	July 27	J. M. Ray	3.05	87
21	F. R. Burfield	4.14	373	Aug. 29	F. R. Burfield	2.56	21.2
21	W. A. Lamb	4.14	370	Sept. 13	W. A. Lamb	2.51	18.1
June 15	R. k. Randell	3.42	148	Oct. 12	L. Danielson	2.90	73.2
25	F. R. Burfield	3.16	102	Nov. 18	do	2.80	39.9
July 9	do	2.99	81	Dec. 20	W. A. Lamb	2.45	11.9
23	do	2.80	50.4				

Daily gage height, in feet, of South Fork of Milk River near Browning, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.60	4.02	3.50	2.80	2.58	2.55		2.66
2		3.64	3.94	3.35	2.76	2.57	2.55		2.60
3		3.80	3.90	3.27	2.72	2.56	2.57		2.62
4		3.67	3.84	3.25	2.73	2.53	2.68		2.61
5		3.60	3.75	3.27	2.71	2.52	2.71		2.63
6		3.59	3.69	3.20	2.70	2.48	2.70		2.67
7		3.68	3.63	3.12	2.75	2.47	2.74		2.63
8		3.74	3.57	3.08	2.77	2.47	2.77		2.60
9		3.63	3.55	3.04	2.96	2.46	2.88		2.60
10		3.60	3.58	2.98	3.15	2.47	2.76		2.56
11		3.78	3.61	3.00	3.05	2.48	2.79		2.64
12		4.00	3.52	3.05	2.89	2.51	2.9		2.66
13	5.55	4.01	3.45	3.01	2.81	2.48	3.3		2.69
14	5.5	4.00	3.40	2.97	2.81	2.49	3.2		2.69
15	5.2	3.93	3.40	2.92	2.83	2.50	2.95		2.65
16	5.05	3.88	3.36	2.90	2.80	2.50	2.8		2.66
17	4.6	4.16	3.30	2.86	2.78	2.50	2.8		2.62
18	4.45	4.10	3.27	2.85	2.78	2.50	2.6	2.75	2.60
19	4.8	4.54	3.27	2.83	2.80	2.54	2.7	2.80	2.54
20	4.75	4.40	3.37	2.80	2.76	2.55	2.9	2.52	2.48
21	4.8	4.17	3.38	2.81	2.70	2.58	3.15	2.60	
22	4.65	4.16	3.24	2.80	2.68	2.62	3.26	2.65	
23	3.9	4.24	3.21	2.85	2.64	2.70	3.07	2.71	
24	3.9	4.18	3.21	2.80	2.60	2.72	2.81	2.77	
25	3.8	4.17	3.15	2.80	2.58	2.70	2.67	2.81	
26	3.8	4.22	3.36	2.80	2.57	2.65	2.70	2.79	
27	4.13	4.30	4.05	3.05	2.57	2.62	2.70	2.74	
28	4.11	4.32	4.23	2.92	2.57	2.60	2.64	2.68	
29	3.93	4.26	4.04	2.88	2.56	2.56	2.58	2.67	
30	3.66	4.19	3.71	2.86	2.55	2.55		2.70	
31		4.08		2.86	2.55				

NOTE.—Gage out of order Oct. 30–Nov. 17. Gage removed for winter on Dec. 20. Gage heights after Dec. 10 affected by ice in stream.

Daily discharge, in second-feet, of South Fork of Milk River near Browning, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	196	315	173	50	25	22	.....	34
2	.....	206	289	141	45	24	22	.....	27
3	.....	248	277	125	40	23	24	.....	29
4	.....	214	260	122	42	21	36	.....	28
5	.....	196	234	125	39	20	39	.....	30
6	.....	194	218	112	38	17	38	.....	35
7	.....	216	204	98	44	16	43	.....	30
8	.....	232	189	92	46	16	46	.....	27
9	.....	204	184	85	73	15	61	.....	27
10	.....	196	191	76	104	16	45	.....	23
11	.....	243	198	79	87	17	49	.....	.....
12	.....	308	178	87	63	19	64	.....	.....
13	864	311	162	81	51	17	131	.....	.....
14	815	308	151	74	51	17	112	.....	.....
15	734	286	151	67	54	18	72	.....	.....
16	678	271	143	64	50	18	50	.....	.....
17	516	361	131	58	48	18	50	.....	.....
18	462	341	125	57	48	18	27	44	.....
19	588	494	125	54	50	22	38	50	.....
20	570	445	145	50	45	22	64	20	.....
21	588	365	147	51	38	25	104	27	.....
22	534	361	120	50	36	29	123	32	.....
23	277	389	114	57	31	38	90	39	.....
24	277	368	114	50	27	40	51	46	.....
25	248	365	104	50	25	38	35	51	.....
26	248	382	143	50	24	32	38	49	.....
27	351	410	324	87	24	29	38	43	.....
28	344	417	386	67	24	27	31	36	.....
29	286	396	321	61	23	23	25	35	.....
30	211	372	224	58	22	22	25	38	.....
31	.....	334	.....	58	22	.....	25	.....	.....

NOTE.—Discharge determined from a well-defined curve. Discharge Oct. 30-31, estimated; mean discharge Nov. 1-17, estimated 25 second feet; Dec. 11-31, 15 second-feet.

Monthly discharge of South Fork of Milk River near Browning, Mont., for 1913.

[Drainage area, 288 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	864	211	479	1.66	1.11	17,100	A.
May	494	196	311	1.08	1.24	19,100	A.
June	386	104	196	.680	.76	11,700	A.
July	173	50	79.3	.275	.32	4,880	A.
August	104	22	44.0	.153	.18	2,700	A.
September	40	15	22.7	.079	.09	1,350	A.
October	131	22	52.2	.181	.21	3,210	B.
November	51	20	31.2	.108	.12	1,860	C.
December	34	15	19.5	.068	.08	1,200	C.
The period	.....	.....	.....	.....	.....	63,100	

MILK RIVER AT INTERNATIONAL BOUNDARY.

Location.—In the SE. ¼ sec. 1, T. 1, R. 5 W. fourth meridian, Alberta, Canada, at international boundary line, 30 miles north of Rudyard, Mont., the nearest railroad station.

Records available.—April 1 to December 31, 1913. From August 7, 1909 to 1912 station was maintained by the Canadian Department of the Interior.

Drainage area.—2,448 square miles.

Gage.—Gurley automatic gage on left bank, installed August 13, 1913. At the station maintained by the Canadian officials readings were obtained from a staff gage on the right bank, about 1,000 feet above the present gage.

Control.—Likely to shift.

Discharge measurements.—Made from a cable about 1,000 feet above gage; low-water measurements made by wading at the gage.

Winter flow.—Affected by ice.

Accuracy.—Records good.

Cooperation.—Maintained in cooperation with the Irrigation Office, Department of the Interior, Canada, during 1913.

Discharge measurements of Milk River at international boundary in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	J. E. Degnan	[a] 3.58	572	Aug. 13	J. E. Degnan	[b] 2.98	60
28	do	[a] 3.26	403	13	J. B. Stewart	[b] 2.95	59
May 16	do	[a] 3.45	508	Sept. 4	J. E. Degnan	[b] 2.56	34
18	J. B. Stewart	[a] 3.45	470	18	do	[b] 2.42	22
30	J. E. Degnan	[a] 3.70	518	Oct. 8	do	[b] 2.80	55
June 18	do	[a] 2.71	295	24	do	[b] 3.05	74
July 8	do	[a] 2.72	165	Nov. 7	do	[b] 2.97	55
22	J. B. Stewart	[a] 2.23	81	9	W. A. Lamb	[b] 3.14	85
25	J. E. Degnan	[a] 2.16	84	Dec. 24	do	[b] 2.95	14.7

[a] Gage height from rod near cable. [b] Gage height from rod at automatic gage.

Daily gage height, in feet, of Milk River at international boundary for 1913.

[Frank Galloway, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.50	3.63	3.67	3.74	2.12	2.75	2.76	3.02	3.22
2	5.55	3.51	3.70	3.63	2.11	2.72	2.74	3.09	3.24
3	4.23	3.41	3.65	3.55	2.11	2.60	2.71	3.03	3.30
4	5.80	3.25	3.60	3.16	2.10	2.55	2.70	3.03	3.30
5	5.60	3.32	3.38	2.99	2.12	2.53	2.77	3.08	3.30
6	4.27	3.28	3.24	2.86	2.13	2.50	2.86	3.08	3.30
7	4.55	3.27	3.19	2.75	2.13	2.48	2.87	3.06	3.30
8	4.61	3.29	3.14	2.72	2.13	2.47	2.82	3.07	3.30
9	4.45	3.23	3.10	2.68	2.14	2.46	2.83	3.14	3.30
10	4.18	3.18	3.07	2.65	2.14	2.46	2.89	3.18	3.28
11	4.20	3.22	3.05	2.62	2.08	2.46	2.88	3.10	3.28
12	4.42	3.26	2.95	2.56	2.08	2.44	2.86	3.08	3.28
13	4.50	3.29	3.00	2.48	2.98	2.43	2.88	3.00	3.28
14	4.55	3.20	2.89	2.45	3.40	2.43	2.88	2.85	3.28
15	4.52	3.32	2.87	2.45	3.56	2.43	2.90	3.25	3.28
16	4.48	3.42	2.86	2.42	3.35	2.42	2.89	3.15	3.28
17	4.41	3.46	2.75	2.34	3.18	2.43	2.97	3.40	3.38
18	4.18	3.45	2.72	2.33	4.58	2.43	3.30	3.26	3.38
19	4.25	3.46	2.70	2.31	4.41	2.45	3.30	3.24	3.38
20	4.10	3.66	2.90	2.32	4.01	2.45	3.22	3.18	3.37
21	4.04	3.52	2.87	2.30	3.63	2.48	3.15	2.98	3.00
22	4.10	3.93	2.83	2.15	3.29	2.54	3.08	3.44	2.45
23	4.05	3.74	2.79	2.17	3.12	2.62	3.05	3.10	2.09
24	3.97	3.65	2.84	2.17	3.04	2.58	3.05	3.11	.....
25	3.75	3.58	2.88	2.16	2.98	2.58	3.03	3.12	2.00
26	3.58	3.60	2.76	2.16	2.93	2.63	3.02	3.13	.....
27	3.37	3.57	2.83	2.14	2.89	2.66	3.00	3.14	.....
28	3.29	3.56	3.23	2.14	2.86	2.65	3.02	3.15	.....
29	3.32	3.56	2.94	2.12	2.82	2.70	3.01	3.16	.....
30	3.45	3.67	2.89	2.12	2.80	2.76	3.04	3.18	.....
31	.....	3.65	.....	2.11	2.77	.....	2.92	.....	.....

NOTE.—Discharge relation affected by ice Apr. 1–10 and after Nov. 30.

Daily discharge, in second-feet, of Milk River at international boundary for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	60	642	676	739	70	50	51	65
2	105	550	702	642	69	47	49	70
3	130	484	658	580	69	36	46	64
4	330	398	618	353	68	32	46	63
5	480	434	467	277	70	31	52	66
6	550	414	393	229	72	28	60	65
7	680	408	368	192	72	27	61	63
8	720	419	343	184	72	26	56	71
9	1,078	388	325	175	73	25	58	85
10	1,259	363	311	168	73	25	62	89
11	1,287	383	302	161	66	25	61	82
12	1,634	403	261	148	66	24	59	80
13	1,771	419	281	131	61	23	61	72
14	1,858	373	239	125	99	23	61	59
15	1,806	434	232	121	115	23	62	95
16	1,737	490	229	119	96	22	61	86
17	1,617	516	192	104	82	23	68	108
18	1,259	509	184	102	207	23	98	96
19	1,362	516	179	99	193	24	97	94
20	1,149	667	243	101	158	24	90	89
21	1,070	557	232	97	125	27	84	71
22	1,149	937	218	74	95	31	77	112
23	1,082	739	205	77	80	38	74	82
24	984	658	222	77	74	35	74	83
25	748	603	236	75	69	35	71	84
26	603	618	195	75	66	39	70	85
27	461	595	218	73	62	42	67	86
28	419	587	388	73	60	41	67	86
29	434	587	257	70	56	46	66	87
30	509	676	239	70	54	51	67	89
31	.....	658	.....	69	52	.....	56	.....

NOTE.—Discharge determined from two fairly well defined curves and by indirect method for shifting channels.

Monthly discharge of Milk River at international boundary for 1913.

[Drainage area, 2,448 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	1,858	60	944	0.385	0.431	56,172	B.
May	937	363	530	.217	.250	32,588	B.
June	702	179	320	.131	.146	19,041	B.
July	739	69	180	.074	.085	11,068	B.
August	216	52	85	.035	.040	5,214	B.
September	51	22	32	.013	.014	1,874	B.
October	98	46	66	.027	.031	4,027	B.
November	112	59	81	.033	.037	4,814	B.
The period	.....	.....	.....	.....	.....	134,798	

MILK RIVER AT HAVRE, MONT.

Location.—In the SE. ¼ SE. ¼ sec. 5, T. 32 N., R. 16 E., at the highway bridge over Milk River at Havre, Mont.

Records available.—May 15, 1898, to December 31, 1913.

Drainage area.—Not accurately determined.

Gage.—Chain fastened to bridge rail on the downstream side.

Control.—Shifts.

Discharge measurements.—Made from bridge or by wading.

Winter flow.—From the last part of November to the first part of April the river at Havre is frozen entirely over and in portions of the cross section it is usually frozen to the bottom.

Diversions.—An irrigation company in southern Alberta, Canada, has been granted an appropriation of 500 second-feet of the low-water flow and 1,500 second-feet of the high-water flow, and a canal of 330 second-feet capacity has been partly constructed but no water has been diverted. There are no other important irrigation rights above Havre, but farther downstream are five large canal systems supplied directly from Milk River and irrigating about 22,000 acres. Preliminary steps toward the adjudication of the water rights of these various systems have been taken. A suit in behalf of the Fort Belknap Indians was decided in their favor, with the result that they were given a prior right over the other canals to 125 second-feet, the priority of the other rights not being touched upon. Although no provision for storage has been made by the above claimants, the entire unappropriated flow of the stream has been filed upon by the United States Reclamation Service in connection with its Milk River irrigation project now under construction.

Accuracy.—Frequent discharge measurements are necessary to properly define the rating curve, and even with these the estimates are subject to considerable error. In years of low precipitation the flow ceases entirely and the water stands in pools for several months.

Discharge measurements of Milk River at Havre, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	R. R. Randell	[a] 7.35	92	July 12	J. B. Stewart	6.35	175
Apr. 30	J. B. Stewart	7.25	572	21	do	5.94	95
May 17	do	7.50	756	26	do	5.78	73
June 5	do	7.05	467	Aug. 8	do	5.58	46
29	do	7.13	411	12	do	5.67	42
July 3	do	7.15	539	Sept. 19	W. A. Lamb	4.94	10
9	do	6.50	206	Oct. 30	do	5.70	61

[a] Ice present.

Daily gage height, in feet, of Milk River at Havre, Mont., for 1913.

[C. W. Ling, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7.8	7.2	7.1	6.9	5.5	5.5	5.2	5.7	5.7
2	.....	8.4	7.5	7.2	7.2	5.4	5.5	5.2	5.7	5.7
3	.....	7.7	7.3	7.2	7.1	5.5	5.4	5.4	5.7	5.8
4	.....	7.9	7.3	7.3	7.2	5.5	5.3	5.4	5.7	5.8
5	.....	8.2	7.0	7.1	7.1	5.5	5.2	5.4	5.8	5.8
6	.....	8.5	7.1	6.9	7.1	5.7	5.2	5.4	5.8	5.8
7	.....	8.5	6.9	6.8	6.4	5.8	5.2	5.7	5.8	5.8
8	.....	9.3	7.0	6.8	6.5	5.7	5.1	5.7	5.8	5.8
9	.....	9.0	6.9	6.7	6.3	5.6	5.1	5.7	5.8	5.8
10	.....	8.8	7.0	6.7	6.4	5.6	5.1	5.7	5.8	.....
11	9.0	8.2	6.9	6.7	6.3	5.8	5.1	5.7	5.8	.....
12	8.0	8.4	7.0	6.6	6.2	5.7	5.0	5.7	5.8	.....
13	7.7	8.5	6.9	6.7	6.2	5.7	5.0	5.6	5.7	.....
14	7.0	9.2	8.0	6.6	6.1	5.7	5.0	5.6	5.7	.....
15	7.0	9.7	7.5	6.8	6.2	5.8	5.0	5.6	5.7	.....
16	7.0	9.4	7.6	6.6	6.0	5.7	5.0	5.7	5.7	.....
17	7.0	9.3	7.4	6.6	6.1	5.7	4.9	5.7	5.7	.....
18	7.0	9.0	7.4	7.1	5.8	6.2	4.8	5.6	5.7	.....
19	7.4	8.5	7.3	6.6	5.9	6.2	4.8	5.7	5.7	.....
20	.....	8.3	7.4	6.4	5.8	7.5	4.8	5.7	5.7	.....
21	.....	8.0	7.3	6.6	5.9	6.8	4.8	5.7	5.7	.....
22	.....	7.7	7.5	6.8	5.8	6.5	4.9	6.1	5.8	.....
23	.....	8.3	7.4	6.7	5.9	6.3	4.8	6.1	5.8	.....
24	.....	8.1	7.6	6.4	5.7	6.1	4.8	6.1	5.8	.....
25	.....	7.7	7.5	6.5	5.7	6.1	4.8	5.9	5.8	.....
26	.....	7.6	7.3	6.6	5.7	5.9	5.3	5.9	5.8	.....
27	.....	7.6	7.2	6.5	5.5	5.8	5.3	5.9	5.8	.....
28	.....	7.6	7.3	6.7	5.6	5.6	5.2	5.8	5.7	.....
29	.....	7.6	7.1	7.4	5.4	5.6	5.2	5.8	5.7	.....
30	.....	7.3	7.2	7.3	5.4	5.6	5.3	5.7	5.7	.....
31	8.4	.....	.....	.....	5.4	5.5	.....	5.7	.....	.....

NOTE.—On Apr. 30 it was found that a sand bar had formed under the chain gage and a temporary staff gage was installed on the right abutment of the bridge, to read the same as the chain gage. This staff gage was read Apr. 30 to June 5. Gage heights Mar. 11–19 are affected by ice.

Daily discharge, in second-feet, of Milk River at Havre, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		945	565	505	395	38	38	20	58	58
2		1,370	750	565	565	31	38	20	58	58
3		880	625	565	505	38	31	31	58	70
4		1,010	625	625	565	38	25	31	58	70
5		1,220	450	505	505	38	20	31	70	70
6		1,450	505	395	505	58	20	31	70	70
7		1,450	395	345	195	70	20	58	70	70
8		2,160	450	345	225	58	15	58	70	70
9		1,880	395	300	170	43	15	58	70	70
10		1,700	450	300	195	40	15	58	70	
11		1,220	395	300	170	56	15	58	70	
12		1,370	450	260	145	42	12	58	70	
13		1,450	395	300	145	42	12	47	58	
14		2,060	1,080	260	123	43	12	47	58	
15		2,540	750	345	145	66	12	47	58	
16		2,260	815	260	104	45	12	58	58	
17		2,160	685	260	123	46	9	58	58	
18		1,880	685	505	70	123	7	47	58	
19		1,450	625	260	86	125	7	58	58	
20		1,300	685	195	70	698	7	58	58	
21		1,080	625	260	86	314	7	58	58	
22		880	750	345	70	207	9	123	70	
23		1,300	685	300	86	150	7	123	70	
24		1,150	815	195	58	119	7	123	70	
25		880	750	225	58	121	7	86	70	
26		815	625	260	58	86	25	86	70	
27		815	565	225	38	70	25	86	70	
28		815	625	300	47	47	20	70	58	
29		815	505	685	31	47	20	70	58	
30		625	565	625	31	47	25	58	58	
31	1,370		535		31	38		58		

NOTE.—Discharge determined from a well-defined rating curve except for the period Aug. 9–25, when the indirect method for shifting channels was used.

Monthly discharge of Milk River at Havre, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	2,540	625	1,360	80,900	A.
May	1,080	395	607	37,300	A.
June	685	195	360	21,400	A.
July	565	31	181	11,100	A.
August	698	31	96.3	5,920	B.
September	38	7	16.5	982	B.
October	123	20	60.4	3,710	A.
November	70	58	63.6	3,780	A.
December 1–9	70	58	67.3	1,200	A.
The period				166,000	

NOTE.—Accuracy for September is reduced because of some doubt as to the accuracy of observer's readings.

MILK RIVER AT MALTA, MONT.

Location.—In the NW. ¼ sec. 17, T. 30 N., R. 30 E., at the old highway bridge at Malta, Mont.

Records available.—July 31, 1902, to December 31, 1913.

Drainage area.—Not accurately determined.

Gage.—Chain fastened to handrail on downstream side of bridge.

Control.—Sandy; shifts during floods.

Discharge measurements.—Made from bridge or by wading.

Winter flow.—More or less ice present during winter months.

Diversions.—The entire run-off from the drainage area above does not pass the station, for between Havre and Malta seven irrigation canals, which irrigate about 25,000 acres of land, divert water from Milk River and its tributaries. The United States Reclamation Service has constructed a diversion dam at Dodson, about 17 miles above the station, which will eventually divert water for the irrigation of about 108,000 acres of land in Milk River Valley. East of Malta there are nearing completion two canals, one on each side, the combined discharge being 1,000 second-feet.

Discharge measurements of Milk River at Malta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 21	R. R. Randell	[a] 3.30	266	July 15	J. B. Stewart	2.23	218
Apr. 24	J. B. Stewart	5.05	2,050	28	do	1.34	40
May 5	do	3.65	975	Aug. 1	do	1.11	29
22	do	3.78	968	Sept. 19	W. Lamb	1.20	27
June 18	do	2.37	318	Nov. 13	do	1.89	152

[a] Ice present.

Daily gage height, in feet, of Milk River at Malta, Mont., for 1913.

[D. P. Burkhart, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.6	.....	2.55	1.0	1.55	1.2	2.3	.....
2	.....	3.7	.....	3.0	.8	1.55	1.2	1.9	.....
3	.....	3.6	.....	3.0	8	1.55	1.2	1.9	.....
4	.....	3.7	2.7	3.15	.8	.....	1.2	1.8	.....
5	.....	3.6	.....	3.0	1.0	1.38	1.2	1.8	.....
6	6.0	3.6	.....	3.0	1.0	1.38	1.3	1.8	.....
7	5.8	3.5	.....	3.3	1.0	1.29	1.3	1.9	.....
8	5.8	3.3	2.5	3.5	1.2	1.20	1.3	1.9	.....
9	5.9	3.2	2.5	3.3	1.2	1.2	1.3	1.9	.....
10	6.0	.....	2.4	2.85	1.2	1.2	1.3	1.9	.....
11	6.2	.....	2.4	2.4	1.2	1.2	1.3	1.9	1.6
12	5.7	.....	.....	2.25	1.2	1.2	1.3	1.9	.....
13	5.7	.....	.....	2.25	1.2	1.2	1.4	1.9	1.5
14	5.6	.....	2.4	2.25	1.0	1.2	1.4	1.9	.....
15	6.3	.....	.....	1.90	1.0	1.2	1.45	1.9	.....
16	.....	.....	2.4	1.72	1.0	1.2	1.55	1.9	1.5
17	7.8	.....	.....	1.72	1.0	1.2	1.7	1.9	.....
18	8.3	.....	.....	1.72	.8	1.2	1.6	1.9	.....
19	8.2	.....	2.5	1.72	.8	1.20	1.6	1.9	.....
20	7.4	.....	2.25	1.55	1.2	1.38	1.6	1.9	.....
21	7.3	.....	2.25	1.55	1.0	1.20	1.6	1.9	.....
22	5.7	.....	2.55	1.55	1.0	1.25	1.6	1.9	.....
23	5.2	.....	2.55	1.38	.....	1.2	1.6	1.9	.....
24	5.0	.....	2.85	1.38	1.9	1.2	1.7	1.8	.....
25	4.9	.....	2.55	1.38	1.9	1.2	1.7	1.8	.....
25	4.9	.....	2.55	1.38	1.9	1.3	1.7	1.8	.....
27	4.6	.....	2.55	1.20	1.90	1.3	1.7	1.7	.....
28	4.2	.....	2.4	1.20	1.73	1.3	1.8	1.7	.....
29	4.0	.....	2.4	1.20	1.73	1.3	1.9	1.6	.....
30	3.8	.....	2.7	1.20	1.55	1.3	2.1	1.6	.....
31	.....	.....	.....	1.00	1.55	.....	2.5	.....	.....

NOTE.—Gage heights June 10 to Sept. 21 read on a chain gage at the new highway bridge, about 300 yards above the station. The gage heights as published have been computed for the station gage from a curve showing the relation between the two gages. Ice present at the station previous to Apr. 6, from Dec. 1–10, and after Dec. 16.

Daily discharge, in second-feet, of Milk River at Malta, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	988	.....	382	17	76	31	281	.....
2	.....	1,060	.....	601	8	76	31	152	.....
3	.....	988	.....	601	8	76	31	152	.....
4	.....	1,060	448	688	8	64	31	127	.....
5	.....	988	426	601	17	51	31	127	.....
6	2,650	988	404	601	17	51	41	127	.....
7	2,520	916	382	781	17	40	41	152	.....
8	2,520	781	360	916	31	31	41	152	.....
9	2,580	718	360	781	31	31	41	152	.....
10	2,650	.....	319	522	31	31	41	152	.....
11	2,780	.....	319	319	31	31	41	152	85
12	2,450	.....	319	263	31	31	41	152	.....
13	2,450	.....	319	263	31	31	53	152	68
14	2,380	.....	319	263	17	31	53	152	.....
15	2,860	.....	319	152	17	31	60	152	.....
16	3,330	.....	319	109	17	31	76	152	68
17	3,800	.....	319	109	17	31	105	152	.....
18	4,100	.....	318	109	8	31	85	152	.....
19	4,040	.....	360	109	8	31	85	152	.....
20	3,560	.....	263	76	31	51	85	152	.....
21	3,500	.....	263	76	17	31	85	152	.....
22	2,450	968	382	76	17	36	85	152	.....
23	2,100	.....	382	51	84	31	85	152	.....
24	1,960	.....	522	51	152	31	105	127	.....
25	1,900	.....	382	51	152	31	105	127	.....
26	1,900	.....	382	51	152	41	105	127	.....
27	1,680	.....	382	31	152	41	105	105	.....
28	1,410	.....	319	31	112	41	127	105	.....
29	1,280	.....	319	31	112	41	152	85	.....
30	1,140	.....	448	31	76	41	211	85	.....
31	.....	.....	.....	17	76	.....	360	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge estimated as follows, from records of flow at Hinsdale and Havre: May 10-21, at 1,260 second-feet; May 23-31, at 975 second-feet; June 1-3, at 550 second-feet. Discharge interpolated for other periods for which gage heights are missing.

Monthly discharge of Milk River at Malta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 6-30	4,100	1,140	2,560	127,000	B.
May	.....	.....	1,080	66,400	D.
June	.....	.....	377	22,400	C.
July	916	17	282	17,300	C.
August	152	8	48.2	2,960	C.
September	76	31	40.7	2,420	C.
October	360	31	82.9	5,100	B.
November	281	85	144	8,570	B.
The period	.....	.....	.....	252,000	

NOTE.—Accuracy for June, July, August, and September reduced on account of method of obtaining gage heights.

MILK RIVER AT HINSDALE, MONT.

Location.—In the NE. ¼ SW. ¼ sec. 33, T. 31 N., R. 36 E., at the highway bridge over Milk River about 1 mile from Hinsdale, Mont., a point 46 miles from the junction of Milk River with the Missouri.

Records available.—May 13, 1908, to December 31, 1913.

Drainage area.—Not accurately determined.

Gage.—Chain fastened to upstream side of highway bridge.

Discharge measurements.—Made from bridge or by wading.

Winter flow.—Stream frozen entirely across and to a considerable depth from late in November until the first of April.

Diversions.—No water is diverted between the station at Hinsdale and that at Malta. The flow of the stream has, however, been appropriated by the United States Reclamation Service in connection with the Milk River project, and will be diverted at a point 9 miles east of Hinsdale to irrigate land in lower Milk River valley.

Discharge measurements of Milk River at Hinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 24	R. R. Randell	[a] 3.22	338	June 19	J. B. Stewart	3.40	664
Apr. 23	J. B. Stewart	6.92	2,930	July 20	do	2.45	216
May 6	do	4.37	1,110	Aug. 1	do	1.73	92
23	do	4.63	1,280	Sept. 20	W. A. Lamb	1.35	30

[a] Ice present.

Daily gage height, in feet, of Milk River at Hinsdale, Mont., for 1913.

[Goldie Wooldridge, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.8	3.9	3.7	1.77	2.01	1.4	.....
2	.....	4.6	3.6	3.9	1.72	1.91	1.4	.....
3	.....	4.5	3.8	3.6	1.67	1.80	1.35	.....
4	12.4	4.5	3.6	3.7	1.61	1.80	1.4	.....
5	11.8	4.4	3.3	.....	1.66	1.70	1.4	.....
6	.....	4.4	3.2	4.4	1.56	1.70	1.4	.....
7	10.8	4.4	3.2	4.2	1.61	1.70	1.4	2.1
8	9.4	4.3	3.1	4.1	1.64	1.59	1.4	2.0
9	8.4	4.0	3.0	4.1	1.65	1.59	1.4	2.0
10	7.4	3.8	2.9	.....	1.65	1.49	1.5	2.0
11	7.0	4.0	2.9	.....	1.65	1.49	1.5	2.0
12	7.0	3.9	3.15	.....	1.65	1.49	1.5	2.0
13	7.0	3.8	3.1	.....	1.65	1.48	1.5	1.9
14	7.0	4.0	3.1	.....	1.64	1.48	1.6	1.9
15	7.0	4.0	3.0	.....	1.64	1.38	1.7	.....
16	7.0	4.2	3.0	.....	2.04	1.38	1.7	.....
17	8.4	4.1	3.3	.....	2.04	1.38	1.6	.....
18	8.9	4.1	3.2	.....	1.94	1.37	1.5	.....
19	.....	6.0	4.1	.....	1.83	1.27	1.5	.....
20	9.0	7.8	5.0	2.45	1.73	1.30	1.6	.....
21	8.4	7.8	4.6	2.39	1.73	1.3	1.6	.....
22	7.7	4.8	4.0	2.39	1.73	1.2	1.7	.....
23	6.0	4.6	4.3	2.29	1.73	1.2	1.8	.....
24	6.5	4.5	4.1	2.19	1.72	1.3	1.8	.....
25	6.1	4.4	4.0	1.99	1.72	1.3	.....	.....
26	5.9	4.4	3.8	1.98	1.67	1.3	.....	.....
27	5.7	4.4	3.6	1.98	1.67	1.3	.....	.....
28	5.5	4.4	3.4	2.98	1.62	1.3	.....	.....
29	5.3	4.4	3.4	1.98	2.41	1.3	.....	.....
30	5.0	4.4	3.4	1.88	1.93	1.35	.....	.....
31	.....	4.2	.....	1.82	2.11	.....	.....	.....

Daily discharge, in second-feet, of Milk River near Hinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1,430	880	770	86	122	40	.....
2	.....	1,300	720	880	78	106	40	.....
3	.....	1,240	820	720	70	90	35	.....
4	7,380	1,240	720	770	62	90	40	.....
5	6,820	1,180	570	975	69	75	40	.....
6	6,370	1,180	520	1,180	56	75	40	.....
7	5,920	1,180	520	1,060	62	75	40	140
8	4,720	1,120	475	1,000	66	59	40	120
9	3,930	940	430	1,000	68	59	40	120
10	3,210	820	390	.....	68	49	50	120
11	2,930	940	390	.....	68	49	50	120
12	2,930	880	498	.....	68	49	50	120
13	2,930	820	475	.....	68	48	50	105
14	2,930	940	475	.....	66	48	60	105
15	2,930	940	430	.....	66	38	75	.....
16	2,930	1,060	430	.....	128	38	75	.....
17	3,930	1,000	570	.....	128	38	60	.....
18	4,320	1,000	520	.....	111	37	50	.....
19	4,360	2,230	1,000	.....	94	27	50	.....
20	4,400	3,490	1,560	225	80	30	60	.....
21	3,930	3,490	1,300	208	80	30	60	.....
22	3,420	1,430	940	208	80	20	75	.....
23	2,230	1,300	1,120	182	80	20	90	.....
24	2,580	1,240	1,000	158	78	30	90	.....
25	2,300	1,180	940	118	78	30	.....	.....
26	2,160	1,180	820	117	70	30	.....	.....
27	2,020	1,180	720	117	70	30	.....	.....
28	1,880	1,180	620	422	63	30	.....	.....
29	1,760	1,180	620	117	213	30	.....	.....
30	1,560	1,180	620	102	110	35	.....	.....
31	.....	1,060	.....	93	142	.....	.....	.....

NOTE.—Discharge determined from a fairly well defined rating curve which is the same as for 1912 above gage height 3.8 feet. July 10–19, discharge estimated at 80 second-feet. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Milk River at Hinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 4–30	7,380	1,560	3,580	192,000	B.
May	3,490	820	1,310	80,600	B.
June	1,560	390	703	41,800	B.
July	1,180	93	459	28,200	C.
August	213	56	84.7	5,210	B.
September	122	20	49.6	2,950	B.
October 1–24	90	35	54.2	2,580	B.
The period	.....	.....	.....	353,000	

NORTH FORK OF MILK RIVER NEAR KIMBALL, ALBERTA.

Location.—At the Peters ranch, 18 miles east of Kimball, Alberta, and about 2 miles north of the international boundary.

Records available.—January 1 to December 31, 1913. A station was maintained by irrigation office department of the interior, Canada, in the NE. ¼ sec. 13, T. 1, R. 23 W. fourth meridian, about 2 miles downstream, from July 21, 1909, to December 31, 1912. A station was maintained at Alexander Dubray's ranch, 2 miles south of the international boundary, May 8, 1911, to December 31, 1912.

Drainage area.—101 square miles.

Gage.—Stevens automatic gage on left bank.

Control.—Permanent.

Discharge measurements.—Made by wading at convenient sections near the gage at low water and from a cable 2 miles below the gage at high water.

Winter flow.—Affected by ice.

Accuracy.—Results good.

Cooperation.—Maintained during 1913 in cooperation with the irrigation office department of the interior, Canada.

Discharge measurements of North Fork of Milk River near Kimball, Alberta, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 2	F. R. Burfield	2.05	49.2	July 28	W. A. Lamb	1.80	22
20	W. A. Lamb	2.32	82	Aug. 11	F. R. Burfield	1.84	27.3
23	F. R. Burfield	2.24	66	29	do	1.74	18.3
June 7	do	1.94	35.4	Sept. 13	W. A. Lamb	1.74	17.1
14	R. R. Randell	1.87	30	Oct. 25	do	1.84	23
24	F. R. Burfield	1.84	29	Nov. 25	J. E. Degnan	1.81	27.3
26	do	2.31	76.2	Dec. 6	do	1.76	20.2
July 9	do	1.77	21.7	17	do	1.69	14.6
23	do	1.77	21.8	31	do	2.12	14.1

NOTE.—All discharge measurements are referred to the automatic gage.

Daily gage height, in feet, of North Fork of Milk River, near Kimball, Alberta, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.58	3.18	3.69	4.02	2.03	2.04	1.99	1.74	2.15	1.87	1.83	1.75
2	2.62	3.17	3.66	4.07	2.05	2.01	1.89	1.73	2.12	1.86	1.84	1.74
3	2.63	3.24	3.68	4.06	2.12	2.00	1.83	1.74	2.11	1.86	1.90	1.79
4	2.60	3.34	3.71	4.13	2.20	2.00	1.88	1.74	2.11	1.87	1.95	1.76
5	2.69	3.38	3.82	4.43	2.01	1.96	1.86	1.74	2.10	1.87	1.82	1.74
6	2.66	3.42	4.03	4.55	1.99	1.95	1.80	1.73	2.10	1.87	1.81	1.77
7	2.52	3.44	4.64	4.85	2.07	1.95	1.78	1.72	2.09	1.87	1.80	1.73
8	2.46	3.42	5.26	4.96	2.04	1.96	1.74	1.84	2.08	1.88	1.80	1.74
9	2.39	3.36	5.41	4.76	1.98	1.95	1.77	2.03	2.07	1.89	1.80	1.78
10	2.33	3.29	5.22	4.85	2.00	1.99	1.75	1.84	2.07	1.90	1.79	1.79
11	2.11	3.32	5.05	5.26	2.15	1.96	1.81	1.84	2.05	1.92	1.80	1.75
12	2.24	3.32	5.54	5.74	2.14	1.98	1.81	1.80	2.03	2.25	1.78	1.76
13	2.30	3.35	4.04	5.48	2.13	1.90	1.78	1.78	2.02	2.09	1.90	1.78
14	2.64	3.37	4.03	5.03	2.08	1.89	1.76	1.81	2.03	1.98	2.01	1.77
15	2.65	3.40	4.01	3.97	2.07	1.87	1.76	1.79	2.01	1.90	1.90	1.74
16	2.70	3.73	3.99	3.07	2.15	1.85	1.76	1.78	1.99	1.88	1.78	1.74
17	2.68	4.21	3.97	2.99	2.32	1.84	1.75	1.79	2.00	1.89	1.77	1.75
18	2.70	4.25	3.95	2.84	2.40	1.84	1.74	1.83	1.99	1.88	1.77	1.84
19	2.78	4.28	3.93	2.78	2.44	1.88	1.74	1.80	2.00	1.84	2.04	1.87
20	2.32	4.28	3.91	2.76	2.32	2.08	1.73	1.79	1.98	1.84	1.94	1.89
21	2.26	4.29	3.89	2.50	2.28	1.91	1.73	1.77	1.99	1.80	1.84	1.79
22	2.32	4.22	3.87	2.21	2.29	1.85	1.74	1.75	2.15	1.81	1.86	1.84
23	2.41	4.04	3.84	2.10	2.23	1.85	1.77	1.75	1.94	1.79	1.83	1.85
24	2.56	3.90	3.82	2.01	2.18	1.84	1.74	1.74	1.89	1.80	1.80	1.97
25	2.59	3.52	3.83	2.07	2.17	1.95	1.78	1.74	1.82	1.79	1.79	2.04
26	2.75	3.76	3.83	2.04	2.18	2.10	2.02	1.74	1.75	1.78	1.84	2.06
27	2.84	3.73	3.87	2.01	2.18	2.25	1.88	1.74	1.75	1.77	1.83	2.09
28	2.89	3.73	3.94	1.98	2.16	2.29	1.80	1.73	1.75	1.80	1.82	2.19
29	2.92	.....	3.99	1.98	2.20	2.11	1.80	1.74	1.75	1.80	1.80	2.14
30	3.06	.....	3.90	2.00	2.08	2.11	1.82	2.15	1.80	1.80	1.79	2.18
31	3.09	.....	3.90	.....	2.05	.....	1.77	2.22	.....	1.98	.....	2.23

NOTE.—Gage heights Jan. 1–Apr. 30, and Aug. 30 to Sept. 22, were recorded by Canadian engineers at a station about 2 miles below the present site. Gage height May 1–Aug. 29 and Sept. 23–Dec. 31 were obtained from the automatic gage. Discharge relation affected by ice Jan. 1–Apr. 13 and Dec. 18–31.

Daily discharge, in second-feet, of North Fork of Milk River near Kimball, Alberta, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.6	17.4	22	24	46	47	42.0	18.7	24.0	30	26	19.5
2	13.0	17.4	21	32	48	44	32.0	17.9	24.0	29	27	18.8
3	13.0	17.9	21	40	56	43	26.0	18 7	23.0	29	33	23.0
4	12.8	18.7	22	48	45	43	31.0	18.7	24.0	30	38	20.0
5	13.5	19.0	23	56	44	39	29.0	18.7	24.0	30	26	18.8
6	13.3	19.4	24	64	42	38	24.0	17.9	25.0	30	25	21.0
7	12.2	19.5	29	72	51	38	22.0	17.0	25.0	30	24	17.9
8	11.7	19.4	34	80	47	39	18.7	27.0	25.0	31	24	18.8
9	11.1	18.9	35	90	41	38	21.0	46.0	25.0	32	24	22.0
10	10.6	18.3	34	100	43	42	19.5	27.0	25.0	33	23	23.0
11	8.9	18.6	32	140	59	39	25.0	27.0	25.0	35	24	19.5
12	9.9	18.6	28	180	58	41	25.0	24.0	25.0	71	22	20.0
13	10.4	18.8	24	220	57	33	22.0	22.0	25.0	53	33	22.0
14	13.1	19.0	24	278	52	32	20.0	25.0	25.0	41	44	21.0
15	13.2	19.2	24	172	51	30	20.0	23.0	25.0	33	33	18.8
16	13.6	22.0	24	93	59	28	20.0	22.0	25.0	31	22	18.8
17	13.4	26.0	24	87	79	27	19.5	23.0	26.0	32	21	19.5
18	13.6	26.0	24	76	88	27	18.7	26.0	26.0	31	21	14.6
19	14.2	26.0	23	72	93	31	18.7	24.0	27.0	27	47	14.5
20	10.6	26.0	23	70	79	52	17.9	23.0	26.0	27	37	14.5
21	10.1	26.0	23	54	74	34	17.9	21.0	27.0	24	27	14.5
22	10.6	26.0	23	39	75	28	18.7	19.5	34.0	25	29	14.5
23	11.3	24.0	23	35	68	28	21.0	19.5	37.0	23	26	14.4
24	12.5	23.0	23	31	63	27	18.7	18.7	32.0	24	24	14.4
25	12.7	20.0	23	34	62	38	22.0	18.7	25.0	23	23	14.3
26	14.0	22.0	23	32	63	54	45.0	18.7	19.5	22	27	14.3
27	14.7	22.0	23	31	63	71	31.0	18.7	19.5	21	26	14.3
28	15.1	22.0	24	30	61	75	24.0	17.9	19.5	24	26	14.3
29	15.4	.....	24	30	65	55	24.0	18.7	19.5	24	24	14.2
30	16.5	.....	23	31	52	55	26.0	24.0	24.0	24	23	14.2
31	16.7	.....	23	.....	48	.....	21.0	26.0	.....	41	.....	14.1

NOTE.—Discharges Jan. 1–Apr. 13, and Dec. 18–31, estimated by the office of the Canadian Commissioner of Irrigation, because of effect of ice on the relation of gage height to discharge. Discharge Apr. 14–30 and Aug. 30 to Sept. 22, obtained from gage heights recorded at a station maintained by the Canadian Government about 2 miles below the present station. Discharge May 1–Aug. 29 and Sept. 23–Dec. 17, determined from a well defined curve.

Monthly discharge of North Fork of Milk River near Kimball, Alberta, for 1913.

[Drainage area, 101 square miles.] [a]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	16.7	8.9	12.7	0.116	0.13	781	
February	26.0	17.4	21.1	.194	.20	1,172	
March	35.0	21.0	24.8	.228	.26	1,525	
April	278.0	24.0	78.0	.716	.80	4,641	
May	93.0	41.0	59.1	.585	.67	3,634	A.
June	75.0	27.0	40.5	.401	.45	2,410	A.
July	45.0	17.9	24.0	.238	.27	1,476	A.
August	46.0	17.0	22.2	.220	.25	1,365	A.
September	37.0	19.5	25.2	.250	.28	1,500	A.
October	71.0	21.0	31.0	.307	.35	1,906	B.
November	47.0	21.0	27.6	.273	.30	1,642	B.
December	23.0	14.1	17.5	.173	.20	1,076	B.
The year	278	8.9	32.0	.308	4.16	23,128	

[a] During January, February, March, and April the records are from the station about 2 miles below the present station, and the drainage area used is 109 square miles.

BATTLE CREEK[1] NEAR CHINOOK, MONT.

Location.—In sec. 3, T. 33 N., R. 19 E., at a point about 4½ miles north of Chinook, Mont., about 7 miles above the junction with the main stream.

Records available.—April 22, 1905, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Chain on the left bank near the house of the observer.

Control.—Sandy and shifting.

Discharge measurements.—Made by wading or at the cable near the gage.

Winter flow.—Ice present.

Diversions.—Three canals, which divert in the aggregate about 20 second-feet, take out above the station; several small pumping plants, which supply water for irrigating the bottom land along the valley, also operate above the station. Below the station the Matheson and Cook canals divert water for irrigating land in Milk River valley near the mouth of Battle Creek. The aggregate appropriation for these canals is 78 second-feet. A number of diversions are made from this stream in Canada.

Accuracy.—Results may be considered reliable as a fair rating curve has been constructed. The greater part of the run-off occurs during floods caused by heavy rains in the spring and early summer. In the fall the channel is often dry.

Discharge measurements of Battle Creek near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 20	R. R. Randell	[a]1.30	6.4	June 27	J. B. Stewart	1.00	42
Apr. 21	J. B. Stewart	2.05	173	July 11	do	1.05	36
May 3	do	1.40	83	24	do	.45	4.4
20	do	1.32	78	Aug. 5	do	.42	4.3
June 4	do	.85	28	11	do	.35	2.8
17	do	.50	6.1				

[a] Ice present.

[1] Decision of United States Geographic Board; formerly known as North Fork of Milk River.

Daily gage height, in feet, of Battle Creek near Chinook, Mont., for 1913.

[Mrs. R. B. Snedecor, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7.4	1.46	0.98	1.51	0.50	0.19	0.20	0.48	0.70
2	.....	5.8	1.42	.94	1.45	.49	.18	.20	.48	.....
3	.....	4.0	1.40	.94	1.25	.46	.18	.18	.48	.....
4	.....	2.20	1.38	.90	1.16	.44	.18	.20	.49	.....
5	.....	1.82	1.35	.84	3.70	.42	.18	.20	.52	.....
6	.....	1.58	1.32	.80	2.70	.40	.15	.22	.56	.....
7	.....	1.38	1.28	.72	1.60	.39	.....	.24	.62	.....
8	.....	1.26	1.26	.70	1.34	.38	.....	.26	.61	.....
9	5.0	1.22	1.29	.70	1.28	.40	.....	.45	.62	.....
10	3.6	1.38	1.22	.65	1.18	.40	.....	.46	.65	.....
11	2.60	1.71	1.19	.65	1.08	.38	.....	.48	.66	.....
12	1.42	3.50	1.14	.60	1.01	.36	.....	.50	.69	.....
13	.....	2.8	1.14	.60	.98	.35	.....	.44	.70	.....
14	.....	2.6	1.22	.55	.89	.32	.....	.42	.71	.....
15	.....	2.8	1.26	.55	.86	.31	.....	.42	.71	.....
16	.....	3.5	1.29	.50	.79	.30	.....	.40	.68	.....
17	.....	4.4	1.36	.49	.72	.30	.....	.40	.68	.....
18	.....	3.3	1.40	.46	.66	.30	.....	.40	.70	.....
19	.....	2.6	1.41	.44	.58	.29	.....	.40	.70	.....
20	.....	2.3	1.31	.58	.51	.26	.....	.42	.70	.....
21	.....	2.05	1.28	.45	.49	.19	.....	.46	.68	.....
22	.....	1.95	1.26	.45	.50	.18	.....	.48	.70	.....
23	.....	1.95	1.24	.45	.48	.....	.....	.49	.69	.....
24	.....	1.91	1.22	1.52	.45	.....	.20	.48	.67	.....
25	.....	1.82	1.16	1.38	.62	.....	.23	.46	.69	.....
26	.....	1.72	1.14	1.10	.69	.30	.22	.45	.72	.....
27	.....	1.58	1.12	1.00	.69	.30	.24	.45	.78	.....
28	.....	1.52	1.10	.96	.62	.38	.22	.45	.81	.....
29	.....	1.50	1.06	.95	.52	.36	.22	.44	.82	.....
30	.....	1.48	1.02	1.38	.50	.29	.20	.44	.82	.....
31	6.8	.....	.99	.....	.48	.22	.....	.47	.....	.....

NOTE.—Gage height Mar. 31 affected by ice. Apr. 1, observer notes no ice in the river or along the banks.

Daily discharge, in second-feet, of Battle Creek near Chinook, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10	2,110	92	40	98	6.1	0.7	0.8	5.6	16
2	10	1,420	87	36	91	5.9	.6	.8	5.6	.....
3	10	700	85	36	68	5.1	.6	.6	5.6	.....
4	10	198	83	32	59	4.7	.6	.8	5.9	.....
5	10	139	80	27	596	4.2	.6	.8	6.9	.....
6	50	107	76	23	296	3.7	.4	1.0	8.4	.....
7	100	83	72	17	102	3.5	.....	1.3	11	.....
8	500	70	70	16	70	3.4	.....	1.5	11	.....
9	1,080	65	73	16	62	3.7	.....	4.9	11	.....
10	570	83	65	13	50	3.7	.....	5.1	13	.....
11	282	123	62	13	39	3.4	.....	5.6	13	.....
12	87	538	56	10	33	3.0	.....	6.1	15	.....
13	50	332	56	10	31	2.8	.....	4.7	16	.....
14	30	282	65	8.0	24	2.3	.....	4.2	16	.....
15	20	332	70	8.0	22	2.2	.....	4.2	16	.....
16	10	538	73	6.1	18	2.0	.....	3.7	14	.....
17	10	840	81	5.9	14	2.0	.....	3.7	14	.....
18	6	478	85	5.1	11	2.0	.....	3.7	16	.....
19	6	282	86	4.7	7.7	1.9	.....	3.7	16	.....
20	6	216	75	9.2	5.6	1.5	.....	4.2	16	.....
21	6	173	72	4.9	5.1	.7	.....	5.1	14	.....
22	6	158	70	4.9	5.6	.6	.....	5.6	16	.....
23	6	158	67	4.9	5.4	.4	.....	5.9	15	.....
24	6	152	65	99	4.7	.4	.8	5.6	14	.....
25	6	139	59	83	11	.4	1.2	5.1	15	.....
26	6	125	56	52	15	2.0	1.0	4.9	17	.....
27	6	107	54	42	15	2.0	1.3	4.9	22	.....
28	50	99	52	38	11	3.4	1.0	4.9	24	.....
29	100	97	48	37	6.9	3.0	1.0	4.7	25	.....
30	500	95	44	83	6.1	1.9	.8	4.7	25	.....
31	1,000	.....	41	.....	5.6	1.0	.....	5.4	.....	.....

NOTE.—Discharge determined from a rating curve fairly well defined between 0.8 second-foot and 260 second-feet. Discharge estimated Mar. 1–8, 13–19, 21–31, and Aug. 23–25. Sept. 7–23, flow estimated at zero.

Monthly discharge of Battle Creek near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	1,080	6	147	9,040	D.
April	2,110	65	341	20,300	C.
May	92	41	68.4	4,210	B.
June	99	4.7	26.2	1,560	B.
July	596	4.7	57.7	3,550	C.
August	6.1	.4	2.67	164	B.
September	1.3	0	.35	21	C.
October	6.1	.6	3.81	234	B.
November	25	5.6	14.1	839	B.
The period	.....	.....	.....	39,900	

ROCK CREEK NEAR HINSDALE, MONT.

Location.—In sec. 10, T. 31 N., R. 36 E., at Ottenstror's ranch, about 2 miles below the headgates of Rock Creek canal and 6 miles northeast of Hinsdale.

Records available.—April 19, 1912, to December 31, 1913. From July 5, 1905, to December 31, 1907, data were obtained at a station 2 miles upstream, just below the diversion dam of the Rock Creek canal. The flow at these two points is practically the same.

Drainage area.—Not measured.

Gage.—Overhanging chain gage on the left bank.

Control.—Shifts slightly at high water.

Discharge measurements.—Made by wading one-fourth mile below the gage at low and medium stages and from a bridge 2 miles below at high stages.

Winter flow.—Affected by ice.

Diversions.—There is no storage, but the normal summer flow is appropriated and used during the irrigation season.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Rock Creek near Hinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 24	R. R. Randell	[a]6.09	16.0	May 23	J. B. Stewart	5.65	4.5
Apr. 17	J. B. Stewart	6.25	51	June 19	do	6.25	44
May 6	do	5.40	0.85	Aug. 1	do	5.85	12.6

[a] Ice present.

Daily gage height, in feet, of Rock Creek near Hinsdale, Mont., for 1913.

[Mrs. John Ottenstror, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1		12.1	5.3	5.4	6.6	5.85	5.6	5.75
2		10.1	5.3	5.4	7.1	5.85	5.05	5.75
3		9.4	5.35	5.45	7.05	5.85	5.05	5.8
4		8.0	5.3	5.5	6.9	5.8	5.05	5.9
5		7.7	5.35	5.55	7.4	5.75	5.05	5.9
6		7.4	5.4	5.5	7.4	5.7	5.05	5.95
7		6.8	5.4	5.5	7.4	5.7	5.05	5.9
8		6.85	5.4	5.55	6.9	5.7	5.5	5.8
9		6.8	5.4	5.55	6.2	5.7	5.5	5.8
10		6.75	5.4	5.55	6.4	5.7	5.5	5.8
11		6.6	5.4	5.55	6.3	5.7	5.5	5.8
12		6.5	5.65	5.55	6.2	5.7	5.5	5.8
13		6.45	5.4	5.55	6.25	5.7	5.5	5.8
14		6.5	5.4	5.55	6.15	5.7	5.6	5.8
15		6.45	5.45	5.55	6.05	5.7	5.6	5.8
16		6.5	5.5	5.55	6.05	.....	5.6	5.8
17		6.1	5.9	5.6	6.05	6.0	5.6	5.9
18		5.9	5.55	5.6	6.05	5.95	5.6	5.9
19		5.65	5.5	6.25	5.95	5.8	5.6	5.9
20		5.5	5.45	6.25	.....	5.75	5.6	5.9
21		5.35	5.75	6.05	5.85	5.75	5.6	5.9
22		5.4	5.6	6.60	5.9	5.7	5.6	5.9
23		5.3	5.65	6.85	5.95	5.8	5.6	5.85
24		5.3	5.6	6.75	5.95	5.8	5.6	5.85
25		5.3	5.45	6.4	5.95	5.75	5.6	5.9
26		5.35	5.45	6.15	5.9	5.7	5.6	5.95
27		5.3	5.45	6.15	7.5	5.7	5.6	5.95
28		5.3	5.45	6.15	6.3	5.7	5.6	5.9
29		5.35	5.45	6.35	6.05	5.65	5.75	.....
30		5.3	5.45	6.2	5.95	5.65	5.75	.....
31	14.5	.....	5.45	.....	5.85	5.6	.....	.....

NOTE.—Gage height Mar. 31 affected by ice. Gage heights Sept. 2–7 probably erroneous.

Daily discharge, in second-feet, of Rock Creek near Hinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	2,200	0	1.0	87	12	3.0	8.0
2	1,220	0	1.0	180	12	2.0	8.0
3	935	.5	1.5	169	12	2.0	10
4	410	0	2.0	138	10	2.0	15
5	335	.5	2.5	246	8.0	2.0	15
6	262	1.0	2.0	246	6.0	2.0	18
7	136	1.0	2.0	246	6.0	2.0	15
8	146	1.0	2.5	138	6.0	2.0	10
9	136	1.0	2.5	38	6.0	2.0	10
10	127	1.0	2.5	60	6.0	2.0	10
11	100	1.0	2.5	48	6.0	2.0	10
12	84	4.5	2.5	38	6.0	2.0	10
13	76	1.0	2.5	43	6.0	2.0	10
14	84	1.0	2.5	34	6.0	3.0	10
15	76	1.5	2.5	26	6.0	3.0	10
16	84	2.0	2.5	26	14	3.0	10
17	35	15	3.0	26	22	3.0	15
18	18	2.5	3.0	26	18	3.0	15
19	4.5	2.0	43	18	10	3.0	15
20	2.0	1.5	43	15	8.0	3.0	15
21	0.5	8.0	26	12	8.0	3.0	15
22	1.0	3.0	87	15	6.0	3.0	15
23	0	4.5	129	18	10	3.0	12
24	0	3.0	112	18	10	3.0	12
25	0	1.5	60	18	8.0	3.0	15
26	.5	1.5	34	15	6.0	3.0	18
27	0	1.5	34	268	6.0	3.0	18
28	0	1.5	34	48	6.0	3.0	15
29	.5	1.5	54	26	4.5	8.0	15
30	0	1.5	38	18	4.5	8.0	15
31	.....	1.5	.....	12	3.0	.....	15

NOTE.—Discharge determined from two rating curves fairly well defined between 3 and 85 second-feet and applicable through May 5 and after May 5, respectively. Discharge estimated Sept. 2–7, because of probable errors in gage heights. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Rock Creek near Hinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	2,220	0	216	12,900	B.
May	15	0	2.16	133	C.
June	129	1.0	24.5	1,460	B.
July	268	12	74.7	4,590	B.
August	22	3.0	8.32	512	B.
September	8	2.0	2.93	174	C.
October	18	8	13.0	799	B.
The period	.....	.....	.....	20,600	

PORCUPINE CREEK AT NASHUA, MONT.

Location.—In the center of the NW. ¼ sec. 25, T. 28 N., R. 40 E., at the road crossing at Nashua, Mont.

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

Drainage area.—Not measured

Gage.—Staff nailed to tree on left bank.

Control.—Channel dry in late summer and in winter.

Discharge measurements.—Made by wading near gage or at high stages from a bridge one-fourth mile below.

Diversions and storage.—The water of this stream is neither diverted nor stored.

Discharge measurements of Porcupine Creek at Nashua, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	J. B. Stewart	3.98	24.5	June 21	J. B. Stewart	3.35	4.0
May 11	do	3.57	9.6	July 16	do	3.08	.7
26	do	3.95	21.5				

Daily gage height, in feet, of Porcupine Creek at Nashua, Mont., for 1913.

[Mrs. R. L. Brocksmith, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	15.1	3.7	3.65	3.25	2.9	2.7
2	.....	11.1	3.7	3.65	3.25	2.95	2.7
3	.....	11.5	3.7	3.55	3.2	2.95	.....
4	.....	9.5	3.6	3.55	3.2	2.8	.....
5	.....	5.8	3.6	3.5	3.2	2.8	.....
6	.....	5.5	3.6	3.5	3.15	2.85	.....
7	.....	5.2	3.5	3.45	3.15	2.85	.....
8	.....	5.1	3.5	3.45	3.15	2.85	.....
9	.....	4.7	3.5	3.4	3.15	2.85	.....
10	.....	4.5	3.5	3.35	3.15	2.9	.....
11	.....	4.4	3.5	3.35	3.1	2.9	.....
12	.....	4.3	3.65	3.3	3.1	2.9	.....
13	.....	4.2	3.6	3.3	3.1	2.9	.....
14	.....	4.2	3.7	3.3	3.1	2.85	.....
15	.....	4.1	3.85	3.3	3.1	2.85	.....
16	.....	4.0	3.95	3.3	3.1	2.85	.....
17	.....	3.9	4.05	3.3	3.1	2.7	.....
18	.....	3.9	4.1	3.3	3.05	2.65	.....
19	.....	3.9	4.2	3.25	3.05	2.65	.....
20	.....	3.9	4.45	3.3	3.05	2.6	.....
21	.....	3.8	4.4	3.3	3.05	2.55	.....
22	.....	3.8	4.3	3.35	3.05	2.55	.....
23	.....	3.8	4.2	3.3	3.05	2.55	.....
24	.....	3.7	4.1	3.3	3.05	2.55	.....
25	.....	3.7	4.05	3.25	3.05	2.5	.....
26	.....	3.7	3.95	3.25	3.05	2.5	.....
27	.....	3.7	3.9	3.25	3.05	2.5	.....
28	.....	3.7	4.0	3.25	3.05	2.5	.....
29	.....	3.7	3.85	3.25	3.05	2.5	.....
30	7.7	3.7	3.85	3.25	3.05	2.5	.....
31	15.6	.....	3.8	.....	2.95	2.7	.....

Daily discharge, in second-feet, of Porcupine Creek at Nashua, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.
1	.....	611	14	12	2.5
2	.....	371	14	12	2.5
3	.....	395	14	9.0	1.8
4	.....	275	10	9.0	1.8
5	.....	92	10	7.5	1.8
6	.....	80	10	7.5	1.3
7	.....	68	7.5	6.3	1.3
8	.....	64	7.5	6.3	1.3
9	.....	48	7.5	5.1	1.3
10	.....	42	7.5	4.2	1.3
11	.....	38	7.5	4.2	.8
12	.....	34	12	3.2	.8
13	.....	31	10	3.2	.8
14	.....	31	14	3.2	.8
15	.....	28	19	3.2	.8
16	.....	24	22	3.2	.8
17	.....	20	26	3.2	.8
18	.....	20	28	3.2	.5
19	.....	20	31	2.5	.5
20	.....	20	40	3.2	.5
21	.....	17	38	3.2	.5
22	.....	17	34	4.2	.5
23	.....	17	31	3.2	.5
24	.....	14	28	3.2	.5
25	.....	14	26	2.5	.5
26	.....	14	22	2.5	.5
27	.....	14	20	2.5	.5
28	.....	14	24	2.5	.5
29	.....	14	19	2.5	.5
30	180	14	19	2.5	.5
31	641	.....	17	.....	.1

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge for August was practically zero.

Monthly discharge of Porcupine Creek at Nashua, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 30–31	641	180	410	1,630	B.
April	611	14	82.0	4,880	B.
May	40	7.5	19.0	1,170	B.
June	12	2.5	4.67	278	B.
July	2.5	.1	.94	58	B.
The period	.....	.....	.....	8,020	

PRIVATE CANALS IN MILK RIVER VALLEY.

GENERAL FEATURES.

Since 1905 a number of stations have been maintained on private canals in Milk River valley for the purpose of ascertaining the extent of private water rights. With the exception of Rock Creek canal, which is near Hinsdale, in Valley County, these canals are situated in Hill and Blaine counties and are used to irrigate lands in the vivinity of Harlem and Chinook.

The canals are all built on small grades and in soil which is easily eroded. In many of them silt has been deposited, and nearly all of them contain a growth of weeds and moss. At low stages the water is uniformly sluggish. In order to divert water into the laterals checks are erected in the main canals, and these checks often produce backwater effects for long distances above. They are put up under a great variety of conditions, and as a result velocities are found to differ widely at the same gage height during the season. In order to establish the correct relation between gage height and discharge it is necessary to make several rating curves for the same canal station. Frequent discharge measurements are necessary to obtain reliable results. Staff gages are located on all canals and most measurements are made by wading.

PARADISE VALLEY CANAL NEAR CHINOOK, MONT.

Location.—Near the headgate at Rudolph Friede's ranch; reached by driving along the south river road from Chinook.

Records available.—June, 1903, to December 31, 1913.

Discharge measurements.—Made by wading.

Discharge measurements of Paradise Valley canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 16	J. B. Stewart	2.10	11.2	July 25	J. B. Stewart	1.77	4.8
28	do	2.10	9.7	Aug. 4	do	1.95	5.8
July 11	do	1.90	6.1	11	do	1.90	7.8

Daily gage height, in feet, and discharge, in second-feet, of Paradise Valley canal near Chinook, Mont., for 1913.

[Rudolph Friede, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1					1.32	1.8	1.90	6.0	2.01	7.4	0.4	
2					1.41	2.4	1.89	5.9	1.98	6.6	.3	
3					1.39	2.2	2.00	8.0	1.98	6.4		
4					1.10	.9	1.98	7.6	1.96	5.9		
5					1.5	3.0	2.02	8.4	1.95	6.0		
6	0.35				1.9	7.0	1.94	6.8	1.93	6.2		
7	.32				2.1	11.0	1.92	6.4	1.90	6.0		
8	.62				2.0	9.0	1.97	7.4	1.94	7.4		
9	.63				2.0	9.0	1.80	5.0	1.90	7.0		
10	.53				1.90	7.0	2.01	8.2	1.9	7.4		
11	.51				2.02	9.4	1.94	6.8	1.90	7.8		
12	.48				1.95	8.0	1.88	5.8	1.99	9.6		
13	.63				2.23	14	1.91	6.2	1.92	8.2		
14	.70				2.18	13	1.71	4.2	1.93	8.6		
15	.64				2.18	13	1.79	4.9	1.91	8.2		
16	.62		0.30	0.1	2.05	10	1.79	4.9	1.90	8.0		
17	.50		.29	.1	2.10	11	1.64	3.6	1.91	8.2		
18	.32		.29	.1	1.94	7.8	1.14	.9	2.04	11		
19	.10		1.55	3.3	2.04	10	1.20	1.2	2.18	14		
20	.01		1.50	3.0	2.08	10	1.89	5.9	2.28	16		
21			1.39	2.2	2.18	12	1.86	5.6	1.94	8.8		
22			.55		2.09	10	1.93	6.6	2.00	10		
23			.4		2.10	10	1.90	6.0	1.97	9.4		
24			.4		2.21	13	1.80	5.0	1.93	8.6		
25			.55		2.18	12	1.74	4.5	1.87	7.4		
26			.35		2.14	11	1.80	5.0	1.08	1.0		
27			.31		2.05	9.2	1.79	4.9	.92	.4	.32	
28			.31		2.08	10	1.72	4.3	.98	.6	.32	
29			.31		2.60	24	2.00	7.8	.84	.2	.44	
30			.31		2.17	11	2.05	8.6	.72	.0	.31	
31			.64				2.02	7.8	.66	.0		

NOTE.—Discharge determined as follows: Previous to June 28, by indirect method for shifting channels; June 28 to July 28, from a rating curve fairly well defined between 4 and 12 second-feet, and poorly defined at other stages; after July 28 by indirect method for shifting channels. From Apr. 6 to May 15 the headgates were closed, but a small quantity of water was leaking through the headgates; this was estimated for the period Apr. 6–20 at 0.1 second-foot. From May 16–31, the flow came from waste water from the Cook canal for the periods May 16–18 and May 22–31 this was estimated at 0.1 second-foot. The canal headgates were opened May 31, at 1 p. m., and were closed Aug. 25. A very little water leaked through the headgates after this date.

Monthly discharge of Paradise Valley canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 6–20			0.1	3	D.
May 16–31	3.3		.61	19	D
June	24	0.9	9.39	559	C.
July	8.6	.9	5.81	357	B.
August	16		6.85	421	C.
The season				1,360	

COOK CANAL NEAR CHINOOK, MONT.

Location.—About half a mile above a small wooden highway bridge on the road running parallel to the Great Northern Railway, about 3 miles east of Chinook.

Records available.—April 10, 1905, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—Made from highway bridge.

Discharge measurements of Cook canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 2	J. B. Stewart	2.70	15.0	June 28	J. B. Stewart	2.70	12.4
15	do	3.18	25	July 11	do	3.03	16.6
20	do	3.20	25	25	do	1.40	1.1
June 4	do	2.92	17.2	Aug. 5	do	1.50	*a* 5
16	do	2.20	6.5	11	do	1.32	*a* 3

a Discharge estimated.

Daily gage height, in feet, and discharge, in second-feet, of Cook canal near Chinook, Mont., for 1913.

[Adam Jamison, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.75	16	3.0	20	2.8	15	1.52	0.5	1.30	0.3
2	.....	.....	2.77	17	3.0	20	2.4	8.7	1.52	.5	1.23	.2
3	.....	.....	2.78	17	2.9	17	1.9	3.9	1.55	.6	.....	.....
4	.....	.....	2.80	17	2.9	17	2.1	5.4	1.48	.5	.....	.....
5	.....	.....	2.9	19	2.80	15	3.5	34	1.50	.5	.....	.....
6	.....	.....	3.0	21	2.62	12	2.25	5.8	1.70	1.0	.....	.....
7	.....	.....	3.05	22	2.48	9.7	1.9	3.2	1.72	1.1	.....	.....
8	.....	.....	3.1	24	2.40	8.7	1.2	.5	1.65	.8	.....	.....
9	.....	.....	3.1	24	2.35	8.1	3.2	21	1.6	.7	.....	.....
10	.....	.....	3.05	22	2.39	8.6	3.1	18	1.55	.6	.....	.....
11	.....	.....	3.05	22	2.55	11	3.1	18	1.3	.3	.....	.....
12	.....	.....	3.3	30	2.4	8.7	2.95	15	1.25	.2	.....	.....
13	.....	.....	3.3	30	2.4	8.7	2.9	14	1.15	.2	.....	.....
14	.....	.....	3.3	29	2.30	7.5	2.40	7.2	1.05	.1	.....	.....
15	.....	.....	3.15	24	2.31	7.6	2.69	11	1.0	0	.....	.....
16	.....	.....	3.2	25	2.21	6.5	2.65	10	1.0	0	.....	.....
17	.....	.....	3.2	25	2.00	4.6	2.50	8.3	.9	0	.....	.....
18	.....	.....	3.2	25	1.9	3.9	2.34	6.6	.80	0	.....	.....
19	.....	.....	3.25	27	1.8	3.3	2.15	4.9	.82	0	.....	.....
20	.....	.....	3.2	25	2.0	4.6	1.7	2.3	1.05	.1	.....	.....
21	.....	.....	3.15	24	2.2	6.4	1.70	2.3	1.25	.2	.....	.....
22	.....	.....	3.15	24	2.0	4.6	1.72	2.4	1.5	.5	.....	.....
23	.....	.....	3.15	24	1.75	3.0	1.60	1.9	1.7	1.0	.....	.....
24	.....	.....	3.1	22	1.65	2.6	1.5	1.5	1.75	1.2	.....	.....
25	.....	.....	3.1	22	3.5	38	1.4	1.1	1.50	.5	.....	.....
26	2.18	7.3	3.05	21	2.45	9.4	1.90	3.0	1.43	.4	.....	.....
27	2.15	7.0	3.05	21	2.85	16	1.89	2.7	1.28	.3	.....	.....
28	2.15	7.0	3.05	21	2.7	13	2.00	3.0	1.05	.1	.....	.....
29	2.63	14	3.1	22	3.0	20	1.70	1.5	.85	0	.....	.....
30	2.80	17	3.1	22	3.2	25	1.62	1.0	.....	0	.....	.....
31	.....	.....	3.05	21	.....	.....	1.52	.6	.....	0	.....	.....

NOTE.—Discharge determined as follows: Previous to May 15, by indirect method for shifting channels; May 15 to July 4, from a fairly well-defined rating curve; July 5, by indirect method for shifting channels; July 6–25, from a poorly defined rating curve; July 26–30, by indirect method for shifting channels; July 31 to Sept. 2, from a poorly defined rating curve. The headgate of the canal was opened Apr. 25, and there was practically no flow after Aug. 14.

Monthly discharge of Cook canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 26–30	17	7.0	10.5	104	C.
May	30	16	22.7	1,400	C.
June	38	2.6	10.2	607	B.
July	34	0.5	7.54	464	C.
August	1.2	0	.38	23	C.
The season				2,598	

MATHESON CANAL NEAR CHINOOK, MONT.

Location.—At a footbridge 200 feet below the headgate of the canal, near the main road, 3½ miles east of Chinook.

Records available.—April 10, 1905, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—Made from footbridge or by wading.

Discharge measurements of Matheson canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	J. B. Stewart	3.63	8.0	July 11	J. B. Stewart	3.45	1.9
May 2	do	3.50	7.0	25	do	3.50	1.2
20	do	3.48	4.3	Aug. 5	do	3.52	*a*.3
une 16	do	3.28	2.2	11	do	3.45	*a*.1
28	do	3.90	3.8				

a Discharge estimated.

Daily gage height, in feet, and discharge, in second-feet, of Matheson canal near Chinook, Mont., for 1913.

[Adam Jamison, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.6	7.8	2.8	0.5	4.2	6.2	3.4	0.2	2.4	
2			3.5	7.0	2.75	.4	4.1	5.5	3.4	.2	2.4	
3			3.45	6.4	2.8	.5	3.95	4.5	3.4	.1		
4			3.25	4.8	2.6	0	4.0	4.9	3.5	.3		
5			3.15	3.9	3.1	1.6	4.9	13.1	3.5	.3		
6			3.2	4.1	3.5	3.9	4.4	8.4	3.45	.2		
7			3.3	4.7	3.5	3.8	4.1	5.9	3.35	0		
8			3.2	3.9	3.5	3.7	3.9	4.5	3.3			
9			3.15	3.4	3.5	3.7	3.5	2.1	3.3			
10			3.2	3.6	3.45	3.4	3.5	2.1	3.3			
11			3.2	3.4	3.2	1.9	3.5	2.2	3.4			
12			3.2	3.3	3.55	3.9	3.4	1.6	3.4			
13			3.25	3.5	3.6	4.3	3.35	1.3	3.4			
14			3.3	3.7	3.5	3.6	3.3	1.0	3.4			
15			3.4	4.3	3.3	2.4	3.25	.8	3.35			
16			3.4	4.1	3.25	2.0	3.2	.6	3.15			
17			3.4	4.0	3.25	1.8	3.2	.5	3.1			
18			3.45	4.2	3.2	1.5	3.25	.6	3.0			
19			3.45	4.1	3.2	1.3	3.25	.6	3.00			
20			3.5	4.3	3.4	2.2	3.45	1.2	2.98			
21			3.4	3.7	3.5	2.6	3.0	0	2.95			
22			3.4	3.7	3.65	3.3	3.5	1.3	2.93			
23			3.4	3.7	3.75	3.7	3.4	.9	2.90			
24			3.4	3.6	3.75	3.6	3.5	1.3	2.85			
25			3.45	3.9	4.1	5.8	3.5	1.2	2.75			
26	3.5	7.0	3.5	4.2	4.0	4.8	3.55	1.3	2.79			
27	3.55	7.4	3.4	3.6	3.9	3.9	3.5	.9	2.72			
28	3.6	7.8	3.25	2.6	3.9	3.8	3.65	1.4	2.63			
29	3.6	7.8	3.00	1.3	4.1	5.3	3.45	.6	2.58			
30	3.6	7.8	2.93	1.0	4.2	6.2	3.5	.6	2.45			
31			2.85	.7			3.4	.3	2.42			

NOTE.—Discharge determined as follows: Apr. 4–25, estimated at 8 second-feet; Apr. 26 to May 2, from a fairly well defined rating curve; after May 2, by indirect method for shifting channels. The headgates of the canal were opened Apr. 3 and the flow remained practically constant to Apr. 26, when gage observations were begun. No water was running in the canal from Aug. 7 to Sept. 2, but it was standing in pools.

Monthly discharge of Matheson canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 4–30			7.92	424	B.
May	7.8	0.7	3.89	239	C.
June	6.2	.0	2.98	177	C.
July	13.1	.0	2.50	154	C.
August	.3	.0	0.22	3	C.
The season				997	

HARLEM CANAL NEAR ZURICH, MONT.

Location.—About 500 feet below the headgates of the canal, 1½ miles southeast of the Great Northern Railway section house at Zurich; reached by driving from Chinook.

Records available.—June, 1903, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—Made by wading.

Discharge measurements of Harlem canal near Zurich, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 25	J. B. Stewart	2.48	30	June 16	J. B. Stewart	3.68	35
May 16	do	3.02	41	July 3	do	3.00	6.7
30	do	3.40	41				

Daily gage height, in feet, and discharge, in second-feet, of Harlem canal near Zurich, Mont., for 1913.

[Howsan Kirby, observer.]

Day.	Apr.		May.		June.		July.		Aug.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.34	27	3.57	44	3.11	10	1.70	
2			2.38	28	3.66	45	2.98	6.7	1.15	
3			2.59	32	3.74	46	2.98	6.7		
4			2.52	30	3.64	42	2.96	6.4		
5			2.47	29	3.50	39	2.84	4.9		
6			2.48	30	3.48	37	2.65	3.0		
7			2.34	27	3.54	38	2.48	1.9		
8			2.34	27	3.49	36	2.32	1.1		
9			2.64	33	3.57	38	2.51	2.0		
10			2.86	38	3.58	37	3.10	8.5		
11			2.91	39	3.70	38	3.08	8.2		
12			3.03	42	3.67	38	2.86	5.1		
13			3.09	43	3.74	38	3.93	25		
14			3.30	48	3.78	38	4.12	28		
15			3.53	54	3.77	38	3.83	23		
16			3.05	42	3.66	35	3.72	20		
17			3.08	43	3.66	34	3.83	23		
18			3.02	42	3.59	32	3.89	24		
19			3.16	44	3.46	28	3.71	20		
20	2.08	22	3.28	47	3.68	31	3.37	13		
21	1.99	20	3.16	42	3.79	33	3.25	11		
22	1.98	20	3.41	48	3.84	33	3.30	12		
23	2.09	22	3.38	47	3.71	29	3.55	17		
24	2.10	22	3.36	45	3.70	28	3.25	11		
25	2.26	25	3.34	43	3.60	25	3.18	9.7		
26	2.47	29	3.36	44	3.40	20	3.08	8.2		
27	2.46	29	3.36	42	3.28	17	2.85	5.0		
28	2.36	27	3.36	41	3.16	13	2.80	4.5		
29	2.36	27	3.40	42	2.76	6	2.68	3.3		
30	2.41	28	3.46	41	2.38	2	2.39	1.5		
31			3.52	42			2.00	0.5		

NOTE.—Discharge determined as follows: Apr. 20 to May 18, from a poorly defined rating curve; May 19 to July 1, by indirect method for shifting channels; July 2 to 31, from a poorly defined rating curve. The head gates were opened Apr. 20 and closed Aug. 2.

Monthly discharge of Harlem canal near Zurich, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 20–30	29	20	24.6	537	C.
May	54	27	39.4	2,420	C.
June	46	2	31.9	1,900	C.
July	28	.5	10.5	646	C.
The season				5,500	

AGENCY DITCH NEAR HARLEM, MONT.

Location.—At the highway bridge about one-fourth mile below the headgate of the ditch; reached by driving southward from Harlem, Mont.
Records available.—July 14, 1905, to December 31, 1913.
Gage.—Staff.
Discharge measurements.—Made by wading.

Discharge measurements of Agency ditch near Harlem, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 29	J. B. Stewart	4.60	87	June 23	Lee Teter	4.35	73
June 1	do	4.50	76	26	do	4.50	57
2	Lee Teter	4.55	78	30	J. B. Stewart	4.83	65
6	do	4.50	70	July 1	Lee Teter	3.78	87
10	do	4.35	60	9	do	3.35	69
15	C. R. Hauke	4.30	58	25	do	2.00	26
18	J. B. Stewart	4.15	58				

Daily gage height, in feet, and discharge, in second-feet, of Agency ditch near Harlem, Mont., for 1913.

[L. W. Teter, observer.]

Day.	May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			4.5	76	3.8	87
2			4.6	78	3.1	60
3				77	3.0	56
4			4.6	76	3.2	64
5				73	3.3	67
6			4.5	70	3.8	87
7				70	3.4	71
8				70	3.0	56
9				60	3.0	56
10			4.4	60	2.0	26
11			4.3	55	1.25	11
12				54		
13			4.2	54		
14				56		
15			4.3	58		
16			4.3	58		
17			4.2	58		
18			4.2	58		
19			4.2	62		
20			4.2	66		
21			4.4	70		
22			4.6	80		
23			4.4	73		
24			4.3	67		
25			4.2	62	1.90	24
26			4.1	51	2.00	26
27	4.6	87	4.1	57	2.05	27
28	4.6	87	2.05	30	2.05	27
29	4.6	87		30		
30	4.6	87		65		
31	4.5	76				

NOTE.—Discharge determined as follows: July 1-31, from a fairly well-defined rating curve; May and June, estimated from discharge measurements. Canal dry July 12-24. Headgates opened May 27 and closed for the season July 28. Checks were put in the canal just below the gage and removed at frequent intervals during the irrigating season, causing sudden changes in the relation of gage height to discharge.

Monthly discharge of Agency ditch near Harlem, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 27–31	87	76	84.8	841	C.
June	80	30	62.7	3,730	C.
July	87	0	24.0	1,480	B.
The season				6,050	

FORT BELKNAP CANAL NEAR CHINOOK, MONT.

Location.—At the highway bridge about 500 feet below the headgates of the canal, 8 miles west of Chinook.

Records available.—June 21, 1903, to December 31, 1913.

Gages.—The high water of June, 1908, washed out both the bridge and the gage; a new gage was installed June 27, 1908, at a different datum within a few feet of the site of the old gage; a new bridge was built about one-fourth mile upstream from the site of the old one.

Discharge measurements.—Made by wading at a section about 300 feet below the gage.

Discharge measurements of Fort Belknap canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 4	J. B. Stewart	1.53	23.6	July 10	J. B. Stewart	1.88	25
17	do	1.68	32	24	do	2.70	42
June 4	do	2.49	58	Aug. 4	do	2.33	14.4
17	do	2.65	61	9	do	2.90	26
27	do	2.50	47				

Daily gage height, in feet, and discharge, in second-feet, of Fort Belknap canal near Chinook, Mont., for 1913.

[E. O. Walters, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1				22	2.4	55	2.10	30	2.4	19	2.3	8
2			1.4	20	2.4	54	2.02	27	2.4	18	2.3	8
3				20	2.4	54	1.80	21	2.40	17	2.3	8
4			1.4	20	2.5	58	1.8	21	2.27	13	2.3	8
5			1.5	23	2.5	58	1.3	10	2.70	23	2.3	8
6			1.55	25	2.5	57	1.5	14	2.85	27	2.3	8
7			1.6	26	2.45	54	1.45	13	2.9	28	2.4	10
8			1.75	32	2.5	56	1.55	15	2.90	27	2.35	9
9			1.95	41	2.5	55	1.65	18	2.92	27	2.3	8
10			2.1	50	2.8	75	1.9	26	2.92	26	2.3	8
11			2.0	44	2.85	77	1.9	25	2.95	27	2.2	6
12			2.0	45	2.85	77	2.1	31	2.95	26	2.25	7
13			2.1	51	2.8	73	2.1	30	2.95	26	2.25	7
14			1.9	40	2.8	72	2.1	29	2.97	26	2.2	6
15			1.5	25	2.7	65	2.15	30	2.90	24	2.2	6
16			2.0	46	2.5	52	2.2	31	2.8	21	2.1	4
17				32	2.55	55	2.55	45	2.8	20	1.4	
18			1.6	28	2.7	63	2.55	43	2.8	20		
19			1.7	31	2.8	70	2.72	51	2.7	17		
20			1.7	31	2.6	56	2.72	49	2.95	24		
21			1.6	26	2.6	55	2.70	47	2.45	11		
22			1.8	34	2.6	55	2.7	45	2.4	10		
23			1.7	29	2.55	52	2.7	44	2.35	9		
24			1.75	31	2.5	48	2.7	42	2.3	8		
25			1.8	32	2.5	48	2.65	38	2.25	7		
26			1.8	31	2.55	51	2.65	36	1.5	0		
27	2.0	42	1.85	32	2.5	47	2.6	33	1.5	0		
28	2.0	42	2.0	37	2.5	47	2.6	31	1.5	0		
29	2.0	42	2.05	39	2.55	51	2.55	27	1.5	0		
30	1.5	23	2.15	43	2.3	38	2.5	25	2.3	8		
31			2.1	40			2.45	22	2.3	8		

NOTE.—Discharge determined by the indirect method for shifting channels for the entire season. Headgates were opened Apr. 27 and closed Sept. 17.

Monthly discharge of Fort Belknap canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 27–30	42	23	37.2	295	C.
May	51	20	33.1	2,040	C.
June	77	38	57.6	3,430	C.
July	51	10	30.6	1,880	C.
August	28	0	16.7	1,030	D.
September 1–17	10	0	7.0	236	D.
The season				8,910	

LITTLE PORCUPINE CREEK BASIN.

LITTLE PORCUPINE CREEK NEAR FRAZER, MONT.

Location.—In the NE. ¼ NE. ¼ sec. 28, T. 27 N., R. 44 E., above the intake of the reservoir about half a mile north of Frazer.

Records available.—July 13, 1908, to Dec. 31, 1913. Records from 1908 to 1910 were obtained at a site 1¾ miles downstream. April 14, 1911, to May 10, 1913, records were obtained one-fourth mile below the present site.

Drainage area.—Not measured.

Gage.—Staff gage on left bank. Previous to May 10 a staff gage on the left bank about one-fourth mile farther downstream.

Control.—Shifting during high water.

Discharge measurements.—Made by wading.

Diversions.—None.

Accuracy.—Results fair.

Discharge measurements of Little Porcupine Creek near Frazer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 15	J. B. Stewart	[a]3.59	7.75	June 20	J. B. Stewart	1.50	54
May 11	do	.44	1.75	21	do	1.88	106
26	do	.77	7.8	21	do	2.00	119
27	do	.72	6.8	25	do	1.02	25.5
Jnne 20	do	1.12	31				

[a] Measurement on Apr. 15 is referred to old gage. All other measurements are referred to the new gage.

Daily gage height, in feet, and discharge, in second-feet, of Little Porcupine Creek near Frazer, Mont., for 1913.

[William Ivey, observer.]

Day.	April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	5.3	231	3.41	2.2	0.58	4.6	0.62	6
2	5.2	215	3.06	.1	.52	3.4	.65	6
3	4.9	168	3.06	.1	.50	3.0	.60	5
4	4.5	108	3.06	.1	.50	3.0	.68	7
5	4.2	66	3.21	.3	.48	2.6	.62	6
6	3.86	28	3.44	2.8	.42	1.4	.52	3.4
7	3.68	14	3.48	3.6	.35	.5	.48	2.6
8	3.64	11	3.51	4.4	.30	.0	.42	1.4
9	3.58	7	3.51	4.4	.30	.0	.40	1.0
10	3.48	3.6	3.48	3.6	.30	.0	.40	1.0
11	3.41	2.2	.45	2.0	.25	.0	.32	.2
12	3.38	1.7	.50	3.0	.25	.0	.30	.0
13	3.38	1.7	.50	3.0	.22	.0	.30	.0
14	3.61	9	.60	5	.20	.0	.28	.0
15	3.61	9	.60	5	.20	.0	.22	.0
16	3.51	4.4	.62	6	.20	.0	.20	.0
17	3.26	.5	.72	8	.20	.0	.18	.0
18	3.26	.5	.75	9	.20	.0	.....	.....
19	3.24	.4	.90	16	.15	.0	.....	.....
20	3.18	.3	1.00	21	1.16	31	.....	.....
21	3.21	.3	1.02	22	1.76	86	.....	.....
22	3.16	.2	.98	20	1.90	105	.....	.....
23	3.16	.2	.82	12	1.20	34	.....	.....
24	3.16	.2	.82	12	1.80	91	.....	.....
25	3.16	.2	.80	11	1.00	21	.....	.....
26	3.11	.1	.75	9	.95	18	.....	.....
27	3.08	.1	.70	8	.90	16	.....	.....
28	3.44	2.8	.70	8	.82	12	.....	.....
29	3.51	4.4	.68	7	.75	9	.....	.....
30	3.56	6	.65	6	.70	8	.....	.....
31	.....	.....	.62	6	.....	.....	.....	.....

NOTE.—Gage heights to May 10 at old station and after May 10 at new station.

Discharge to May 10 determined from a poorly defined rating curve, and after May 10 from a rating curve fairly well defined above 1 second-foot. Creek practically dry after July 12.

Monthly discharge of Little Porcupine Creek near Frazer, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	231	0.1	29.9	1,780	C.
May	22	.1	7.12	438	B.
June	105	.....	15.0	893	B.
July	7	.....	1.28	79	B.
August	.....	.....	Dry.	.....	
September	.....	.....	Dry.	.....	
October	.....	.....	Dry.	.....	
November	.....	.....	Dry.	.....	
December	.....	.....	Dry.	.....	
The period	.....	.....	.....	3,190	

WOLF CREEK BASIN.

WOLF CREEK NEAR WOLF POINT, MONT.

Location.—In the SE. ¼ SW. ¼ sec. 8, T. 27 N., R. 47 E., at William Smith's ranch, 2½ miles northwest of Wolf Point, Mont.

Records available.—August 15, 1908, to December 31, 1913.

Drainage area.—Not measured.

Gage.—A staff near the house of the observer.

Control.—Shifting.

Discharge measurements.—Made by wading near the gage.

Diversions.—A small irrigation ditch diverts water above the gage.

Accuracy.—Results only fair.

Discharge measurements of Wolf Creek near Wolf Point, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	J. B. Stewart	2.03	5.7	June 22	J. B. Stewart	1.82	1.7
May 8	do	1.88	4.2	July 19	do	1.55	.1
24	do	2.19	11.2				

Daily gage height, in feet, of Wolf Creek near Wolf Point, Mont., for 1913.

[W. H. Smith, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5
2	.....	3.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5
3	.....	3.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5
4	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
5	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
6	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
7	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
8	.....	2.5	1.85	1.8	1.6	1.5	1.5	1.5	1.5
9	.....	2.5	1.85	1.6	1.6	1.5	1.5	1.5	.....
10	.....	2.3	1.85	•1.6	1.6	1.5	1.5	1.5	.....
11	.....	2.3	1.85	1.6	1.6	1.5	1.5	1.5	.....
12	.....	2.0	1.85	1.6	1.6	1.5	1.5	1.5	.....
13	.....	2.0	1.85	1.6	1.6	1.5	1.5	1.5	.....
14	.....	2.0	2.1	1.6	1.6	1.5	1.5	1.5	.....
15	.....	2.0	2.1	1.6	1.5	1.5	1.5	1.5	.....
16	.....	2.0	2.1	1.6	1.5	1.5	1.5	1.5	.....
17	.....	2.0	2.1	1.6	1.6	1.5	1.5	1.5	.....
18	.....	2.0	2.1	1.6	1.6	1.5	1.5	1.5	.....
19	.....	2.0	2.2	1.6	1.6	1.5	1.5	1.5	.....
20	.....	2.0	2.2	1.6	1.5	1.5	1.5	1.5	.....
21	.....	2.0	2.2	1.6	1.5	1.5	1.5	1.5	.....
22	.....	2.0	2.2	1.6	1.5	1.5	1.5	1.5	.....
23	.....	1.9	2.2	1.6	1.5	1.5	1.5	1.5	.....
24	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
25	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
26	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
27	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
28	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
29	.....	1.9	2.2	1.9	1.5	1.5	1.5	1.5	.....
30	4.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5	.....
31	4.0	.....	2.0	.....	1.5	1.5	.....	1.5	.....

NOTE.—Gage heights Mar. 30–31 distorted by ice.

Daily discharge, in second-feet, of Wolf Creek near Wolf Point, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1	45	4.2	5.8	3.2	16	5.1	8.7	0.1	0.1
2	45	4.2	5.6	3.2	17	5.1	8.7	.1	.1
3	45	4.2	5.6	3.2	18	5.1	8.7	.1	.1
4	45	4.3	2.2	3.4	19	5.3	12	.1	.1
5	45	4.3	2.2	3.4	20	5.3	12	.1	.....
6	45	4.3	2.1	3.4	21	5.3	12	.1	.....
7	45	4.5	2.1	3.5	22	5.4	12	.1	.....
8	20	3.7	2.0	.1	23	3.7	12	.1	.....
9	20	3.7	.1	.1	24	3.7	12	4.5	.....
10	13	3.7	.1	.1	25	3.9	12	4.5	.....
11	13	3.7	.1	.1	26	3.9	11	4.5	.....
12	5.1	3.7	.1	.1	27	3.9	11	4.7	.....
13	5.1	3.7	.1	.1	28	4.0	11	4.7	.....
14	5.1	8.7	.1	.1	29	4.0	11	3.1	.....
15	5.1	8.7	.1	.1	30	4.0	6.0	3.1	.....
					31	.....	5.8	.....	.....

NOTE.—Discharge determined by the indirect method for shifting channels. Discharge estimated June 9–23 and July 8–19. Stream practically dry after July 19. A small ditch, heading just above the gage, diverted about 1 second-foot during May and about 0.8 second-foot June 1–23.

Monthly discharge of Wolf Creek near Wolf Point, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	45	3.7	15.6	928	C.
May	12	3.7	7.60	467	C.
June	5.8	.1	1.94	115	C.
July	3.5	0	.79	49	D.
August	0	0	0	.....	
September	0	0	0	.....	
October	0	0	0	.....	
November 1–8	0	0	0	.....	
The period	.....	.....	.....	1,560	

POPLAR RIVER BASIN.

POPLAR RIVER NEAR POPLAR, MONT.

Location.—At the United States Reclamation Service camp in NE. ¼ sec. 4, T. 29 N., R. 51 E., 18 miles north of Poplar, and 12 miles upstream from the station formerly maintained at Buershia's ranch, in the S. ½ sec. 5, T. 28 N., R. 51 E.

Records available.—August 15, 1908, to June 30, 1911, at old site; May 2, 1911, to October 4, 1913, at present site. From October 5 to December 31, 1913, records were obtained at a new United States Reclamation Service camp 5 miles from Poplar.

Drainage area.—Not measured.

Gage.—Overhanging chain gage.

Channel.—Slightly shifting.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Discharge measurements of Poplar River near Poplar, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 14	J. B. Stewart	4.90	246	July 17	J. B. Stewart	4.18	45.0
May 9	....do	4.15	66	30	....do	3.80	17.2
24	....do	4.55	131	[a] Nov. 12	W. A. Lamb	4.2	41
June 23	....do	4.30	75				

[a] At new United States Reclamation Service camp near Poplar.

Daily gage height, in feet, of Poplar River near Poplar, Mont., for 1913.

[R. A. Kerin, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.25	4.2	4.4	3.8	3.7	3.6	4.10
2	.....	4.25	4.2	4.35	3.85	3.6	3.6	4.08
3	.....	4.2	4.1	4.25	3.85	3.8	3.8	4.08
4	.....	4.2	4.05	4.55	3.85	3.8	3.8	4.05
5	.....	4.2	4.05	4.4	3.8	3.8	3.90	4.10
6	.....	4.2	4.0	4.35	3.8	3.8	4.00	4.10
7	.....	4.2	3.95	4.3	3.85	3.8	4.00	4.15
8	.....	4.15	3.85	4.3	3.85	3.7	4.00	4.20
9	.....	4.15	3.8	4.25	3.85	3.8	4.00	4.20
10	.....	4.5	3.9	4.3	4.0	3.8	4.10	4.20
11	.....	4.3	3.95	4.3	3.95	3.8	4.10	4.15
12	.....	4.25	3.9	4.3	3.9	1.8	4.12	4.20
13	.....	4.2	3.85	4.25	3.9	3.8	4.15	3.85
14	4.90	4.35	3.85	4.25	3.9	3.8	4.18	4.20
15	4.94	4.35	4.25	4.2	3.9	3.8	4.15	4.20
16	4.86	4.4	4.1	4.2	3.85	3.7	4.15	4.20
17	4.82	4.45	4.0	4.18	3.9	3.7	4.15	4.25
18	4.75	4.55	3.95	4.2	3.9	3.7	4.12	4.25
19	4.7	4.6	3.9	4.1	3.9	3.7	4.12	4.25
20	4.65	4.7	3.9	4.1	3.9	3.7	4.10	4.20
21	4.6	4.65	4.0	.....	3.85	3.7	4.10	4.25
22	4.55	4.6	4.0	4.0	3.85	3.7	4.10	4.15
23	4.55	4.55	4.3	3.95	3.85	3.7	4.10	4.25
24	4.45	4.55	4.55	3.95	3.85	3.8	4.10	4.15
25	4.4	4.5	4.6	3.9	3.85	3.8	4.10	4.10
26	4.35	4.45	4.5	3.9	3.8	3.8	4.10	4.20
27	4.32	4.4	4.45	3.9	3.8	3.8	4.10	4.12
28	4.30	4.35	4.55	3.9	3.8	3.8	4.05	4.20
29	4.3	4.3	4.5	3.85	3.8	3.8	4.10	4.20
30	4.25	4.25	4.45	3.85	3.8	3.8	4.10	.....
31	.....	4.25	.....	3.8	3.8	.....	4.10	.....

NOTE.—Station was visted Apr. 14, and it was found that the staff gage had been washed out. A temporary staff gage was put in at a section about 200 feet above the old gage, and this was replaced by a chain gage May 9. The datum is the same as that of the gage used during 1912, but the control and conditions of channel are different. On Oct. 5 the gage was moved to a new United States Reclamation Service camp several miles below the former site, the old camp being abandoned. Gage heights after Oct. 4 read at the new site.

Daily discharge, in second-feet, of Poplar River near Poplar, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	86	56	93	18	15	12
2	.....	86	56	83	20	12	12
3	.....	77	42	64	20	18	18
4	.....	77	36	129	20	18	18
5	.....	77	36	93	18	18	.....
6	.....	77	31	83	18	18	.....
7	.....	77	27	73	20	18	.....
8	.....	69	20	73	20	15	.....
9	.....	69	18	64	20	18	.....
10	.....	135	23	73	31	18	.....
11	.....	93	27	73	27	18	.....
12	.....	82	23	73	23	18	.....
13	.....	74	20	64	23	18	.....
14	245	99	20	64	23	18	.....
15	258	99	64	56	23	18	.....
16	233	107	42	56	20	15	.....
17	221	117	31	53	23	15	.....
18	201	137	27	56	23	15	.....
19	187	149	23	42	23	15	.....
20	174	171	23	42	23	15	.....
21	161	156	31	36	20	15	.....
22	149	142	31	31	20	15	.....
23	149	129	73	27	20	15	.....
24	126	129	129	27	20	18	.....
25	115	116	142	23	20	18	.....
26	105	104	116	23	18	18	.....
27	99	93	104	23	18	18	.....
28	95	83	129	23	18	18	.....
29	95	73	116	20	18	18	.....
30	86	64	104	20	18	18	.....
31	.....	64	.....	18	18	.....	.....

NOTE.--Discharge determined as follows: To May 9 from a fairly well-defined rating curve; May 10–20, by indirect method for shifting channels; May 20–Oct. 4, from a fairly well-defined rating curve. Discharge interpolated July 21. No rating as yet developed for the new location of the gage.

Monthly discharge of Poplar River near Poplar, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 14–30	258	86	159	5,360	B.
May	171	64	100	6,150	C.
June	142	18	54.0	3,210	B.
July	129	18	54.1	3,330	B.
August	31	18	20.8	1,280	B.
September	18	12	16.8	1,000	B.
The period	.....	.....	.....	20,300	

BIG MUDDY CREEK BASIN.

BIG MUDDY CREEK NEAR CULBERTSON, MONT.

Location.—In the SW. ¼ sec. 17, T. 29 N., R. 54 E., at Shield's, formerly Sholtz's ranch, 11 miles above mouth of stream, 15 miles northwest of Culbertson, and 8 miles above site of original station at Boyd's ranch, which was discontinued because gage heights were affected by backwater from the Missouri.

Records available.—July 14, 1908, to July 19, 1909, at original station; July 19, 1909, to December 31, 1913, at present station.

Gage.—An inclined rod on left bank of stream near residence of observer.

Control.—Mud.

Discharge measurements.—Made by wading.

Winter flow.—Little if any flow during months of January, February, October, November, and December.

Accuracy.—Results at new station good.

Discharge measurements of Big Muddy Creek near Culbertson, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 13	J. B. Stewart	3.49	71	July 18	J. B. Stewart	3.25	5.7
May 7	do	2.45	19.0	29	do	3.10	5.3
25	do	2.80	34	Nov. 11	W. A. Lamb	2.32	10.2
June 24	do	2.25	6.1				

Daily gage height, in feet, of Big Muddy Creek near Culbertson, Mont., for 1913.

[Thomas Shields, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.9	2.55	2.62	5.6	2.9	3.45	2.0	2.4
2	3.2	2.5	2.52	5.4	2.85	3.35	2.0	2.35
3	3.4	2.5	2.5	4.9	2.85	3.35	2.0	2.35
4	5.1	2.5	2.5	4.6	2.7	3.35	2.0	2.4
5	5.2	2.45	2.5	4.5	2.69	3.3	2.0	2.45
6	7.0	2.45	2.48	4.4	2.6	3.3	2.1	2.4
7	7.2	2.45	2.45	3.85	.....	3.25	2.1	2.4
8	6.0	2.45	2.4	3.7	2.5	3.2	2.15	2.4
9	4.6	2.45	2.35	3.6	2.5	3.1	2.15	2.35
10	4.35	2.45	2.35	3.55	2.4	2.9	2.2	2.35
11	4.05	2.5	2.35	3.45	2.45	2.7	2.2	2.3
12	3.6	2.5	2.3	3.4	2.4	2.6	2.0	2.3
13	3.5	2.5	2.25	3.4	2.35	2.55	2.0	2.3
14	3.4	2.5	2.25	3.3	2.35	2.4	2.2	2.3
15	3.35	2.55	2.22	3.3	2.3	2.45	2.2	2.3
16	3.4	2.6	2.22	3.28	2.3	2.4	2.3	2.3
17	3.3	2.6	2.22	3.25	2.25	2.4	2.3	2.3
18	3.1	2.65	2.22	3.25	2.22	2.3	2.45	2.3
19	2.95	2.7	2.35	3.25	2.2	2.25	2.45	2.3
20	2.9	2.75	2.5	3.25	2.2	2.25	2.5	2.3
21	2.8	2.8	2.55	3.25	2.2	2.2	2.5	2.3
22	2.75	2.9	2.5	3.25	2.15	2.15	2.5	2.3
23	2.7	2.9	2.4	3.23	2.15	2.1	2.45	.....
24	2.65	2.9	2.25	3.22	2.15	2.10	2.45	.....
25	2.6	2.8	2.35	3.20	2.15	2.05	2.4	.....
26	2.6	2.78	2.5	3.15	2.15	2.0	2.4	.....
27	2.6	2.7	3.6	3.15	2.25	2.0	2.35	.....
28	2.55	2.68	5.8	3.1	2.85	2.0	2.35	.....
29	2.6	2.65	5.8	3.05	3.1	2.0	2.4	.....
30	2.55	2.6	5.6	3.0	3.3	2.0	2.4	.....
31	.....	2.65	.....	2.95	3.35	.....	.....	.....

NOTE.—Gage heights Apr. 1 and 2 may be slightly affected by ice, but are assumed correct.

Daily discharge, in second-feet, of Big Muddy Creek near Culbertson, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	38	21	24	255	.....	69	2	14
2	55	18	19	230	.....	63	2	12
3	66	18	18	160	.....	63	2	12
4	231	18	18	130	.....	63	2	14
5	243	16	18	115	.....	60	2	16
6	494	16	18	105	.....	60	4	14
7	526	16	16	60	.....	58	4	14
8	347	16	14	50	.....	55	5	14
9	173	16	12	41	.....	50	5	12
10	147	16	12	38	.....	38	6	12
11	117	18	12	28	.....	28	6	10
12	79	18	10	24	.....	23	2	10
13	72	18	8	20	.....	21	2	10
14	66	18	8	14	.....	14	6	10
15	63	21	6.8	12	.....	16	6	10
16	66	23	6.8	10	.....	14	10	10
17	60	23	6.8	8	.....	14	10	10
18	50	26	6.8	6	.....	10	16	10
19	41	28	12	6	.....	8	16	10
20	38	30	18	8	.....	8	18	10
21	33	33	21	8	.....	6	18	10
22	30	38	18	8	.....	5	18	10
23	28	38	14	8	.....	4	16	.....
24	26	38	8	8	.....	4	16	.....
25	23	33	12	8	.....	3	18	.....
26	23	32	18	7	.....	2	14	.....
27	23	28	74	7	8	2	18	.....
28	21	27	305	6	36	2	12	.....
29	23	26	295	5	50	2	14	.....
30	21	23	270	5	60	2	14	.....
31	.....	26	.....	5	63	.....	14	.....

NOTE.—Discharge determined as follows: Apr. 1 to June 26 and after Aug. 26, from one poorly defined rating curve; June 27 to July 29, by indirect method for shifting channels. Discharge estimated July 30 and 31; Aug. 1–26, estimated at 5 second-feet.

Monthly discharge of Big Muddy Creek near Culbertson, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	526	21	107	6,370	C.
May	38	16	23.7	1,460	C.
June	305	6.8	43.3	2,580	C.
July	255	5.0	45.0	2,770	C.
August	63	.....	11.2	689	D.
September	69	2.0	25.6	1,520	C.
October	18	2.0	9.3	572	C.
November 1–22	16	10	11.5	502	C.
The period	.....	.....	.....	16,500	

YELLOWSTONE RIVER BASIN.

YELLOWSTONE RIVER NEAR CANYON STATION, YELLOWSTONE NATIONAL PARK.

Location.—In secs. 9–16, T. 13 S., R. 10 E., Montana meridian, one-eighth mile above Chittenden bridge, half a mile above Upper Falls, 1 mile south of Canyon station, and about 13 miles below outlet of Lake Yellowstone.

Records available.—June 22 to November 18, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff on left bank.

Control.—Rock. One channel at all stages.

Discharge measurements.—Can be made by wading at certain stages. When too deep to be waded, can be made by measuring flow at Fishing bridge and adding the inflow.

Winter flow.—Ice forms in the winter, but the falls remain open.

Accuracy.—Data insufficient for estimates of discharge.

Cooperation.—Gage heights and transportation are furnished by the Yellowstone National Park.

Estimates withheld for additional measurements.

The following discharge measurement was made by R. C. Pierce:

September 12.—Gage height, 2.31 feet; discharge, 2,160 second-feet.

Daily gage height, in feet, of Yellowstone River near Canyon station, Yellowstone National Park, for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	5.2	4.6	2.7	1.8	1.4	16	.....	4.8	3.45	.....	1.6	1.1
2	.....	5.15	4.65	2.7	1.8	1.4	17	.....	4.7	3.4	.....	1.6	1.05
3	.....	5.15	4.7	2.65	1.8	1.4	18	.....	4.55	3.35	.....	1.55	1.0
4	.....	5.15	4.7	2.6	1.75	1.4	19	.....	4.45	3.35	.....	1.55	.....
5	.....	5.05	4.6	2.55	1.7	1.4	20	.....	4.45	3.3	1.75	1.55	.....
6	.....	5.05	4.4	2.5	1.7	1.4	21	5.25	4.4	3.25	1.75	1.55	.....
7	.....	5.05	4.15	2.5	1.7	1.35	22	5.25	4.25	3.2	1.8	1.5	.....
8	.....	5.05	4.0	.....	1.7	1.35	23	5.35	4.3	3.1	1.8	1.5	.....
9	.....	4.95	3.9	.....	1.75	1.35	24	5.3	4.15	3.05	1.8	1.5	.....
10	.....	4.95	3.75	.....	1.75	1.3	25	5.35	4.2	3.0	1.85	1.5	.....
11	.....	4.95	3.75	.....	1.7	1.3	26	5.3	4.25	2.95	1.85	1.5	.....
12	.....	4.95	3.6	2.3	1.7	1.25	27	5.25	4.35	2.85	1.85	1.45	.....
13	.....	4.95	3.55	2.3	1.65	1.2	28	5.25	4.25	2.8	1.85	1.45	.....
14	.....	4.9	3.55	.....	1.6	1.15	29	5.25	4.25	2.75	1.85	1.45	.....
15	.....	4.85	3.55	.....	1.6	1.1	30	5.2	4.7	2.75	1.85	1.4	.....
							31	5.2	4.6	2.75	.....	1.4	.....

NOTE.—All gage heights reduced to datum of the permanent gage installed Sept. 13, 1913; no record was obtained Nov. 19 to Dec. 31, as water was below gage.

YELLOWSTONE RIVER AT CORWIN SPRINGS, MONT.

Location.—In the NE. ¼ sec. 30, T. 8 S., R. 8 E., in the canyon at Corwin Springs, Mont., 8 miles below Gardiner, the northern entrance to Yellowstone National Park.

Records available.—September 2, 1910, to December 31, 1913.

Drainage area.—2,630 square miles.

Gage.—A chain gage fastened to the floor of the highway bridge on the downstream side near the right bank. Previous to October 25, 1911, a staff gage set to the same datum and fastened to a pile beside the concrete abutment on the right bank.

Control.—Bed of stream rocky; free from vegetation.

Discharge measurements.—Made from the lower side of highway bridge.

Diversions.—No water is diverted from the Yellowstone above this station.

Storage.—Yellowstone Lake furnishes a natural but uncontrolled regulation.

The following discharge measurement was made by R. R. Randell:

May 31, 1913: Gage height, 8.90 feet; discharge, 18,000 second-feet.

Daily gage height, in feet, of Yellowstone River at Corwin Springs, Mont., for 1913.

[Mrs. C. H. Wilks, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	2.9	9.0	6.9	5.9	3.4	2.1	1.7	1.4
2	.....	1.4	2.4	9.3	7.2	5.4	3.3	2.1	1.7	1.4
3	.....	1.5	2.5	9.1	7.1	5.2	3.3	2.1	1.6	1.3
4	.....	1.5	2.3	9.2	7.0	5.1	3.3	2.1	1.6	1.3
5	.....	1.3	2.2	9.3	6.8	5.1	3.3	2.0	1.6	1.2
6	.....	1.5	2.4	9.5	6.6	5.2	3.3	2.1	1.6	1.2
7	.....	1.4	2.7	9.3	6.5	5.2	3.2	2.2	1.6	1.2
8	.....	1.4	3.5	9.6	6.4	5.0	3.1	2.2	1.6	1.2
9	.....	1.5	4.4	9.3	6.4	5.0	3.1	2.2	1.6	1.2
10	.....	1.5	4.7	8.9	6.3	4.8	3.1	2.2	1.6	1.2
11	.....	1.5	5.0	8.4	6.3	4.8	3.1	2.1	1.6	1.1
12	.....	1.6	4.9	8.8	6.0	4.7	3.0	2.2	1.6	1.1
13	.....	1.8	4.8	9.0	5.8	4.7	2.9	2.2	1.5	1.1
14	.....	1.8	4.1	8.7	5.7	4.5	2.8	2.4	1.5	1.1
15	.....	1.9	3.9	8.5	5.4	4.5	2.7	2.1	1.5	.....
16	1.0	1.8	4.2	8.2	5.3	4.4	2.7	2.0	1.6	.....
17	1.0	2.0	4.5	8.4	5.3	4.2	2.6	2.0	1.6	.....
18	.9	2.0	4.3	8.3	5.3	4.1	2.6	1.9	1.5	.....
19	.....	2.3	4.4	8.3	5.2	4.0	2.6	1.9	1.5	.....
20	.....	2.2	4.1	8.4	5.2	3.7	2.5	1.8	1.4	.....
21	.....	2.2	4.2	8.3	5.2	3.6	2.5	1.8	1.4	.....
22	.....	2.4	4.7	8.0	5.3	3.6	2.6	1.8	1.4	.....
23	.....	2.1	5.6	7.5	5.1	3.5	2.5	1.8	1.4	.....
24	.....	2.2	6.1	7.8	5.2	3.5	2.4	1.8	1.4	.....
25	.....	2.0	6.6	7.5	4.9	3.5	2.4	1.9	1.3	.....
26	.....	2.1	7.5	7.2	5.3	3.4	2.4	1.7	1.4	.....
27	.....	2.3	8.4	7.2	5.5	3.4	2.4	1.7	1.5	.....
28	.....	2.6	8.7	6.9	5.9	3.4	2.3	1.8	.....	.....
29	.....	3.0	8.3	6.9	6.2	3.4	2.2	1.7	.....	.....
30	1.2	3.2	8.0	6.8	6.8	3.4	2.2	1.7	1.4	.....
31	1.1	.....	8.5	.....	6.2	3.4	.....	1.7	.....	.....

NOTE.—Ice at the gage previous to Mar. 16, Mar. 19–29, and after Dec. 14.

Daily discharge, in second-feet, of Yellowstone River at Corwin Springs, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,300	2,910	18,300	11,900	9,030	3,680	1,910	1,530	1,300
2	.....	1,300	2,250	19,300	12,800	7,720	3,520	1,910	1,530	1,300
3	.....	1,370	2,370	18,600	12,500	7,230	3,520	1,910	1,450	1,230
4	.....	1,370	2,130	18,900	12,200	6,990	3,520	1,910	1,450	1,230
5	.....	1,230	2,020	19,300	11,600	6,990	3,520	1,810	1,450	1,160
6	.....	1,370	2,250	19,900	11,000	7,230	3,520	1,910	1,450	1,160
7	.....	1,300	2,630	19,300	10,700	7,230	3,360	2,020	1,450	1,160
8	.....	1,300	3,840	20,200	10,400	6,760	3,210	2,020	1,450	1,160
9	.....	1,370	5,470	19,300	10,400	6,760	3,210	2,020	1,450	1,160
10	.....	1,370	6,090	18,000	10,200	6,310	3,210	2,020	1,450	1,160
11	.....	1,370	6,760	16,400	10,200	6,310	3,210	1,910	1,450	1,100
12	.....	1,450	6,530	17,700	9,310	6,090	3,060	2,020	1,450	1,100
13	.....	1,620	6,310	18,300	8,760	6,090	2,910	2,020	1,370	1,100
14	.....	1,620	4,890	17,400	8,490	5,670	2,770	2,250	1,370	1,100
15	.....	1,710	4,530	16,800	7,720	5,670	2,630	1,910	1,370	.....
16	1,040	1,620	5,080	15,800	7,470	5,470	2,630	1,810	1,450	.....
17	1,040	1,810	5,670	16,400	7,470	5,080	2,500	1,810	1,450	.....
18	990	1,810	5,270	16,100	7,470	4,890	2,500	1,710	1,370	.....
19	1,000	2,130	5,470	16,100	7,230	4,710	2,500	1,710	1,370	.....
20	1,020	2,020	4,890	16,400	7,230	4,180	2,370	1,620	1,300	.....
21	1,030	2,020	5,080	16,100	7,230	4,010	2,370	1,620	1,300	.....
22	1,050	2,250	6,090	15,200	7,470	4,010	2,500	1,620	1,300	.....
23	1,060	1,910	8,230	13,700	6,990	3,840	2,370	1,620	1,300	.....
24	1,080	2,020	9,590	14,600	7,230	3,840	2,250	1,620	1,300	.....
25	1,090	1,810	11,080	13,700	6,530	3,840	2,250	1,710	1,230	.....
26	1,110	1,910	13,700	12,800	7,470	3,680	2,250	1,530	1,300	.....
27	1,120	2,130	16,400	12,800	7,970	3,680	2,250	1,530	1,370	.....
28	1,140	2,500	17,400	11,900	9,030	3,680	2,130	1,620	1,340	.....
29	1,150	3,060	16,100	11,900	9,870	3,680	2,020	1,530	1,320	
30	1,160	3,360	15,200	11,600	11,600	3,680	2,020	1,530	1,300	.....
31	1,100	.....	16,800	.....	9,870	3,680	.....	1,530	.....	.....

NOTE.—Discharge determined from a rating curve fairly well defined between 3,000 and 4,700 second-feet and well defined at other stages. Discharge estimated Mar. 19–29 and interpolated Nov. 28–29.

Monthly discharge of Yellowstone River at Corwin Springs, Mont., for 1913.

[Drainage area, 2,630 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
March 16–31	1,160	990	1,070	0.407	0.24	34,000	C.
April	3,360	1,230	1,780	.677	.76	106,000	A.
May	17,400	2,020	7,190	2.73	3.15	442,000	A.
June	20,200	11,600	16,400	6.24	6.96	976,000	A.
July	12,800	6,530	9,240	3.51	4.05	568,000	A.
August	9,030	3,680	5,420	2.06	2.38	333,000	A.
September	3,680	2,020	2,790	1.06	1.18	166,000	A.
October	2,250	1,530	1,800	.684	.79	111,000	A.
November	1,530	1,230	1,390	.529	.59	82,700	A.
December 1–14	1,300	1,100	1,170	.445	.23	32,500	A.
The period						2,850,000	

YELLOWSTONE RIVER AT HUNTLEY, MONT.

Location.—In the SW. ¼ sec. 24, T. 2 N., R. 27 E., at new steel highway bridge 1 mile below Huntley, Mont., 1 mile below Pryor Creek. Station replaces that formerly maintained at Junction.

Records available.—October 1, 1907, to December 31, 1913. A station was maintained May 10, 1906, to December 31, 1907, at Junction, Mont., where the flow is practically the same as at Huntley.

Drainage area.—12,000 square miles.

Gage.—Chain fastened to bridge rail; datum unchanged.

Channel.—Shifts.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—River frozen entirely over in places during winter, but during the coldest seasons open channels with floating ice are not of uncommon occurrence.

Diversions.—The Huntley canal, built by the United States Reclamation Service, takes water from the river about 2 miles above the gaging station; its normal capacity is 400 second-feet, and it supplies the water for 29,000 acres of land. Near Laurel are the headgates of the Billings Land & Irrigation Co.'s canal, which carries about 305 second-feet and irrigates 28,000 acres. Many small ditches take water from the tributaries of the Yellowstone, but few from the stream itself, owing to the variation of the stage of the water surface and consequent difficulty of diversion.

Accuracy.—Conditions for obtaining accurate data at this station are only fair and many discharge measurements are necessary to define a good rating curve.

Discharge measurements of Yellowstone River at Huntley, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 23	R. R. Randell	3.16	6,680	Aug. 22	J. M. Ray	4.62	8,770
June 28	do	8.19	24,800	Oct. 3	do	3.96	4,170

Daily gage height, in feet, of Yellowstone River at Huntley, Mont., for 1913.

[E. V. Carpenter, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	5.1	4.4	5.4	3.4	10.0	8.1	7.4	4.4	3.9	4.0	3.7
2	2.1	5.1	4.5	5.5	3.2	10.4	8.0	6.7	4.4	3.9	4.2	3.7
3	2.1	5.0	4.5	3.9	3.2	10.5	8.2	6.0	4.5	4.0	4.2	3.6
4	2.1	4.9	4.6	3.3	3.1	10.3	8.1	6.3	4.4	4.0	4.1	3.4
5	2.3	4.9	4.7	3.5	3.0	10.2	8.2	6.0	4.5	4.0	4.0	3.4
6	4.8	4.9	4.6	3.5	2.9	10.2	8.0	6.0	4.4	4.1	4.0	3.4
7	4.8	4.8	4.7	4.1	2.8	10.4	8.0	6.0	4.4	4.1	4.0	3.4
8	4.8	4.8	4.9	3.6	3.0	10.3	7.9	5.8	4.3	4.1	4.0	3.6
9	4.9	4.8	4.8	2.8	3.1	10.2	7.6	5.9	4.3	4.2	4.0	3.9
10	5.1	4.7	4.7	2.6	4.0	9.9	7.6	6.0	4.2	4.3	3.9	3.8
11	5.1	4.7	4.1	2.6	4.6	9.7	7.4	6.3	4.3	4.2	3.9	3.8
12	5.3	4.8	4.0	2.8	5.4	10.2	7.2	6.0	4.2	4.2	3.8	3.8
13	5.3	4.8	3.9	2.9	5.6	10.6	7.4	5.7	4.2	4.2	3.9	3.8
14	5.3	5.0	3.6	2.9	5.0	10.1	6.4	5.7	4.1	4.2	3.9	3.9
15	5.4	5.1	3.5	3.0	4.6	10.0	6.2	5.5	4.1	4.1	3.9	3.9
16	5.4	5.3	3.5	2.9	4.5	10.0	5.9	5.4	4.1	4.2	3.8	3.9
17	5.4	4.3	.....	3.0	4.4	9.8	5.8	5.3	4.1	4.1	3.8	3.8
18	5.4	4.3	.....	3.0	4.3	9.6	5.7	5.2	4.1	4.0	3.8	3.8
19	5.4	4.6	.....	3.0	4.2	9.8	5.6	5.0	4.0	4.0	3.8	3.7
20	4.9	4.6	.....	3.0	4.6	9.9	5.6	4.9	3.9	4.0	3.8	3.6
21	4.9	4.6	.....	.....	4.4	9.6	5.5	4.7	4.0	4.0	3.8	3.6
22	4.9	4.6	.....	.....	4.3	9.4	5.6	4.6	4.0	4.0	3.8	3.6
23	5.1	4.6	.....	3.1	4.1	9.1	5.7	4.5	4.1	4.0	3.8	3.6
24	5.1	4.6	.....	3.2	4.6	9.1	5.8	4.5	4.2	4.0	3.7	3.6
25	5.4	4.4	.....	3.0	7.0	9.0	5.8	4.5	4.2	4.0	3.7	3.6
26	5.4	3.9	.....	3.0	7.8	8.7	5.6	4.4	4.1	4.0	3.7	3.6
27	5.4	4.3	.....	2.8	9.2	8.2	6.0	4.4	4.1	4.1	3.7	3.6
28	5.4	4.4	.....	2.7	10.0	8.2	6.4	4.3	4.0	4.0	3.7	3.9
29	5.3	.....	.....	3.2	10.5	8.2	6.1	4.4	4.0	4.0	3.7	3.7
30	5.2	.....	6.4	3.5	10.3	8.2	6.2	4.4	4.0	4.0	3.7	3.6
31	5.1	.....	6.0	.....	9.6	.....	6.9	4.3	.....	4.0	.....	3.6

NOTE.—Jan. 1 to Apr. 8, gage heights affected by ice.

Daily discharge, in second-feet, of Yellowstone River at Huntley, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7,750	42,000	24,400	21,500	7,000	4,100	4,450	3,500
2	.....	7,050	44,400	23,800	17,500	7,000	4,100	5,150	3,500
3	.....	7,050	45,000	25,000	13,700	7,300	4,450	5,150	3,200
4	.....	6,700	43,800	24,400	15,300	7,000	4,450	4,800	2,700
5	.....	6,350	43,200	25,000	14,200	7,300	4,450	4,450	2,700
6	.....	6,000	43,200	23,800	14,200	6,500	4,800	4,450	2,700
7	.....	5,650	44,400	23,800	14,200	6,500	4,800	4,450	2,700
8	.....	6,350	43,800	23,200	13,000	6,000	4,800	4,450	3,200
9	5,650	6,700	43,200	21,400	13,700	6,000	5,150	4,450	4,100
10	4,950	10,100	41,400	21,400	14,800	5,700	5,500	4,100	3,800
11	4,950	12,800	40,200	20,200	16,500	5,800	5,150	4,100	3,800
12	5,650	16,600	43,200	19,200	14,800	5,500	5,150	3,800	3,800
13	6,000	17,600	45,600	20,200	13,000	5,500	5,150	4,100	3,800
14	6,000	14,600	41,300	14,800	13,000	5,100	5,150	4,100	4,100
15	6,350	12,800	40,800	13,700	12,700	5,100	4,800	4,100	4,100
16	6,000	12,400	40,800	12,200	12,200	4,800	5,150	3,800	4,100
17	6,350	11,900	39,000	11,700	11,500	4,800	4,800	3,800	3,800
18	6,350	11,400	37,300	11,200	11,200	4,800	4,450	3,800	3,800
19	6,350	11,000	37,700	10,700	10,300	4,450	4,450	3,800	3,500
20	6,350	12,800	37,800	10,700	9,800	4,100	4,450	3,800	3,200
21	6,450	11,900	35,500	10,200	9,300	4,450	4,450	3,800	3,200
22	6,600	11,400	34,200	10,700	8,700	4,450	4,450	3,800	3,200
23	6,700	10,600	32,000	11,200	8,200	4,800	4,450	3,800	3,200
24	7,050	12,800	31,300	11,700	8,200	5,150	4,450	3,500	3,200
25	6,350	24,800	31,000	11,700	8,200	5,150	4,450	3,500	3,200
26	6,350	29,200	28,500	10,700	7,300	4,800	4,450	3,500	3,200
27	5,650	37,200	25,000	13,200	7,300	4,800	4,800	3,500	3,200
28	5,300	42,000	25,000	15,300	7,000	4,450	4,450	3,500	4,100
29	7,050	45,000	25,000	13,700	7,300	4,450	4,450	3,500	3,500
30	8,100	43,800	25,000	14,300	7,300	4,450	4,450	3,500	3,200
31	.....	39,600	.....	18,500	7,000	.....	4,450	.....	3,200

NOTE.—Discharge determined as follows. Apr. 9 to June 13, from a rating curve fairly well defined for 1912 but poorly defined for 1913; June 14–26 and July 27 to Sept. 15, by indirect method for shifting channels; June 27 to July 26 and Sept. 16 to Dec. 31, from a poorly defined rating curve. Discharge interpolated Apr. 21–22.

Monthly discharge of Yellowstone River at Huntley, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 9–30	8,100	4,950	6,210	271,000	C.
May	45,000	5,650	16,500	1,010,000	C.
June	45,600	25,000	37,700	2,240,000	C.
July	25,000	10,200	16,800	1,030,000	C.
August	21,500	7,000	11,700	719,000	C.
September	7,300	4,100	5,440	324,000	C.
October	5,500	4,100	4,660	287,000	C.
November	5,150	3,500	4,030	240,000	C.
December	4,100	2,700	3,440	212,000	C.
The period				6,330,000	

YELLOWSTONE RIVER AT INTAKE, MONT.

Location.—At the Lower Yellowstone diversion dam at Intake in NW. ¼ sec. 36, T. 18 N., R. 56 E., 18 miles below Glendive, Mont.

Records available.—January 1, 1911, to December 31, 1913. Records were obtained at Glendive, 18 miles above by the War Department and Department of Agriculture from 1893 to 1903, and by the Geological Survey from August 1, 1903, to December 31, 1910.

Gage.—A chain gage on the north abutment of the dam. The gage readings show the depth of water on the crest of the dam.

Winter flow.—Affected by ice.

The dam.—The dam, a rock-filled timber-crib structure on a pile foundation, was completed January 29, 1910. It is 700 feet long, crosses the stream at right angles to the current, and raises the low-water level of the river about 4 feet. The dam is specially designed to resist the destructive effects of ice by having an approach on a slope of 3 to 1, and the downstream face is ogee-shaped and protected by a heavy rock apron.

Diversions.—The Lower Yellowstone canal, which diverts water to irrigate 66,000 acres of land, has its headworks at the north abutment.

Accuracy.—A curve showing relation of gage heights at Glendive and at Lower Yellowstone dam was constructed. Using this curve of relation and discharge measurements made at Glendive, a discharge curve was constructed which is applicable to the gage heights of Lower Yellowstone dam, and should give fair results.

Daily gage height, in feet, of Yellowstone River at Intake, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.5	2.0	12.1	2.3	7.5	5.6	4.7	2.0	1.9	1.8	1.6
2	2.1	1.5	1.7	12.5	2.7	7.4	5.8	4.9	2.0	1.9	1.8	1.6
3	2.1	1.5	1.6	9.5	2.9	7.5	5.8	4.6	2.0	1.9	1.8	1.6
4	2.0	1.4	2.45	7.2	3.1	7.7	5.6	4.3	2.0	1.8	1.8	1.6
5	1.7	1.4	2.4	6.3	3.1	7.7	5.6	4.0	2.0	1.8	1.75	1.6
6	1.5	1.4	2.45	5.5	2.9	7.5	5.5	3.9	2.1	1.95	1.8	1.5
7	1.5	1.4	3.3	5.1	2.7	7.3	5.4	3.8	2.15	2.2	1.8	1.5
8	1.4	1.4	4.1	4.9	2.6	7.2	5.3	3.8	2.1	2.3	1.8	1.5
9	1.4	1.4	.....	4.9	2.45	7.1	5.1	3.7	2.0	2.2	1.7	1.5
10	1.3	1.4	.....	4.3	2.3	7.1	5.1	3.8	2.0	2.2	1.8	1.5
11	1.2	1.4	.....	3.2	2.3	7.3	5.0	3.9	1.9	2.2	1.7	1.5
12	1.2	1.4	.....	2.9	2.9	7.0	4.9	3.9	1.85	2.2	1.7	1.5
13	1.2	1.4	.....	2.7	3.7	6.9	4.7	3.9	1.8	2.2	1.7	1.5
14	1.2	1.5	.....	2.6	4.3	6.7	4.7	3.5	1.8	2.15	1.7	1.5
15	1.1	1.6	.....	2.6	4.5	6.9	4.4	3.3	1.8	2.1	1.8	1.5
16	1.1	2.1	3.1	2.6	4.1	6.5	4.1	3.3	2.2	2.0	1.8	1.5
17	1.1	2.2	2.7	2.7	4.1	6.6	3.9	5.1	2.1	2.0	1.7	1.5
18	1.1	3.2	2.6	2.9	3.8	6.3	3.8	5.1	2.1	1.9	1.7	1.5
19	1.1	4.3	2.5	3.1	3.7	5.9	3.7	3.8	2.05	1.8	1.7	1.5
20	1.2	5.0	2.4	3.0	3.8	6.0	3.5	3.1	2.0	1.8	1.7	1.5
21	1.3	3.9	2.2	3.1	3.5	6.9	3.3	2.7	2.05	1.8	1.7	1.5
22	1.4	3.8	2.2	3.2	3.5	6.6	3.3	2.6	2.1	1.8	1.7	1.5
23	1.4	3.5	.....	3.2	3.5	6.3	3.3	2.5	2.15	1.8	1.7	1.5
24	1.4	3.0	.....	3.2	3.5	6.3	3.1	2.4	2.2	1.8	1.7	1.5
25	1.4	3.0	.....	3.2	3.5	6.1	3.0	2.25	2.4	1.8	1.7	1.5
26	1.5	2.6	.....	3.1	3.5	6.0	3.3	2.2	2.4	1.7	1.6	1.5
27	1.5	2.35	.....	3.0	4.3	6.1	3.5	2.15	2.3	1.8	1.6	1.5
28	1.5	2.3	.....	2.7	5.3	6.3	3.7	2.0	2.2	1.8	1.6	1.5
29	1.6	.....	.....	2.5	6.1	6.1	4.1	2.0	2.2	1.8	1.6	1.5
30	1.6	.....	2.7	2.4	6.9	5.7	4.5	2.0	2.1	1.8	1.6	1.5
31	1.6	.....	9.1	.....	7.5	.....	4.6	2.0	.....	1.7	.....	1.5

NOTE.—Gage heights have been increased 0.7 foot for error in gage found Apr. 21, 1914. Discharge relation believed to have been affected by ice Feb. 16 to 28; Mar. 1 to 15; and Mar. 23 to Apr. 10.

Daily discharge, in second-feet, of Yellowstone River at Intake, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6,240	5,300	.....	.....	9,540	70,600	42,200	30,800	7,800	7,260	6,740	5,760
2	8,360	5,300	.....	.....	12,200	69,100	45,000	33,100	7,800	7,260	6,740	5,760
3	8,360	5,300	.....	.....	13,600	70,600	45,000	29,600	7,800	7,260	6,740	5,760
4	7,800	4,860	.....	.....	15,200	73,800	42,200	26,400	7,800	6,740	6,740	5,760
5	6,240	4,860	.....	.....	15,200	73,800	42,200	23,400	7,800	6,740	6,490	5,760
6	5,300	4,860	.....	.....	13,600	70,600	40,800	22,400	8,360	7,530	6,740	5,300
7	5,300	4,860	.....	.....	12,200	67,600	39,400	21,400	8,650	8,940	6,740	5,300
8	4,860	4,860	.....	.....	11,500	66,000	38,100	21,400	8,360	9,540	6,740	5,300
9	4,860	4,860	.....	.....	10,500	64,400	35,600	20,400	7,800	8,940	6,240	5,300
10	4,440	4,860	.....	.....	9,540	64,400	35,600	21,400	7,800	8,940	6,740	5,300
11	4,040	4,860	.....	16,000	9,540	67,600	34,300	22,400	7,260	8,940	6,240	5,300
12	4,040	4,860	.....	13,600	13,600	62,900	33,100	22,400	7,000	8,940	6,240	5,300
13	4,040	4,860	.....	12,200	20,400	61,400	30,800	22,400	6,740	8,940	6,240	5,300
14	4,040	5,300	.....	11,500	26,400	58,200	30,800	18,600	6,740	8,650	6,240	5,300
15	3,660	5,760	.....	11,500	28,600	61,400	27,500	16,800	6,740	8,360	6,740	5,300
16	3,660	.....	15,200	11,500	24,400	55,200	24,400	16,800	8,940	7,800	6,740	5,300
17	3,660	.....	12,200	12,200	24,400	56,800	22,400	35,600	8,360	7,800	6,240	5,300
18	3,660	.....	11,500	13,600	21,400	52,200	21,400	35,600	8,360	7,260	6,240	5,300
19	3,660	.....	10,800	15,200	20,400	46,400	20,400	21,400	8,080	6,740	6,240	5,300
20	4,040	.....	10,200	14,400	21,400	47,900	18,600	15,200	7,800	6,740	6,240	5,300
21	4,440	.....	9,240	15,200	18,600	61,400	16,800	12,200	8,080	6,740	6,240	5,300
22	4,860	.....	8,940	16,000	18,600	56,800	16,800	11,500	8,360	6,740	6,240	5,300
23	4,860	.....	.....	16,000	18,600	52,200	16,800	10,800	8,650	6,740	6,240	5,300
24	4,860	.....	.....	16,000	18,600	52,200	15,200	10,200	8,940	6,740	6,240	5,300
25	4,860	.....	.....	16,000	18,600	49,400	14,400	9,240	10,200	6,740	6,240	5,300
26	5,300	.....	.....	15,200	18,600	47,900	16,800	8,940	10,200	6,240	5,760	5,300
27	5,300	.....	.....	14,400	26,400	49,400	18,600	8,650	9,540	6,740	5,760	5,300
28	5,300	.....	.....	12,200	38,100	52,200	20,400	8,080	8,940	6,740	5,760	5,300
29	5,760	.....	.....	10,800	49,400	49,400	24,400	7,800	8,940	6,740	5,760	5,300
30	5,760	.....	.....	10,200	61,400	43,600	28,600	7,800	8,360	6,740	5,760	5,300
31	5,760	.....	.....	.....	70,600	.....	29,600	7,800	.....	6,240	.....	5,300

NOTE.—Discharge determined from a rating curve which is believed to be fairly well defined and which was obtained by a curve of gage height relation from the rating curve for the old station at Glendive. Mean discharge estimated as follows: Feb. 16 to 28 at 4,000 second-feet; Mar. 1 to 15 at 6,000 second-feet; Mar. 23 to 31 at 15,000 second-feet; Apr. 1 to 10 at 25,000 second-feet.

Attention is called to the probability that the daily discharges published in Water-Supply Paper 326 for October to December, 1912, may be considerably in error because of the gage error found on Apr. 21, 1914. Hydrograph comparisons indicate that this error probably existed after Oct. 18, 1912.

Monthly discharge of Yellowstone River at Intake, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	8,360	3,660	5,070	312,000	C.
February	.....	.....	4,560	253,000	D.
March	.....	.....	9,780	601,000	D.
April	.....	10,200	17,500	1,040,000	D.
May	70,600	9,540	22,300	1,370,000	B.
June	73,800	43,600	59,200	3,520,000	B.
July	45,000	14,400	28,700	1,760,000	B.
August	35,600	7,800	18,700	1,150,000	B.
September	10,200	6,740	8,210	489,000	B.
October	9,540	6,240	7,500	461,000	B.
November	6,740	5,760	6,340	377,000	B.
December	5,760	5,300	5,370	330,000	B.
The year	73,800	3,660	16,100	11,700,000	

BIG TIMBER CREEK NEAR BIG TIMBER, MONT.

Location.—At Webb's ranch, about 9 miles northwest of Big Timber, Mont.

Records available.—April 13, 1912, to December 31, 1913. Stations were maintained on the North and South forks of Big Timber Creek May 6, 1907, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Chain gage on left bank.

Control.—Shifts during high water.

Discharge measurements.—Made by wading at all stages. Above the gage are several channels which may be measured separately at high stages.

Winter flow.—Affected by ice.

Diversions.—Much water is diverted for irrigation above the station.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Big Timber Creek near Big Timber, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 26	R. R. Randell	2.04	44	Aug. 22	C. S. Heidel	2.53	45
May 28	do	3.34	405	Oct. 2	J. M. Ray	2.45	26
June 25	do	3.06	185				

Daily gage height, in feet, of Big Timber Creek near Big Timber, Mont., for 1913.

[Leslie E. Webb, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.12	3.25	3.1	2.65	2.48	2.42	2.5	2.40
2	1.8	2.15	3.35	3.05	2.65	2.45	2.42	2.5	2.42
3	2.1	2.2	3.2	3.0	2.6	2.45	2.42	2.5	2.40
4	2.0	2.1	3.1	.....	2.6	2.5	2.42	2.5	2.38
5	2.2	2.15	3.1	3.0	2.6	2.55	2.45	2.5	2.38
6	2.4	2.0	3.2	3.0	2.6	2.48	2.55	2.5	2.38
7	2.2	2.0	2.95	3.1	2.6	.....	2.48	2.5	.....
8	2.3	2.0	3.2	3.05	2.55	.....	2.48	2.5	.....
9	2.3	2.25	3.2	2.95	2.55	.....	2.45	2.5	.....
10	1.9	2.32	3.25	2.95	2.55	.....	2.5	2.5	.....
11	2.1	2.6	4.4	2.9	2.5	.....	2.5	2.50	.....
12	1.9	2.32	3.75	2.9	2.5	.....	2.5	2.48	.....
13	2.3	2.45	3.6	2.9	2.5	.....	2.5	2.48	.....
14	2.2	2.45	3.7	2.75	2.5	.....	2.5	2.48	.....
15	2.1	2.55	3.6	2.65	2.5	.....	2.5	2.48	.....
16	2.3	2.6	3.55	2.6	2.5	.....	2.50	2.45	.....
17	2.1	2.4	3.5	2.6	2.48	.....	2.48	2.45	.....
18	2.1	2.3	3.4	2.6	2.45	2.5	2.48	2.45	.....
19	2.2	2.3	3.45	2.7	2.48	2.48	2.48	2.45	.....
20	2.1	2.32	3.4	2.7	2.48	2.42	2.48	2.45	.....
21	2.1	2.3	3.3	2.7	2.48	2.42	2.58	2.45	.....
22	1.8	2.25	3.2	2.75	2.48	2.42	2.55	2.45	.....
23	2.2	2.4	3.2	3.1	2.5	2.42	2.55	2.42	.....
24	2.0	2.52	3.1	2.95	2.5	2.4	2.55	2.42	.....
25	2.0	2.9	3.1	2.8	2.5	2.4	2.55	2.42	.....
26	2.1	3.35	3.05	2.9	2.5	2.4	2.52	2.42	.....
27	2.15	3.5	3.8	2.95	2.5	2.4	2.55	2.4	.....
28	2.15	3.4	3.4	2.75	2.5	2.4	2.55	2.4	.....
29	2.2	3.5	3.3	2.7	2.5	2.4	2.55	2.4	.....
30	2.2	3.1	3.2	2.8	2.5	2.4	2.52	2.4	.....
31	.....	3.1	.....	2.72	2.5	.....	2.50	.....	.....

Daily discharge, in second-feet, of Big Timber Creek near Big Timber, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	20	52	360	204	68	33	24	36	21
2	21	56	401	186	68	28	24	36	24
3	49	62	340	168	56	28	24	36	21
4	38	49	302	168	56	36	24	36	19
5	62	56	302	168	56	46	28	36	19
6	96	38	340	168	56	33	46	36	19
7	62	38	249	204	56	33	33	36	.....
8	78	38	340	186	46	33	33	36	.....
9	78	70	340	152	46	33	28	36	.....
10	28	82	360	152	46	33	36	36	.....
11	49	142	882	137	36	33	36	36	.....
12	28	82	576	137	36	33	36	33	.....
13	78	107	502	137	36	36	36	33	.....
14	62	107	537	94	36	36	36	33	.....
15	49	130	484	68	36	36	36	33	.....
16	78	142	454	56	36	36	36	28	.....
17	49	96	424	56	33	36	33	28	.....
18	49	78	374	56	28	36	33	28	.....
19	62	78	387	80	33	33	33	28	.....
20	49	82	358	80	33	24	33	28	.....
21	49	78	310	80	33	24	52	28	.....
22	21	70	264	94	33	24	46	28	.....
23	62	96	256	204	36	24	46	24	.....
24	38	123	211	152	36	21	46	24	.....
25	38	232	204	108	36	21	46	24	.....
26	49	401	186	137	36	21	40	24	.....
27	56	466	484	152	36	21	46	21	.....
28	56	422	318	94	36	21	46	21	.....
29	62	466	279	80	36	21	46	21	.....
30	62	302	241	108	36	21	40	21	.....
31	.....	302	.....	86	36	.....	36	.....	.....

NOTE.—Discharge determined as follows: Apr. 2 to June 10 from a fairly well-defined rating curve; June 11–25, by indirect method for shifting channels; June 26 to Dec. 6, from a rating curve fairly well defined between 6 and 320 second-feet and poorly defined at higher stages. Discharge estimated Apr. 1 and interpolated July 4 and Sept. 7–17.

Monthly discharge of Big Timber Creek near Big Timber, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	96	20	52.6	3,130	B.
May	466	38	147	9,040	B.
June	882	186	369	22,000	C.
July	204	56	127	7,810	B.
August	68	28	41.5	2,550	B.
September	46	21	29.8	1,770	C.
October	52	24	36.7	2 260	B.
November	36	21	30.1	1 790	B.
December 1-6	24	19	20.5	244	B.
The period				50,600	

BOULDER RIVER NEAR CONTACT, MONT.

Location.—In the SE. ¼ sec. 14, T. 3 S., R. 12 E., at ranch of G. W. Baker, about 8 miles above McLeod post office, 4 miles from Contact, Mont., and 2½ miles below the Boulder Falls.

Records available.—May 1, 1910, to December 31, 1913.

Drainage area.—234 square miles.

Gage.—Staff, fastened to left abutment of private wagon bridge near the ranch buildings.

Control.—Rocky; shifting slightly.

Discharge measurements.—Made from bridge or by wading just above the footbridge, which is about 400 yards above the gage.

Winter flow.—Affected by ice.

Accuracy.—Results good.

Discharge measurements of Boulder River near Contact, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 21	W. A. Lamb	[a]2.4	54
Apr. 28	R. R. Randell	[b]3.03	252
May 29	do	6.08	2,440
Aug. 25	C. S. Heidel	3.05	319

[a] Ice present.
[b] Hydrographer notes that a fence across the stream below the gage may have caused backwater at the time of this measurement, but apparently the effect was very slight.

Daily gage height, in feet, of Boulder River near Contact, Mont., for 1913.

[G. W. Baker, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3.15	6.8	4.8	3.7	3.05	2.55	2.55
2	.....	2.85	6.6	4.8	3.65	3.05	2.55	2.55
3	.....	2.75	6.6	4.8	3.7	2.95	2.55	2.55
4	.....	2.75	6.6	4.7	3.7	2.95	2.55	2.5
5	.....	2.9	7.3	4.6	3.75	2.85	2.55	2.5
6	.....	2.75	7.2	4.6	3.65	2.85	2.6	2.45
7	.....	2.75	6.5	4.5	4.2	2.75	2.6	2.45
8	.....	2.85	6.4	4.6	3.9	2.75	2.65	2.45
9	.....	2.95	6.3	4.4	3.9	2.65	2.65	2.45
10	.....	3.2	6.2	4.7	3.8	2.65	2.65	2.45
11	.....	4.05	6.2	4.5	3.75	2.65	2.65	2.4
12	.....	4.05	5.9	4.5	3.75	2.55	2.65	2.4
13	.....	3.8	5.9	4.3	3.65	2.55	2.65	2.4
14	.....	3.75	5.9	4.0	3.65	2.55	2.6	2.4
15	.....	3.6	6.1	3.8	3.55	2.55	2.6	2.4
16	.....	3.45	6.0	3.8	3.55	2.45	2.55	2.35
17	.....	3.35	5.8	3.65	3.55	2.45	2.55	2.35
18	.....	3.35	5.8	3.65	3.55	2.45	2.55	2.35
19	.....	3.25	5.9	3.55	3.45	2.45	2.55	2.35
20	.....	3.4	5.8	3.55	3.45	2.45	2.65	2.3
21	.....	3.35	5.6	3.6	3.35	2.45	2.65	2.3
22	.....	3.45	5.7	3.6	3.25	2.5	2.65	2.3
23	.....	3.55	5.6	3.75	3.25	2.5	2.55	2.3
24	.....	3.75	5.6	3.8	3.15	2.45	2.55	2.25
25	.....	4.0	5.4	3.8	3.15	2.45	2.55	2.25
26	3.1	4.3	5.3	3.7	3.15	2.45	2.55	2.25
27	3.15	6.1	5.2	3.7	3.05	2.45	2.65	2.25
28	3.2	6.9	5.1	3.65	3.05	2.5	2.65	2.25
29	3.2	6.9	5.0	3.65	3.15	2.5	2.65	2.25
30	3.25	7.4	4.9	3.7	3.15	2.55	2.65	2.25
31	.....	6.7	.....	3.7	.....	.....	2.6	.....

Daily discharge, in second-feet, of Boulder River near Contact, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	325	3,160	1,430	645	308	138	138
2	.....	200	2,980	1,430	615	308	138	138
3	.....	165	2,980	1,430	645	265	138	138
4	.....	165	2,980	1,350	645	265	138	125
5	.....	220	3,610	1,270	675	228	138	125
6	.....	165	3,520	1,270	615	228	150	112
7	.....	165	2,890	1,190	965	195	150	112
8	.....	200	2,800	1,270	765	195	165	112
9	.....	240	2,710	1,110	765	165	165	112
10	.....	350	2,620	1,350	705	165	165	112
11	.....	860	2,620	1,190	675	165	165	100
12	.....	860	2,350	1,190	675	138	165	100
13	.....	695	2,350	1,040	615	138	165	100
14	.....	662	2,350	830	615	138	150	100
15	.....	570	2,530	705	558	138	150	100
16	.....	482	2,440	705	558	112	138	90
17	.....	428	2,260	615	558	112	138	90
18	.....	428	2,260	615	558	112	138	90
19	.....	375	2,350	558	502	112	138	90
20	.....	455	2,260	558	502	112	165	80
21	.....	428	2,080	585	450	112	165	80
22	.....	482	2,170	585	400	125	165	80
23	.....	540	2,080	615	400	125	138	80
24	.....	662	2,080	705	352	112	138	70
25	.....	825	1,920	705	352	112	138	70
26	300	1,040	1,830	645	352	112	138	70
27	325	2,530	1,750	645	308	112	165	70
28	350	3,250	1,670	615	308	125	165	70
29	350	3,250	1,590	615	352	125	165	70
30	375	3,700	1,510	645	352	138	165	70
31	.....	3,070	.....	645	330	.....	150	.....

NOTE.—Discharge determined as follows: Apr. 26 to May 25, from a rating curve fairly well defined; May 26 to Nov. 30, from a rating curve fairly well defined above 300 second-feet and poorly defined at lower stages.

Monthly discharge of Boulder River near Contact, Mont., for 1913.

[Drainage area, 234 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 26–30	375	300	340	1.45	0.27	3,370	B.
May	3,700	165	896	3.83	4.42	55,100	B.
June	3,610	1,510	2,420	10.3	11.49	144,000	B.
July	1,430	558	909	3.88	4.47	55,900	B.
August	965	308	542	2.32	2.68	33,300	B.
September	308	112	160	.684	.76	9,520	C.
October	165	138	151	.645	.74	9,280	C.
November	138	70	96.5	.412	.46	5,740	C.
The period						316,000	

BOULDER RIVER NEAR McLEOD, MONT.

Location.—At the bridge at Loasby's ranch, 17 miles southwest of Big Timber and half a mile below McLeod.

Records available.—April 17, 1912, to December 31, 1913. Previous records were obtained on Boulder River near Contact and on East Boulder and West Boulder.

Drainage area.—Not measured.

Gage.—Staff spiked to lower side of middle pier of bridge.

Channel.—Probably permanent.

Discharge measurements.—Made from the bridge at the gage.

Winter flow.—Affected by ice.

Diversions.—Water is diverted from the principal tributaries for irrigation.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Boulder River near McLeod, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 22	W. A. Lamb	[a] 4.41	122	June 26	R. R. Randell	6.05	2,000
Apr. 29	R. R. Randell	4.31	472	Aug. 24	C. S. Heidel	4.30	539
May 30	....do	7.00	3,650				

[a] Ice present.

Daily gage height, in feet, of Boulder River near McLeod, Mont., for 1913.

[S. H. Nicholson, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	4.15	7.4	6.2	5.6	4.4	4.0	3.9
2	4.15	7.4	6.1	5.4	4.3	4.0	3.9
3	4.15	7.5	6.2	5.2	4.2	4.0	3.9
4	4.05	7.3	6.2	5.2	4.2	4.0	3.9
5	4.05	7.4	6.2	5.2	4.1	4.0	3.9
6	4.05	7.4	6.3	5.1	4.1	4.0	3.9
7	4.15	7.6	6.3	5.0	4.1	4.0	3.9
8	4.45	7.3	6.4	5.0	4.1	4.0	3.9
9	4.95	7.3	6.2	5.6	4.1	4.0	3.8
10	5.25	7.0	6.1	5.5	4.1	4.0	3.8
11	5.35	7.0	6.0	5.2	4.1	4.1	3.8
12	5.5	7.3	5.9	5.1	4.1	4.1	3.8
13	5.15	7.3	5.9	5.0	4.0	4.1	3.8
14	5.05	7.1	5.6	5.0	4.0	4.1	3.8
15	5.05	7.2	5.4	4.9	4.0	4.1	3.8
16	4.95	6.9	5.4	4.8	4.0	.....	3.8
17	4.75	7.0	5.3	4.8	4.0	4.1	3.8
18	4.75	6.9	5.3	4.7	4.0	4.1	3.8
19	4.65	6.9	5.2	4.6	4.0	4.0	3.8
20	4.65	6.8	5.2	4.5	4.0	4.0	3.8
21	4.65	6.7	5.3	4.5	4.0	4.0	3.8
22	4.75	6.7	5.2	4.5	4.1	4.0	3.8
23	4.95	6.5	5.1	4.4	4.1	4.0	3.7
24	5.8	6.3	5.1	4.4	4.1	4.0	3.7
25	6.0	6.4	5.2	4.3	4.0	4.0	3.7
26	6.8	6.2	5.2	4.3	4.0	4.0	3.7
27	7.2	6.2	5.4	4.3	4.0	4.1	3.7
28	7.4	6.1	5.2	4.3	4.0	4.1	3.7
29	7.5	6.3	5.1	4.3	4.0	4.0	3.7
30	7.1	6.1	6.1	4.5	4.0	4.0	3.7
31	7.4	.....	5.7	4.6	.....	3.9	.....

Daily discharge, in second-feet, of Boulder River near McLeod, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	400	4,420	2,210	1,500	600	410	370
2	400	4,420	2,070	1,300	550	410	370
3	400	4,650	2,210	1,130	500	410	370
4	360	4,200	2,210	1,130	500	410	370
5	360	4,420	2,210	1,130	450	410	370
6	360	4,420	2,350	1,050	450	410	370
7	400	4,880	2,350	970	450	410	370
8	545	4,200	2,500	970	450	410	370
9	820	4,200	2,210	1,500	450	410	330
10	1,020	3,550	2,070	1,400	450	410	330
11	1,100	3,550	1,940	1,130	450	450	330
12	1,220	4,200	1,820	1,050	450	450	330
13	955	4,200	1,820	970	410	450	330
14	885	3,760	1,400	970	410	450	330
15	885	3,980	1,300	900	410	450	330
16	820	3,350	1,300	835	410	450	330
17	700	3,550	1,210	835	410	450	330
18	700	3,350	1,210	770	410	450	330
19	645	3,350	1,130	710	410	410	330
20	645	3,160	1,130	655	410	410	330
21	645	2,980	1,210	655	410	410	330
22	700	2,980	1,130	655	450	410	330
23	820	2,650	1,050	600	450	410	290
24	1,480	2,350	1,050	600	450	410	290
25	1,660	2,500	1,130	550	410	410	290
26	2,950	2,210	1,130	550	410	410	290
27	3,800	2,210	1,300	550	410	450	290
28	4,350	2,070	1,130	550	410	450	290
29	4,650	2,350	1,050	550	410	410	290
30	3,760	2,070	2,070	655	410	410	290
31	4,420	.....	1,600	710	.....	370	.....

NOTE.—Discharge determined as follows: May 1–25, from a fairly well-defined rating curve; May 26–29, by indirect method for shifting channels; May 30 to Nov. 30, from a fairly well-defined rating curve. Discharge interpolated Oct. 16.

Monthly discharge of Boulder River near McLeod, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May	4,650	360	1,380	84,800	B.
June	4,880	2,070	3,470	206,000	B.
July	2,500	1,050	1,630	100,000	B.
August	1,500	550	888	54,600	B.
September	600	410	442	26,300	B.
October	450	370	422	25,900	B.
November	370	290	330	19,600	B.
The period				517,000	

WEST FORK OF BOULDER RIVER AT McLEOD, MONT.

Location.—In the SE. ¼ sec. 16, T. 2 S., R. 13 E., at Koozer's private bridge, 200 yards upstream from highway bridge at McLeod post office.

Records available.—May 4, 1907, to December 31, 1913.

Drainage area.—137 square miles.

Gage.—Staff, fastened to piling of bridge near right bank.

Control.—Composed of bowlders; rough but practically permanent.

Discharge measurements.—Made from bridge or by wading.

Winter flow.—Affected by ice.

Diversions.—Water to irrigate about 800 acres of land is diverted above station. A Carey Act project reclaiming 12,000 to 15,000 acres is now under investigation; the water is to be diverted from the West Fork about 12 miles above the station.

Accuracy.—Open-water records good.

Discharge measurements of West Fork of Boulder River at McLeod, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Rate.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 21	W. A. Lamb	[a] 3.08	41	June 26	R. R. Randell	2.76	443
Apr. 29	R. R. Randell	2.04	157	Aug. 24	C. S. Heidel	1.75	100
May 29	do	3.51	906				

[a] Ice present.

Daily gage height, in feet, of West Fork of Boulder River at McLeod, Mont., for 1913.

[C. C. Nicholson, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.9	3.5	2.9	2.4	1.8	1.7	1.7
2	.....	1.8	3.6	3.0	2.2	1.8	1.7	1.7
3	.....	1.9	3.6	2.8	2.2	1.8	1.7	1.7
4	.....	1.8	3.6	2.8	2.3	1.7	1.7	1.7
5	.....	1.9	3.5	2.8	2.3	1.7	1.7	1.7
6	.....	1.8	3.5	2.9	2.2	1.7	1.7	1.7
7	.....	1.9	3.7	2.9	2.2	1.7	1.7	1.7
8	.....	2.5	3.7	2.9	2.2	1.7	1.7	1.7
9	.....	2.6	3.5	2.8	2.6	1.7	1.7	1.7
10	.....	2.7	3.6	2.8	2.3	1.6	1.7	1.7
11	.....	2.6	3.6	2.7	2.2	1.6	1.8	1.7
12	.....	2.5	3.5	2.6	2.2	1.6	1.8	1.6
13	1.8	2.5	3.6	2.5	2.1	1.6	1.8	1.6
14	1.8	2.4	3.4	2.5	2.1	1.6	1.8	1.6
15	1.8	2.4	3.5	2.4	2.0	1.6	1.8	1.6
16	1.8	2.3	3.3	2.3	1.9	1.6	1.8	1.6
17	2.0	2.3	3.4	2.2	1.9	1.6	1.8	1.6
18	2.0	2.4	3.4	2.2	1.9	1.6	1.8	1.6
19	1.8	2.3	3.3	2.2	1.9	1.6	1.7	1.6
20	1.8	2.3	3.3	2.2	1.8	1.6	1.7	1.6
21	2.0	2.4	3.2	2.2	1.8	1.6	1.7	1.6
22	2.0	2.5	3.0	2.2	1.7	1.7	1.7	1.6
23	2.2	2.9	3.0	2.2	1.7	1.7	1.7	1.6
24	2.2	3.1	3.1	2.2	1.7	1.7	1.7	1.6
25	2.1	3.2	2.9	2.2	1.7	1.7	1.7	1.6
26	2.1	3.9	2.75	2.2	1.7	1.7	1.7	1.6
27	2.0	4.1	2.7	2.3	1.7	1.7	1.7	1.6
28	1.9	4.2	2.6	2.2	1.7	1.7	1.7	1.6
29	2.1	4.1	2.7	2.1	1.7	1.7	1.7	1.6
30	2.0	3.9	2.7	3.0	1.9	1.7	1.7	1.6
31	.....	4.0	.....	2.6	1.9	.....	1.7	.....

Daily discharge, in second-feet, of West Fork of Boulder River at McLeod, Mont., for 1913

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	130	920	535	285	105	85	85
2	.....	105	990	595	210	105	85	85
3	.....	130	990	480	210	105	85	85
4	.....	105	990	480	245	85	85	85
5	.....	130	920	480	245	85	85	85
6	.....	105	920	535	210	85	85	85
7	.....	130	1,060	535	210	85	85	85
8	.....	330	1,060	535	210	85	85	85
9	.....	375	920	480	375	85	85	85
10	.....	425	990	480	245	70	85	85
11	.....	375	990	425	210	70	105	85
12	.....	330	920	375	210	70	105	70
13	105	230	990	330	180	70	105	70
14	105	285	850	330	180	70	105	70
15	105	285	920	285	155	70	105	70
16	105	245	785	245	130	70	105	70
17	155	245	850	210	130	70	105	70
18	155	285	850	210	130	70	105	70
19	105	245	785	210	130	70	85	70
20	105	245	785	210	105	70	85	70
21	155	285	720	210	105	70	85	70
22	155	330	595	210	85	85	85	70
23	210	535	595	210	85	85	85	70
24	210	655	655	210	85	85	85	70
25	180	720	535	210	85	85	85	70
26	180	1,200	452	210	85	85	85	70
27	155	1,340	425	245	85	85	85	70
28	130	1,420	375	210	85	85	85	70
29	180	1,340	425	180	85	85	85	70
30	155	1,200	425	595	130	85	85	70
31	.....	1,270	.....	375	130	.....	85	.....

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

Monthly discharge of West Fork of Boulder River at McLeod, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 13-30	210	105	147	5,250	A.
May	1,420	105	488	30,000	B.
June	1,060	375	790	47,000	A.
July	595	180	349	21,500	A.
August	375	85	163	10,000	A.
September	105	70	81.0	4,820	A.
October	105	85	90.2	5,550	A.
November	85	70	75.5	4,490	A.
The period				129,000	

NOTE.—Accuracy for May reduced because hydrographer did not check observer's gage reading for May 29.

SWEETGRASS CREEK BELOW MELVILLE, MONT.

Location.—At McAllister's ranch, just above head of the canal owned by the Glass Lindsay Land Co.

Records available.—May 4, 1907 (at Adam's ranch site), to April 1, 1909; new site April 1, 1909, to December 31, 1913.

Drainage area.—137 square miles (measured on topographic sheets).

Gage.—Staff on left bank near observer's house.

Control.—Bed composed of clean gravel; shifting.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions and storage.—Many diversions made from this stream. All the low-water flow is appropriated, 550 second-feet being held by adjudicated rights. The Glass-Lindsay canal will carry 575 second-feet and irrigate 30,000 acres; the canal will divert water into two storage reservoirs, with capacities of 12,000 and 6,000 feet, respectively, which will be filled from the spring run-off.

Accuracy.—Records good.

Discharge measurements of Sweetgrass Creek below Melville, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 25	R. R. Randell	0.93	33
May 27	do	2.74	664
June 24	do	2.39	302
Aug. 21	C. S. Heidel	1.20	20.3

Daily gage height, in feet, of Sweetgrass Creek below Melville, Mont., for 1913.

[Alexander Morgan and Robert Donald, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.85	.....	2.4	1.61	1.09	1.55	1.75	1.6
2	.....	.85	.....	2.5	1.63	1.0	1.55	1.7	1.6
3	.....	.85	.....	2.25	1.60	1.0	1.52	1.7	1.6
4	.....	.85	.....	2.35	1.55	1.0	1.60	1.65	.....
5	.....	.85	.....	2.25	1.61	1.04	1.65	1.65	.....
6	.....	.85	.....	2.25	1.61	1.0	1.7	1.70	.....
7	.....	.85	.....	2.2	1.62	1.14	1.65	1.72	.....
8	.....	.9	.....	2.2	1.65	1.2	1.65	1.62	.....
9	.....	1.1	.....	2.1	1.7	1.2	1.65	1.60	.....
10	1.7	1.1	.....	2.1	1.61	1.2	1.65	1.61	.....
11	1.3	1.1	.....	2.1	1.60	1.28	1.72	1.61	.....
12	1.1	1.2	.....	2.0	1.60	1.38	1.82	1.62	.....
13	1.1	1.3	.....	1.85	1.60	1.32	1.82	1.65	.....
14	1.2	1.6	.....	1.85	1.5	1.32	1.75	1.62	.....
15	1.1	1.5	.....	1.7	1.5	1.3	1.70	1.60	.....
16	.9	1.4	.....	1.7	1.48	1.42	1.68	1.6	.....
17	1.1	1.6	.....	1.61	1.48	1.32	1.65	1.6	.....
18	1.0	1.7	.....	1.6	1.45	1.35	1.65	1.6	.....
19	.95	1.8	.....	1.61	1.32	1.32	1.65	1.6	.....
20	1.0	1.7	.....	1.61	1.18	1.35	1.65	1.6	.....
21	1.1	1.6	.....	1.11	1.12	1.35	1.65	1.55	.....
22	.95	1.5	.....	1.24	1.05	1.38	1.6	1.55	.....
23	.9	1.6	.....	1.45	1.0	1.4	1.62	1.6	.....
24	1.0	1.7	2.39	1.52	.....	1.4	1.65	1.65	.....
25	.9	1.95	2.28	1.55	1.0	1.4	1.70	1.6	.....
26	.9	2.15	2.3	1.62	1.04	1.45	1.72	1.6	.....
27	.9	2.8	3.0	1.63	.....	1.52	1.72	1.62	.....
28	.9	3.2	2.5	1.61	1.04	1.65	1.62	1.62	.....
29	.85	.....	2.55	1.61	1.0	1.6	1.70	1.62	.....
30	.85	.....	2.6	1.60	1.1	1.55	1.82	1.6	.....
31	.....	.....	.....	1.65	1.1	.....	1.78	.....	.....

Daily discharge, in second-feet, of Sweetgrass Creek below Melville, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	25	490	310	72	13	62	98	70
2	.....	25	540	354	75	10	62	88	70
3	.....	25	460	248	70	10	55	88	70
4	.....	25	410	289	62	10	70	79	.....
5	.....	25	410	248	72	11	79	79	.....
6	.....	25	460	248	72	10	88	88	.....
7	.....	25	340	229	74	15	79	92	.....
8	.....	30	460	229	79	19	79	74	.....
9	.....	52	460	193	88	19	79	70	.....
10	190	52	490	193	72	19	79	72	.....
11	85	52	1,190	193	70	26	92	72	.....
12	52	67	780	161	70	38	114	74	.....
13	52	85	680	121	70	30	114	79	.....
14	67	158	730	121	54	30	98	74	.....
15	52	130	650	88	54	28	88	70	.....
16	30	106	610	88	51	43	84	70	.....
17	52	158	570	72	51	30	79	70	.....
18	40	190	500	70	47	34	79	70	.....
19	35	225	520	72	30	30	79	70	.....
20	40	190	380	72	18	34	79	70	.....
21	52	158	240	14	14	34	79	62	.....
22	35	130	360	23	12	38	70	62	.....
23	30	158	350	47	10	40	74	70	.....
24	40	190	306	57	10	40	79	79	.....
25	30	284	260	62	10	40	88	70	.....
26	30	370	268	74	11	47	92	70	.....
27	30	706	604	75	11	55	92	74	.....
28	30	940	354	72	11	79	74	74	.....
29	25	630	377	72	10	70	88	74	.....
30	25	410	400	70	13	62	114	70	.....
31	.....	410	.....	79	13	.....	105	.....	.....

NOTE.—Discharge determined as follows: Apr. 10 to May 28, from a poorly defined rating curve; May 29 to June 23, estimated from the flow of Big Timber Creek near Big Timber; June 24 to Dec. 3, from a poorly defined rating curve. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Sweetgrass Creek below Melville, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 10–30	190	25	48.7	2,030	C.
May	940	25	195	12,000	C.
June			488	29,000	D.
July	354	14	137	8,420	C.
August	88	10	44.4	2,730	C.
September	79	10	32.1	1,910	C.
October	114	55	83.6	5,140	C.
November	98	62	75.1	4,470	C.
The period				65,700	

STILLWATER RIVER NEAR NYE, MONT.

Location.—In the W. ½ SW. ¼ sec. 28, T. 5 S., R. 15 E., directly back of B. F. Wood's ranch, 1 mile below Woodbine Creek, 7 miles from the junction of the West Fork, and about 7 miles southwest of Nye.

Records available.—One discharge measurement each in 1911, 1912, and 1913, and gage heights for 1912 and 1913.

Drainage area.—187 square miles.

Gage.—Standard overhanging chain.

Control.—Rock; probably permanent.

Discharge measurements.—Made by wading or from cable.

Winter flow.—Affected by ice.

Diversion.—None of importance.

The following discharge measurement was made by R. R. Randell:
May 17, 1913.—Gage height, 4.16 feet; discharge, 321 second-feet.

Daily gage height, in feet, of Stillwater River near Nye, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.85	6.6	6.0		4.4			
2		3.85	6.6	5.8					
3		3.85	6.6	5.8					
4		3.95	6.4	5.8					
5		3.9	6.4	5.8					
6	2.95	4.05	6.5	6.0		4.2			
7	2.95	4.15	6.5	6.2					
8	2.95	4.35	6.6	6.0					
9	2.95	4.45	6.5	6.0					3.4
10	2.90	4.4	6.4	5.9					
11	2.95	4.55	6.4	5.7					
12	2.95	4.45	6.3	5.2					
13	2.95	4.45	6.3	5.3					
14	2.95	4.25	6.4	5.3		4.0			
15	3.1	4.2	6.5	5.2					
16	3.25	4.25	6.5	5.1					
17	3.45	4.2	6.4	5.2	5.0				
18	3.55	4.2	6.3	5.1					
19	3.65	4.1	6.3	5.0					
20	3.6	4.0	6.4	5.0					
21	3.55	4.0	6.5	5.0					
22	3.55	4.1	6.5	5.6					
23	3.55	4.3	6.6	5.1					
24	3.55	5.3	6.4	5.0					
25	3.6	5.5	6.0	4.9					
26	3.65	5.8	5.8	4.9					
27	3.65	6.3	5.7	4.9					
28	3.65	6.4	5.8	4.9	4.2				
29	3.75	6.4	5.7	5.7					
30	3.8	6.0	5.6	5.7		3.8	3.6		
31		6.4		5.6					

NOTE.—Discharge measurements insufficient to define rating curve.

STILLWATER RIVER NEAR ABSAROKEE, MONT.

Location.—In the SE. ¼ SE. ¼ sec. 30, T. 35 E., R. 19 E., at the public highway bridge crossing stream at the Riverside road house, 13 miles southwest of Columbus, Mont., and about 1 mile northeast of Absarokee, Mont., below mouth of Rosebud River.

Records available.—July 19, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage nailed to right abutment on upstream side of bridge.

Control.—Likely to shift slightly in high water. Bed of stream composed of gravel and bowlders.

Discharge measurements.—Made from lower side of the bridge.

Winter flow.—Affected by ice.

Diversions.—The territory bordering Stillwater River is well irrigated by water taken from the river.

Discharge measurements of Stillwater River near Absarokee, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 24	R. R. Randell	0.87	549
July 8	do	4.41	4,440

Daily gage height, in feet, of Stillwater River near Absarokee, Mont., for 1913.

[S. A. Leaverton, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		0.55	1.05	5.4	3.5	3.3	2.2	1.05	0.75	0.55
2		.3	1.05	5.5	3.6	3.2	2.2	1.05	1.0	.40
3		.15	.9	5.5	4.0	3.1	2.2	1.0	.95	
4		.1	.95	5.3	3.9	3.1	2.1	1.05	.75	
5		.55	.95	5.1	4.1	3.1	2.0	1.25	1.1	
6		.55	.9	5.2	4.0	3.0	1.9	1.1	1.05	
7		.6	.7	5.0	4.1	2.9	1.9	1.05	1.05	
8		.45	.95	5.0	4.5	2.9	1.75	1.05	1.0	
9		.4	1.25	5.2	4.2	3.4	1.75	1.1	1.05	
10		.25	1.5	4.8	4.1	3.6	1.8	1.15	.95	
11		.4	1.85	4.6	4.2	3.3	1.75	1.15	.90	
12		.6	1.85	4.2	3.6	3.0	1.75	1.2	1.05	
13		.55	1.9	4.3	3.2	3.0	1.7	1.25	.90	
14		.7	1.95	4.1	3.1	3.0	1.45	1.15	.80	
15		.65	1.75	5.2	2.9	2.9	1.55	1.05	.75	
16		.65	1.7	4.8	2.7	2.7	1.5	1.05	.95	
17		.7	1.55	4.6	2.8	2.7	1.45	1.05	.75	
18		.65	1.65	4.5	2.7	2.4	1.25	1.0	.60	
19		.8	1.7	4.7	2.8	2.4	1.2	.95	.65	
20		.95	1.65	4.9	2.9	2.4	1.15	.75	.70	
21		.95	1.65	4.7	2.8	2.2	1.15	.75	.65	
22		.95	1.5	4.5	3.0	2.2	1.3	.80	.60	
23		.9	1.55	4.6	3.4	2.3	1.25	.75	.55	
24		.7	2.0	4.4	3.1	2.1	1.25	.80	.60	
25		.55	3.2	4.1	2.9	2.0	1.2	1.0	.65	
26		.55	3.6	3.9	3.4	2.1	1.25	.80	.70	
27		.6	4.5	3.7	3.4	2.1	1.15	.75	.50	
28		.55	5.1	3.8	3.3	2.1	1.1	.95	.60	
29		1.05	5.3	3.6	3.1	2.3	1.15	.95	.45	
30		1.05	4.6	3.6	4.1	2.2	1.05	.90	.70	
31	1.05		4.8		3.8	2.1		.95		

Daily discharge, in second-feet, of Stillwater River near Absarokee, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	375	625	5,920	3,000	2,720	1,400	625	475	375
2	.....	260	625	6,080	3,140	2,580	1,400	625	600	300
3	.....	215	550	6,080	3,720	2,450	1,400	600	575	.....
4	.....	200	575	5,760	3,570	2,450	1,310	625	475	.....
5	.....	375	575	5,440	3,870	2,450	1,220	730	650	.....
6	.....	375	550	5,600	3,720	2,320	1,140	650	625	.....
7	.....	400	450	5,280	3,870	2,190	1,140	625	625	.....
8	.....	325	575	5,280	4,480	2,190	1,040	625	600	.....
9	.....	300	730	5,600	4,020	2,860	1,040	650	625	.....
10	.....	245	880	4,960	3,870	3,140	1,070	675	575	.....
11	.....	300	1,100	4,540	4,020	2,720	1,040	675	550	.....
12	.....	400	1,100	4,020	3,140	2,320	1,040	700	625	.....
13	.....	375	1,140	4,170	2,580	2,320	1,000	730	550	.....
14	.....	450	1,180	3,870	2,450	2,320	850	675	500	.....
15	.....	425	1,040	5,600	2,190	2,190	910	625	475	.....
16	.....	425	1,000	4,960	1,950	1,950	880	625	575	.....
17	.....	450	910	4,540	2,070	1,950	850	625	475	.....
18	.....	425	970	4,480	1,950	1,610	730	600	400	.....
19	.....	500	1,000	4,800	2,070	1,610	700	575	425	.....
20	.....	575	970	5,120	2,190	1,610	675	475	450	.....
21	.....	575	970	4,800	2,070	1,400	675	475	425	.....
22	.....	575	880	4,480	2,320	1,400	760	500	400	.....
23	.....	550	910	4,540	2,860	1,500	730	475	375	.....
24	.....	450	1,220	4,320	2,450	1,310	730	500	400	.....
25	.....	375	2,580	3,870	2,190	1,220	700	600	425	.....
26	.....	375	3,140	3,570	2,860	1,310	730	500	450	.....
27	.....	400	4,480	3,280	2,860	1,310	675	475	350	.....
28	.....	375	5,440	3,420	2,720	1,310	650	575	400	.....
29	.....	625	5,760	3,140	2,450	1,500	675	575	325	.....
30	.....	625	4,540	3,140	3,870	1,400	625	550	450	.....
31	625	.....	4,960	.....	3,420	1,310	.....	575	.....	.....

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

Monthly discharge of Stillwater River near Absarokee, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	625	200	411	24,500	B.
May	5,760	450	1,660	102,000	B.
June	6,080	3,140	4,690	279,000	B.
July	4,480	1,950	2,970	183,000	B.
August	3,140	1,220	1,970	121,000	B.
September	1,400	625	926	55,100	B.
October	730	475	598	36,800	B.
November	650	325	495	29,500	B.
The period	.....	.....	.....	831,000	

WOODBINE CREEK NEAR NYE, MONT.

Location.—Seven miles south of Nye, Mont., in the SE. ¼ sec. 32, T. 5 S., R. 15 E., approximately a quarter of a mile from the junction of this creek and Stillwater River.

Records available.—Two measurements in 1911, one each in 1912 and 1913, and scattering gage heights for 1912 and 1913.

Gage.—Sloping staff.

Control.—Large rocks; very rough.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversion.—None.

Measurements are made at this station to determine the amount of water available for power. In the first mile from its mouth the creek has a fall of 900 feet, and there is at present an application for development of its power.

The following measurement was made by R. R. Randell:

May 16, 1913.—Gage height, 2.63 feet; discharge, 16.6 second-feet.

Daily gage height, in feet, of Woodbine Creek near Nye, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1						3.05	16		2.65				
2							17					3.25	
3				3.75			18				3.25		
4		3.35					19			4.35			
5			4.55				20	2.45					
6	1.65						21		2.35				
7							22						
8							23						
9							24		3.55		3.25		
10				3.55			25						
11							26			3.75			
12			4.35				27	2.95					
13	2.05						28					3.05	
14							29		4.25				
15							30				3.45		
							31						

NOTE.—Measurements insufficient to define a rating curve.

ROSEBUD RIVER AT ABSAROKEE, MONT.

Location.—In the SE. ¼ sec. 36, T. 3 S., R. 18 W., at highway bridge just west of Absarokee, Mont., and 14 miles from Columbus, about 1 mile above Stillwater River.

Records available.—July 19, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff on downstream side of left abutment pier.

Control.—Not likely to shift. Bed of stream is composed of gravel and bowlders.

Discharge measurements.—Made from the downstream side of the bridge.

Winter flow.—Affected by ice.

Diversions.—Water for irrigation is diverted above the station.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Rosebud River at Absarokee, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 24	R. R. Randell	2.11	219
May 14	do	2.50	445

Daily gage height, in feet, of Rosebud River at Absarokee, Mont., for 1913.

[Fred Brunckhorst, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.0	2.25	3.55	3.15	3.35	2.85	2.35	2.15	2.15
2	.....	1.95	2.25	3.65	3.25	3.3	2.85	2.3	2.15	2.15
3	.....	1.95	2.15	3.55	3.25	3.25	2.8	2.25	2.15	2.15
4	.....	2.05	2.25	3.55	3.25	3.25	2.75	2.3	2.1	2.1
5	.....	2.2	2.15	3.5	3.25	3.15	2.7	2.25	2.15	2.15
6	.....	2.15	2.25	3.55	3.35	3.2	2.75	2.3	2.15	2.15
7	.....	2.15	2.2	3.55	3.35	3.15	2.75	2.35	2.15	.....
8	.....	2.05	2.25	3.55	3.55	3.15	2.75	2.35	2.15	.....
9	.....	2.15	2.35	3.55	3.55	3.45	2.75	2.35	2.1	.....
10	.....	2.1	2.35	3.45	3.5	3.3	2.7	2.3	2.15	.....
11	.....	2.25	2.55	3.45	3.55	3.25	2.7	2.3	2.15	.....
12	.....	2.25	2.75	3.75	3.35	3.25	2.7	2.3	2.15	.....
13	.....	2.25	2.65	3.55	3.15	3.25	2.7	2.3	2.25	.....
14	.....	2.35	2.6	3.5	3.05	3.2	2.65	2.25	2.2	.....
15	.....	2.2	2.6	3.5	2.95	3.1	2.55	2.2	2.15	.....
16	.....	2.15	2.55	3.45	2.95	3.15	2.55	2.25	2.15	.....
17	.....	2.15	2.5	3.45	2.95	3.15	2.55	2.25	2.15	.....
18	.....	2.25	2.6	3.45	2.95	3.05	2.5	2.25	2.15	.....
19	.....	2.15	2.55	3.45	3.05	2.95	2.5	2.25	2.1	.....
20	.....	2.1	2.4	3.5	3.05	2.9	2.4	2.2	2.15	.....
21	.....	2.25	2.45	3.55	3.15	2.85	2.4	2.25	2.15	.....
22	.....	2.25	2.45	3.45	3.35	2.85	2.4	2.25	2.15	.....
23	.....	2.15	2.45	3.45	3.4	2.8	2.4	2.2	2.15	.....
24	.....	2.1	2.55	3.45	3.35	2.75	2.45	2.2	2.1	.....
25	.....	2.1	2.9	3.4	3.4	2.7	2.45	2.15	2.15	.....
26	.....	2.05	3.15	3.35	3.45	2.75	2.45	2.2	2.15	.....
27	.....	2.1	3.45	3.25	3.45	2.75	2.45	2.15	2.15	.....
28	.....	2.15	3.55	3.25	3.35	2.75	2.4	2.15	2.15	.....
29	.....	2.2	3.45	3.25	3.45	2.75	2.4	2.15	2.1	.....
30	2.45	2.1	3.35	3.2	3.4	2.7	2.3	2.1	2.15	.....
31	2.25	.....	3.45	.....	3.45	2.75	.....	2.15	.....	.....

Daily discharge, in second-feet, of Rosebud River at Absarokee, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	190	280	1,550	990	1,250	675	325	242	242
2	175	280	1,720	1,120	1,180	675	300	242	242
3	175	242	1,550	1,120	1,120	630	280	242	242
4	208	280	1,550	1,120	1,120	590	300	225	225
5	260	242	1,470	1,120	990	550	280	242	242
6	242	280	1,550	1,250	1,050	590	300	242	242
7	242	260	1,550	1,250	990	590	325	242	.....
8	208	280	1,550	1,550	990	590	325	242	.....
9	242	325	1,550	1,550	1,400	590	325	225	.....
10	225	325	1,400	1,470	1,180	550	300	242	.....
11	280	445	1,400	1,550	1,120	550	300	242	.....
12	280	590	1,880	1,250	1,120	550	300	242	.....
13	280	515	1,550	990	1,200	550	300	280	.....
14	325	480	1,470	875	1,050	515	280	260	.....
15	260	480	1,470	770	930	445	260	242	.....
16	242	445	1,400	770	990	445	280	242	.....
17	242	410	1,400	770	990	445	280	242	.....
18	280	480	1,400	770	875	410	280	242	.....
19	242	445	1,400	875	770	410	280	225	.....
20	225	350	1,470	875	720	350	260	242	.....
21	280	380	1,550	990	675	350	280	242	.....
22	280	380	1,400	1,250	675	350	280	242	.....
23	242	380	1,400	1,320	630	350	260	242	.....
24	225	445	1,400	1,250	590	380	260	225	.....
25	225	720	1,320	1,320	550	380	242	242	.....
26	208	990	1,250	1,400	590	380	260	242	.....
27	225	1,400	1,120	1,400	590	380	242	242	.....
28	242	1,550	1,120	1,250	590	350	242	242	.....
29	260	1,400	1,120	1,400	590	350	242	225	.....
30	225	1,250	1,050	1,320	550	300	225	242	.....
31	.....	1,400	.....	1,400	590	.....	242	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve.

Monthly discharge of Rosebud River at Absarokee, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	325	175	241	14,300	B.
May	1,550	242	572	35,200	B.
June	1,880	1,050	1,430	85,100	B.
July	1,550	770	1,170	71,900	B.
August	1,400	550	890	54,700	B.
September	675	300	476	28,300	B.
October	325	225	279	17,200	B.
November	280	225	241	14,300	B.
December 1-6	242	225	239	2,840	B.
The period				324,000	

CLARK FORK AT FROMBERG, MONT.

Location.—In sec. 21, T. 5 S., R. 23 E., at highway bridge half a mile east of Northern Pacific Railway station at Fromberg, Mont.

Records available.—June 3, 1905, to December 31, 1913.

Drainage area.—2,500 square miles.

Gage.—A standard chain fastened to upstream side of bridge.

Control.—Permanent. Bed of stream composed of rock and gravel; free from vegetation. Channel divided by middle pier of bridge.

Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice from December to the middle of March.

Diversions.—Many diversions are made from the river, but only a small part of the total flow is used.

Accuracy.—Records excellent.

No discharge measurements were made during 1913.

Daily gage height, in feet, of Clark Fork at Fromberg, Mont., for 1913.

[Mrs. E. V. Moran, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.6	3.5	8.0	6.3	5.5	4.3	3.6	3.7	3.6
2	.....	3.6	3.5	8.2	6.2	5.5	4.3	3.5	3.7	3.6
3	.....	3.5	3.5	8.2	6.2	5.5	4.2	3.5	3.7	3.6
4	.....	3.5	3.5	8.3	6.0	5.5	4.2	3.5	3.65	3.6
5	.....	3.5	3.5	8.6	6.0	5.5	4.2	3.5	3.6	3.6
6	.....	3.5	3.3	8.3	6.0	5.5	4.2	3.7	3.6	3.6
7	.....	3.5	3.5	8.2	6.0	5.5	4.2	3.6	3.6	3.6
8	.....	3.5	3.5	8.1	6.3	5.4	4.2	3.6	3.5	3.6
9	.....	3.5	3.5	8.0	6.2	5.4	4.0	3.6	3.5	3.6
10	.....	3.5	3.5	7.9	6.0	5.4	4.0	3.6	3.5	3.6
11	.....	3.5	3.7	7.8	6.0	5.4	4.0	3.5	3.5	3.6
12	.....	3.5	3.7	8.1	5.9	5.5	4.0	3.5	3.55	3.6
13	.....	3.7	3.7	8.0	5.9	5.5	4.0	3.5	3.55	3.7
14	.....	3.7	3.7	8.0	5.9	5.5	4.0	3.5	3.55	3.65
15	.....	3.7	3.9	7.8	5.9	5.5	4.0	3.7	3.55	3.7
16	3.5	3.7	4.0	7.7	5.9	5.4	4.0	3.7	3.5	3.6
17	3.5	3.9	4.0	7.6	5.8	5.3	3.9	3.7	3.5	3.7
18	3.5	3.9	4.1	8.7	5.9	5.3	3.9	3.7	3.5	3.7
19	3.5	3.9	4.15	8.6	6.0	5.3	3.9	3.7	3.5	3.7
20	3.5	3.9	4.2	7.8	5.9	5.3	3.9	3.7	3.5	3.7
21	3.5	3.9	4.3	7.7	5.9	5.3	3.9	3.65	3.5	3.7
22	3.5	3.85	4.4	7.6	5.9	5.3	3.9	3.6	3.5	3.6
23	3.5	3.8	4.85	7.3	5.9	5.3	4.8	3.6	3.5	3.6
24	3.5	3.75	5.4	7.2	5.7	5.3	4.8	3.6	3.5	3.6
25	3.5	3.7	5.6	7.0	5.7	5.2	4.8	3.6	3.5	3.6
26	3.5	3.7	6.4	7.0	5.6	5.2	4.8	3.6	3.5	3.6
27	3.5	3.65	7.3	6.8	5.6	5.1	3.8	3.65	3.5	3.6
28	3.5	3.6	8.1	6.7	5.6	4.9	3.7	3.7	3.5	3.6
29	3.8	3.6	8.0	6.5	5.6	4.7	3.65	3.7	3.5	3.6
30	3.85	3.6	8.0	6.4	5.8	4.5	3.6	3.6	3.7	3.6
31	3.85	.....	7.8	.....	5.8	4.5	.....	3.6	.....	3.6

Daily discharge, in second-feet, of Clark Fork at Fromberg, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	375	325	7,030	3,360	2,160	860	375	430	375
2	.....	375	325	7,620	3,180	2,160	860	325	430	375
3	.....	325	325	7,620	3,180	2,160	780	325	430	375
4	.....	325	325	7,910	2,860	2,160	780	325	402	375
5	.....	325	325	8,810	2,860	2,160	780	325	375	375
6	.....	325	325	7,910	2,860	2,160	780	430	375	375
7	.....	325	325	7,620	2,860	2,160	780	375	375	375
8	.....	325	325	7,330	3,360	2,040	780	375	325	375
9	.....	325	325	7,030	3,180	2,040	625	375	325	375
10	.....	325	325	6,760	2,860	2,040	625	375	325	375
11	.....	325	430	6,490	2,860	2,040	625	325	325	375
12	.....	325	430	7,330	2,710	2,160	625	325	350	375
13	.....	430	430	7,030	2,710	2,160	625	325	350	430
14	.....	430	430	7,030	2,710	2,160	625	325	350	402
15	.....	430	555	6,490	2,710	2,160	625	430	350	430
16	325	430	625	6,230	2,710	2,040	625	430	325	375
17	325	555	625	5,980	2,560	1,920	555	430	325	430
18	325	555	700	9,110	2,710	1,920	555	430	325	430
19	325	555	740	8,810	2,860	1,920	555	430	325	430
20	325	555	780	6,490	2,710	1,920	555	430	325	430
21	325	555	860	6,230	2,710	1,920	555	402	325	430
22	325	522	945	5,980	2,710	1,920	555	375	325	375
23	325	490	1,390	5,280	2,710	1,920	1,340	375	325	375
24	325	460	2,040	5,050	2,420	1,920	1,340	375	325	375
25	325	430	2,290	4,630	2,420	1,800	1,340	375	325	375
26	325	430	3,520	4,630	2,290	1,800	1,340	375	325	375
27	325	402	5,280	4,240	2,290	1,680	490	402	325	375
28	325	375	7,330	4,060	2,290	1,440	430	430	325	375
29	490	375	7,030	3,700	2,290	1,230	402	430	325	375
30	522	375	7,030	3,520	2,560	1,040	375	375	430	375
31	522	.....	6,490	.....	2,560	1,040	.....	375	.....	375

NOTE.—Discharge determined from a rating curve well defined by measurements made in 1910, 1911, and 1912.

Monthly discharge of Clark Fork at Fromberg, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 16-31	522	325	360	11,400	B.
April	555	325	412	24,500	B.
May	7,330	325	1,720	106,000	B.
June	9,110	3,520	6,460	384,000	B.
July	3,360	2,290	2,740	168,000	B.
August	2,160	1,040	1,910	117,000	B.
September	1,340	375	726	43,200	B.
October	430	325	380	23,400	B.
November	430	325	350	20,800	B.
December	430	375	388	23,900	C.
The period	.....	.....	.....	922,000	

NOTE.—Accuracy reduced from A to B because station was not visited during 1913. Accuracy for December reduced because of the possibility of some ice effect.

PRYOR CREEK AT COBURN, MONT.

Location.—At the ranch of John A. Hoyt, at Coburn, Mont., in SE. ¼ sec. 35, T. 1 S., R. 27 E., on the Crow Indian Reservation.

Records available.—September 13, 1911, to December 31, 1913.

Gage.—Overhanging chain gage on left bank opposite farmhouse of John A. Hoyt.

Control.—Firm gravel and cobblestones; permanent. The bed of the stream at the gage is composed of gravel and sand. At low stages the water is deep and sluggish at the gage and for several hundred feet above and below.

Discharge measurement.—Made by wading above the gage.

Winter flow.—Channel blocked with ice during winter months.

Diversion.—Water sufficient to irrigate approximately 1,000 acres near Pryor is diverted about 30 miles above this station.

Discharge measurements of Pryor Creek at Coburn, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 16	R. R. Randell.	4.74	102	Aug. 21	J. M. Ray	3.86	16.6
May 26	do	4.51	69	Oct. 11	do	4.53	73
July 7	do	3.86	16.2				

Daily gage height, in feet, of Pryor Creek at Coburn, Mont., for 1913.

[Harry Foster, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.7	4.5	4.2	3.8	3.6	4.05	4.35	4.15
2	.....	4.7	4.5	4.1	3.8	3.7	4.05	4.4	4.1
3	.....	4.6	4.5	4.05	3.8	3.7	4.05	4.4	.....
4	.....	4.6	4.5	4.0	3.8	3.7	4.1	4.3	.....
5	.....	4.6	4.5	3.95	3.7	3.7	4.15	4.2	.....
6	.....	4.6	4.5	3.9	3.8	3.1	4.6	4.2	.....
7	.....	4.5	4.6	3.8	3.8	3.7	4.6	4.2	.....
8	.....	4.5	4.6	3.8	3.8	3.8	4.8	4.2	.....
9	.....	4.5	4.5	3.8	3.8	3.9	4.8	4.15	.....
10	.....	4.5	4.5	3.8	4.1	3.8	4.9	4.15	.....
11	.....	4.5	4.5	3.9	4.0	3.9	4.5	4.3	.....
12	.....	4.5	4.5	3.9	4.0	3.8	4.15	4.2	.....
13	.....	4.5	4.5	3.85	3.9	3.9	4.15	4.15	.....
14	.....	4.5	4.4	3.8	3.9	3.9	4.1	4.1	.....
15	.....	4.5	4.3	3.9	3.9	3.9	4.0	4.15	.....
16	4.6	4.5	4.3	3.85	3.9	3.9	4.05	4.15	.....
17	4.6	4.5	4.2	3.8	3.9	3.9	4.05	4.1	.....
18	4.6	4.6	4.2	3.8	3.8	3.9	4.0	4.15	.....
19	4.6	4.9	4.2	3.8	3.9	3.9	4.05	4.15	.....
20	4.6	4.9	4.2	3.8	3.8	3.9	4.05	4.1	.....
21	4.6	4.7	4.15	3.7	3.9	3.9	4.05	4.15	.....
22	4.6	4.6	4.2	3.8	3.8	4.0	4.05	4.1	.....
23	4.8	4.6	4.15	3.8	3.7	4.1	4.1	4.1	.....
24	4.6	4.5	4.2	3.8	3.7	4.4	4.15	4.25	.....
25	4.6	4.5	4.2	3.8	3.7	4.7	4.35	4.35	.....
26	4.6	4.5	4.3	3.8	3.7	5.0	4.3	4.2	.....
27	4.6	4.5	4.4	3.8	3.7	4.9	4.3	4.15	.....
28	4.5	4.5	4.25	3.7	3.7	4.8	4.35	4.1	.....
29	4.6	4.5	4.25	3.8	3.7	4.2	4.35	4.1	.....
30	4.7	4.5	4.2	3.8	3.7	4.1	4.3	4.15	.....
31	.....	4.6	.....	3.9	3.7	.....	4.35	.....	.....

Daily discharge, in second-feet, of Pryor Creek at Coburn, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	458	90	70	41	14	6	28	55	36
2	.....	206	90	70	32	14	10	28	60	32
3	.....	245	80	70	28	14	10	28	60	.....
4	.....	368	80	70	23	14	10	32	50	.....
5	.....	552	80	70	20	10	10	36	41	.....
6	.....	327	80	70	18	14	10	80	41	.....
7	.....	245	70	80	14	14	10	80	41	.....
8	.....	149	70	80	14	14	14	100	41	.....
9	.....	96	70	70	14	14	18	100	36	.....
10	.....	96	70	70	14	32	14	111	36	.....
11	.....	88	70	70	18	23	18	70	50	.....
12	.....	81	70	70	18	23	14	36	41	.....
13	.....	88	70	70	16	18	18	36	36	.....
14	.....	81	70	60	14	18	18	32	32	.....
15	.....	81	70	50	18	18	18	23	36	.....
16	.....	80	70	50	16	18	18	28	36	.....
17	.....	80	70	41	14	18	18	28	32	.....
18	.....	80	80	41	14	14	18	23	36	.....
19	.....	80	111	41	14	18	18	28	36	.....
20	.....	80	111	41	14	14	18	28	32	.....
21	.....	80	90	36	10	18	18	28	36	.....
22	.....	80	80	41	14	14	23	28	32	.....
23	.....	100	80	36	14	10	32	32	32	.....
24	.....	80	70	41	14	10	60	36	46	.....
25	.....	80	70	41	14	10	90	55	55	.....
26	.....	80	70	50	14	10	122	50	41	.....
27	.....	80	70	60	14	10	111	50	36	.....
28	.....	70	70	46	10	10	100	55	32	.....
29	.....	80	70	46	14	10	41	55	32	.....
30	1,080	90	70	41	14	10	32	50	36	.....
31	770	.....	80	.....	18	10	.....	55	.....	.....

NOTE.—Discharge determined from a well-defined rating curve. Discharge Mar. 30 to Apr. 15 estimated from flood marks and discharge of Pryor Creek at Huntley.

Monthly discharge of Pryor Creek at Coburn, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	458	70	146	8,690	C.
May	111	70	77.2	4,750	A.
June	80	36	56.4	3,360	A.
July	41	10	16.9	1,040	A.
August	32	10	14.8	910	A.
September	122	6	30.6	1,820	A.
October	111	23	46.7	2,870	A.
November	60	32	40.2	2,390	A.
December	.....	.....	[a] 40	2,460	C.
The period	.....	.....	.....	28,300	

[a] Estimated from flow at Huntley.

PRYOR CREEK AT HUNTLEY, MONT.

Location.—In the SW. ¼ sec. 25, T. 2 N., R. 27 E., at steel highway bridge, half a mile from railroad station at Huntley.

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

Drainage area.—800 square miles.

Gage.—Chain, installed June 16, 1906, at highway bridge crossing the new channel, into which the creek was at that time turned by the United States Reclamation Service.

Control.—Bed composed of clay and gravel and may change somewhat; banks steep and uniformly graded, clean, and not subject to overflow; current moderate.

Discharge measurements.—Made from the bridge to which the gage is attached or by wading.

Winter flow.—Stream freezes over during winter months.

Discharge measurements of Pryor Creek at Huntley, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Mar. 18	W. A. Lamb	[a] 1.85	62	June 28	R. R. Randell	1.74	74
Apr. 23	R. R. Randall	1.91	102	Aug. 22	J. M. Ray	1.10	15.6
May 24	do	1.72	85	Oct. 3	do	1.48	36

[a] Ice present.

Daily gage height, in feet, of Pryor Creek at Huntley, Mont., for 1913.

[E. V. Carpenter, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.95	1.9	2.1	5.2	.....	1.7	1.45	1.1	1.0	1.5	1.65	1.7
2	1.95	1.9	2.1	3.9	.....	1.65	1.35	1.1	1.05	1.45	1.7	1.70
3	1.95	2.0	2.1	2.7	.....	1.65	1.35	1.05	1.1	1.48	1.85	1.67
4	2.0	2.0	2.2	2.9	.....	1.65	1.25	1.0	1.1	1.50	1.75	1.65
5	2.2	2.0	2.05	3.5	.....	1.6	1.2	1.05	1.1	1.55	1.60	1.62
6	2.8	2.0	2.1	4.3	.....	1.65	1.2	1.0	1.1	1.6	1.62	1.62
7	2.6	1.9	2.8	3.3	.....	1.6	1.25	1.0	1.1	2.2	1.65	1.62
8	2.1	1.9	2.5	2.9	.....	1.6	1.2	1.0	1.1	2.0	1.62	1.55
9	2.1	2.0	2.4	2.35	.....	1.65	1.15	1.0	1.1	2.0	1.60	1.57
10	2.0	1.9	2.6	2.0	.....	1.6	1.1	1.45	1.1	2.4	1.6	1.60
11	2.0	1.95	2.4	2.0	.....	1.6	1.1	1.65	1.1	2.3	1.6	1.6
12	1.9	1.95	2.3	1.95	.....	1.5	1.15	1.35	1.1	2.0	1.6	1.6
13	1.9	1.95	2.2	1.9	.....	1.5	1.1	1.3	1.1	1.8	1.60	1.60
14	1.9	1.95	2.2	1.95	1.75	1.55	1.0	1.25	1.1	1.6	1.57	1.62
15	1.9	2.0	2.1	1.9	1.85	1.4	1.0	1.2	1.2	1.55	1.50	1.62
16	1.9	3.0	1.9	1.9	1.7	1.4	1.0	1.2	1.15	1.5	1.53	1.62
17	1.85	2.6	1.9	1.9	1.75	1.4	1.05	1.2	1.15	1.5	1.55	1.60
18	1.9	2.6	1.9	1.9	1.8	1.4	1.0	1.2	1.15	1.50	1.58	1.58
19	1.9	2.6	1.9	1.88	1.9	1.45	.95	1.2	1.15	1.47	1.60	1.56
20	1.9	2.5	1.9	1.95	2.05	1.4	.95	1.2	1.2	1.45	1.6	1.50
21	1.9	2.3	1.9	.....	1.85	1.55	.9	1.2	1.25	1.47	1.6	1.65
22	1.9	2.2	1.9	.....	2.0	1.4	.95	1.1	1.25	1.50	1.6	1.65
23	2.0	2.0	1.9	1.9	2.0	1.35	1.0	1.1	1.3	1.5	1.65	1.65
24	2.0	2.0	1.9	1.9	1.7	1.35	1.0	1.1	1.6	1.5	1.7	1.65
25	2.05	2.0	1.9	1.9	1.75	1.25	1.0	1.1	1.75	1.5	1.7	1.65
26	2.0	2.1	1.9	1.86	1.7	1.35	.95	1.1	2.1	1.7	1.70	1.65
27	2.0	2.1	2.0	1.85	1.7	1.35	.95	1.1	2.2	1.95	1.73	1.65
28	2.0	2.1	2.0	1.82	1.65	1.78	.95	1.05	2.2	1.7	1.65	1.7
29	2.0	.....	2.25	1.82	1.65	1.6	1.0	1.0	1.8	1.8	1.35	1.7
30	2.05	.....	4.0	1.8	1.7	1.5	1.15	1.0	1.5	1.9	1.55	1.7
31	2.0	.....	6.5	.....	1.65	.....	1.1	1.0	.....	1.7	.....	1.7

NOTE.—Jan. 1 to Mar. 28 gage heights affected by ice.

Daily discharge, in second-feet, of Pryor Creek at Huntley, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	960	112	79	36	15	12	40	58	65
2	.....	572	112	68	28	15	14	36	65	65
3	.....	258	100	68	28	14	15	38	92	61
4	.....	306	100	68	22	12	15	40	74	58
5	.....	460	100	59	19	14	15	46	51	54
6	.....	690	100	67	19	12	15	51	54	54
7	.....	408	88	59	22	12	15	158	58	54
8	.....	306	88	58	19	12	15	120	54	46
9	.....	186	88	65	17	12	15	120	51	48
10	.....	120	88	58	15	36	15	196	51	51
11	.....	120	88	57	15	58	15	177	51	51
12	.....	110	88	44	17	28	15	120	51	51
13	.....	101	88	44	15	24	15	82	51	51
14	.....	110	96	49	12	22	15	51	48	54
15	.....	101	110	34	12	19	19	46	40	54
16	.....	101	82	34	12	19	17	40	43	54
17	.....	101	92	33	14	19	17	40	46	51
18	62	101	101	33	12	19	17	40	49	49
19	62	97	120	37	11	19	17	37	51	47
20	62	110	130	33	11	19	19	36	51	40
21	62	107	110	47	10	19	22	37	51	58
22	62	104	139	32	11	15	22	40	51	58
23	62	101	139	28	12	15	24	40	58	58
24	62	101	82	28	12	15	51	40	65	58
25	62	101	92	22	12	15	74	40	65	58
26	62	93	82	28	11	15	139	65	65	58
27	76	92	80	28	11	15	158	110	70	58
28	76	86	72	79	11	14	158	65	58	65
29	168	86	72	51	12	12	82	82	28	65
30	600	82	79	40	17	12	40	101	46	65
31	1,350	.....	70	.....	15	12	.....	65	.....	65

NOTE.—Discharge determined as follows: Mar. 29 to Apr. 30 and after June 27, from a fairly well defined rating curve; Mar. 19–28, estimated from measurement of Mar. 18 and gage heights; May 1–13, estimated from flow of Pryor Creek near Coburn; May 14 to June 27, by indirect method for shifting channels.

Monthly discharge of Pryor Creek at Huntley, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 18–31	1,350	62	202	5,610	C.
April	960	82	209	12,400	B.
May	139	70	96.4	5,930	C.
June	79	22	47.7	2,840	C.
July	36	10	15.8	972	B.
August	58	12	18.0	1,110	B.
September	158	12	36.1	2,150	B.
October	196	36	70.9	4,360	B.
November	92	28	54.9	3,270	B.
December	65	40	55.6	3,420	B.
The period	.....	.....	.....	42,100	

BIGHORN RIVER NEAR HARDIN, MONT.

Location.—On the Crow Indian Reservation, in the SW. ¼ sec. 13, T. 1 S., R. 33 E., at the bridge of the Chicago, Burlington & Quincy Railroad about half a mile above junction of Bighorn and Little Bighorn rivers, 2 miles from Hardin, Mont.

Records available.—June 16, 1904, to December 31, 1913.

Drainage area.—20,700 square miles.

Gage.—A chain attached to west span of railroad bridge was read up to October 11, 1913. After that date a temporary staff gage, set to the datum of the chain gage but located 20 feet farther downstream, was read. The staff gage reads 0.07 lower than the chain, owing to its different location. Gage heights after October 11 have been corrected to chain-gage datum.

Control.—Composed of gravel; free from vegetation.

Discharge measurements.—Made from railroad bridge.

Winter flow.—Affected by ice.

Diversions.—Water is diverted a few miles above the station by a private irrigation company to irrigate land on west side of the river.

Discharge measurements of Bighorn River near Hardin, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 17	R. R. Randell	4.55	6,400
May 19	do	4.42	5,790
June 30	do	6.18	14,300
Aug. 23	J. M. Ray	3.40	3,090

Daily gage height, in feet, of Bighorn River near Hardin, Mont., for 1913.

[H. R. Kean, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	6.5	4.3	7.0	6.6	5.5	3.4	3.2	2.9
2	.....	6.9	4.4	7.2	6.6	5.2	3.5	3.15	2.95
3	.....	6.2	4.3	7.1	6.5	5.1	3.5	3.2	2.95
4	.....	5.3	4.2	6.8	6.2	5.0	3.5	3.1	3.1
5	.....	5.1	4.0	6.6	6.0	4.8	3.6	3.15	3.05
6	.....	4.7	3.9	6.5	5.9	4.9	3.5	3.2	3.1
7	.....	4.7	3.8	6.4	5.8	4.8	3.5	3.4	3.05
8	.....	4.4	3.6	6.4	5.8	4.6	3.4	3.45	3.1
9	.....	4.2	3.6	7.0	5.8	5.0	3.35	3.3	3.05
10	.....	3.3	4.0	6.8	5.8	4.7	3.3	3.2	3.0
11	.....	3.9	4.6	6.4	5.7	4.6	3.25	3.15	2.9
12	.....	3.7	4.9	6.3	5.7	4.5	3.25	3.1	2.9
13	.....	3.7	5.2	6.2	5.6	4.4	3.3	3.05	2.9
14	.....	3.9	5.1	6.2	5.4	4.2	3.3	3.1	2.95
15	4.8	4.0	5.0	6.0	5.2	4.1	3.3	3.05	2.9
16	5.3	4.4	4.9	5.8	5.0	3.95	3.3	3.1	2.85
17	5.3	4.5	4.6	5.6	4.7	3.85	3.25	3.05	2.85
18	5.1	4.7	4.4	5.6	4.6	3.75	3.25	3.1	2.9
19	5.1	4.8	4.4	5.8	4.4	3.7	3.2	3.05	2.85
20	5.0	5.0	4.4	5.8	4.4	3.65	3.15	3.1	2.9
21	5.0	5.0	4.4	5.6	4.4	3.5	3.1	3.05	2.85
22	5.0	5.0	4.4	5.6	4.3	3.45	3.1	3.05	2.9
23	5.1	4.8	4.6	5.8	4.3	3.4	3.1	3.05	.....
24	5.1	4.7	4.5	6.2	4.4	3.45	3.2	3.1	.....
25	5.1	4.4	4.7	6.3	4.8	3.35	3.4	3.05	.....
26	5.1	4.0	5.0	6.3	5.2	3.25	3.3	3.1	.....
27	5.1	3.9	5.5	6.0	5.6	3.2	3.3	3.05	.....
28	5.1	3.6	6.1	5.8	6.0	3.2	3.3	3.1	.....
29	5.1	3.7	6.6	5.8	6.0	3.15	3.2	3.05	.....
30	6.5	4.2	6.9	6.1	5.8	3.25	3.25	2.9	.....
31	6.9	.....	7.2	.....	5.6	3.45	.....	2.9	.....

NOTE.—Gage heights for March may be somewhat affected by ice. Gage height Apr. 10 probably erroneous.

Daily discharge, in second-feet, of Bighorn River near Hardin, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	16,200	5,530	19,300	16,800	10,800	3,010	2,550	1,950
2	.....	18,600	5,860	20,600	16,800	9,230	3,250	2,440	2,040
3	.....	14,600	5,530	20,000	16,200	8,720	3,250	2,550	2,040
4	.....	9,750	5,210	18,000	14,600	8,230	3,250	2,340	2,340
5	.....	8,720	4,600	16,800	13,500	7,320	3,500	2,440	2,240
6	.....	6,920	4,310	16,200	12,900	7,760	3,250	2,550	2,340
7	.....	6,920	4,030	15,600	12,400	7,320	3,250	3,010	2,240
8	.....	5,860	3,500	15,600	12,400	6,550	3,010	3,130	2,340
9	.....	5,210	3,500	19,300	12,400	8,230	2,890	2,770	2,240
10	.....	5,530	4,600	18,000	12,400	6,920	2,770	2,550	2,140
11	.....	4,310	6,550	15,600	11,900	6,550	2,660	2,440	1,950
12	.....	3,760	7,760	15,100	11,900	6,200	2,660	2,340	1,950
13	.....	3,760	9,230	14,600	11,300	5,860	2,770	2,240	1,950
14	.....	4,310	8,720	14,600	10,300	5,210	2,770	2,340	2,040
15	7,320	4,600	8,230	13,500	9,230	4,900	2,770	2,240	1,950
16	9,750	5,860	7,760	12,400	8,230	4,460	2,770	2,340	1,860
17	9,750	6,200	6,550	11,300	6,920	4,170	2,660	2,240	1,860
18	8,720	6,920	5,860	11,300	6,550	3,900	2,660	2,340	1,950
19	8,720	7,320	5,860	12,400	5,860	3,760	2,550	2,240	1,860
20	8,230	8,230	5,860	12,400	5,860	3,630	2,440	2,340	1,950
21	8,230	8,230	5,860	11,300	5,860	3,250	2,340	2,240	1,860
22	8,230	8,230	5,860	11,300	5,530	3,130	2,340	2,240	1,950
23	8,720	7,320	6,550	12,400	5,530	3,010	2,340	2,240	.....
24	8,720	6,920	6,200	14,600	5,860	3,130	2,550	2,340	.....
25	8,720	5,860	6,920	15,100	7,320	2,890	3,010	2,240	.....
26	8,720	4,600	8,230	15,100	9,230	2,660	2,770	2,340	.....
27	8,720	4,310	10,800	13,500	11,300	2,550	2,770	2,240	.....
28	8,720	3,500	14,000	12,400	13,500	2,550	2,770	2,340	.....
29	8,720	3,760	16,800	12,400	13,500	2,440	2,550	2,240	.....
30	16,200	5,210	18,600	14,000	12,400	2,660	2,660	1,950	.....
31	18,600	.....	20,600	.....	11,300	3,130	.....	1,950	.....

NOTE.—Discharge determined from a fairly well defined rating curve. The gage heights for March may be affected by ice, in which case the results are high. Discharge estimated Apr. 10 because of probable error in gage height.

Monthly discharge of Bighorn River near Hardin, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 15–31	18,600	7,320	9,690	327,000	B.
April	18,600	3,500	7,050	420,000	B.
May	20,600	3,500	7,720	475,000	B.
June	20,600	11,300	14,800	881,000	B.
July	16,800	5,530	10,600	652,000	B.
August	10,800	2,440	5,200	320,000	B.
September	3,500	2,340	2,810	167,000	B.
October	3,130	1,950	2,380	146,000	B.
November 1–22	2,340	1,860	2,050	89,500	B.
The period	.....	.....	.....	3,480,000	

SHOSHONE RIVER AT CORBETT DAM, WYO.

Location.—In the NE. ¼ sec. 7, T. 53 N., R. 100 W., at Corbett diversion dam, 8 miles below Cody, Wyo.

Records available.—April 20, 1908, to December 31, 1913.

Drainage area.—Not measured at this station; drainage area above Cody is 1,400 square miles. Sage Creek, the only important tributary that enters between this station and Cody, drains only about 25 square miles.

Gage.—Forty feet upstream from the crest of the dam; readings represent height of water above crest.

Determinations of discharge.—The discharge is computed by considering the dam as a weir and the sluice gates as submerged orifices. The following formula for discharge over the crest was developed by W. A. Lamb from measurements at Cody, Wyo.: $Q=3.50\ BH^{1.58}$. The dam is of reinforced concrete, of the buttressed type, having on the upstream side a deck 2½ feet thick, sloping 1 to 1, and supported by buttresses 2 feet thick spaced 14 feet on centers; it raises the low-water elevation of the river 10.2 feet; the length between abutments is 400 feet.

Diversions and storage.—Little water is diverted above this station, but the Shoshone reservoir, with a capacity of 456,000 acre-feet, regulates the flow.

Cooperation.—Gage heights and discharge into Corbett tunnel furnished by United States Reclamation Service.

Daily gage height, in feet, of Shoshone River at Corbett dam, Wyo., for 1913.

[L. L. Sutton and O. K. Pettee, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.14	0.42	0.37	0.56	0.53	0.45	2.50	1.97	1.00	0.60	0.53	0.42
2	1.12	.41	.40	.54	.50	.65	2.40	1.85	.95	.61	.50	.....
3	1.10	.40	.42	.50	.51	.66	2.45	1.80	.94	.60	.59	.....
4	1.10	.80	.42	.57	.53	.67	2.52	1.77	.90	.59	.55	.....
5	1.09	.68	.42	.50	.50	.63	2.40	1.72	.87	.60	.....	.....
6	1.08	.40	.42	.50	.25	.62	2.35	1.70	.86	.66	.....	.....
7	1.08	.42	.47	.48	.30	.60	2.33	1.60	.83	.65	.....	.....
8	1.07	.41	.48	.45	.31	.58	2.40	1.50	.78	.64	.....	.....
9	1.06	.41	.50	.48	.30	.57	2.31	1.40	.76	.65	.....	.....
10	1.04	.41	.50	.50	.32	.57	2.30	1.40	.76	.66	.42	.....
11	1.03	.42	.49	.55	.33	.58	2.25	1.35	.75	.55	.41	.....
12	1.02	.42	.50	.61	.60	.60	2.09	1.32	.73	.53	.41	.....
13	1.01	.41	.45	.57	.61	.66	1.95	1.27	.71	.50	.41	.....
14	1.00	.42	.37	.55	.59	.72	1.75	1.22	.70	.49	.42	.....
15	.99	.43	.37	.55	.60	.78	1.65	1.13	.65	.47	.41	.....
16	.98	.50	.38	.60	.55	.77	1.63	1.08	.66	.50	.41	.....
17	.96	.55	.38	.71	.48	.76	1.58	1.05	.63	.56	.41	.....
18	.94	.53	.41	.90	.47	.77	1.53	1.05	.64	.55	.39	.....
19	.91	.55	.41	1.20	.49	.75	1.50	.98	.63	.54	.39	.43
20	.85	.54	.33	1.11	.72	.75	1.45	.97	.62	.54	.39	.43
21	.47	.52	.22	1.12	.73	.78	1.45	.91	.61	.53	.39	.43
22	.45	.40	.28	.96	.80	1.72	1.42	.84	.62	.54	.39	.44
23	.45	.38	.40	.97	.81	2.15	1.60	1.03	.62	.53	.41	.43
24	.46	.36	.40	.58	.79	2.40	1.69	.76	.63	.52	.41	.41
25	.48	.37	.39	.48	.80	2.40	1.73	.84	.64	.54	.41	.41
26	.48	.36	.37	.50	.81	2.25	1.70	.84	.57	.54	.42	.42
27	.47	.36	.35	.50	.83	2.32	2.00	.72	.59	.51	.42	.42
28	.47	.37	.38	.52	.81	2.50	2.10	.73	.56	.51	.42	.42
29	.45	.....	.43	.51	.83	2.60	2.05	.86	.56	.51	.42	.41
30	.42	.....	.47	.52	.85	2.80	2.10	.95	.55	.51	.42	.41
31	.42	.....	.41	.....	.30	.....	2.10	.98	.....	.52	.....	.41

NOTE.—Gage heights give the height of water above crest of the dam and were used to compute the flow over the dam only. Gage heights Feb. 4–5 distorted by ice. Ice present on dam Mar. 20–21, but gage heights are assumed correct. Nov. 5–9 and Dec. 2–18, total flow was going through the sluice gates.

Daily discharge, in second-feet, of Shoshone River, including sluices and tunnels, at Corbett dam, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,740	358	294	566	664	658	6,020	4,210	1,580	715	546	376
2	1,690	344	330	534	628	973	5,630	3,820	1,500	731	497	377
3	1,640	330	358	470	657	990	5,810	3,660	1,470	714	639	376
4	1,640	330	358	582	689	1,070	6,080	3,580	1,330	699	575	377
5	1,620	330	358	470	657	1,020	5,630	3,440	1,250	659	559	379
6	1,590	330	358	470	371	1,000	5,480	3,410	1,240	761	543	379
7	1,590	358	428	442	419	967	5,480	3,160	1,200	809	483	381
8	1,570	344	442	400	433	935	5,850	2,900	1,100	799	422	381
9	1,540	344	470	442	436	919	5,600	2,630	1,070	816	390	382
10	1,500	344	470	470	464	919	5,560	2,610	1,050	833	379	384
11	1,470	358	456	550	476	935	5,390	2,460	1,020	644	385	384
12	1,450	358	470	647	860	951	4,860	2,410	1,000	603	385	376
13	1,420	344	400	582	877	1,013	4,400	2,330	964	557	381	368
14	1,400	358	294	550	844	1,080	3,760	2,210	946	560	391	369
15	1,380	278	294	550	860	1,160	3,460	1,990	844	540	377	370
16	1,360	410	306	630	826	1,140	3,410	1,850	844	533	377	371
17	1,310	550	306	818	748	1,120	3,270	1,760	793	590	377	372
18	1,270	518	344	1,180	758	1,140	3,130	1,760	810	582	350	372
19	1,200	550	344	1,880	753	1,100	3,060	1,600	793	571	350	372
20	1,080	534	246	1,660	1,080	1,100	2,930	1,580	776	571	350	372
21	428	502	134	1,690	1,080	1,150	2,930	1,490	735	555	350	372
22	400	330	191	1,310	1,200	3,470	2,850	1,400	738	571	346	386
23	400	306	330	1,330	1,240	4,860	3,300	1,790	728	555	368	372
24	414	282	330	598	1,180	5,720	3,460	1,180	734	539	368	344
25	442	294	318	442	1,180	5,710	3,540	1,320	751	571	370	344
26	442	282	294	470	1,200	5,160	3,450	1,360	609	571	386	358
27	428	282	270	532	1,260	5,390	4,380	1,170	631	523	383	358
28	428	294	306	563	1,280	6,050	4,680	1,180	641	523	377	358
29	400	.....	372	572	1,350	6,430	4,500	1,390	652	523	376	344
30	358	.....	428	648	1,400	7,220	4,640	1,520	636	521	376	344
31	358	.....	387	.....	500	.....	4,620	1,550	.....	530	.....	344

NOTE.—Discharge determined by adding the flow through the tunnel to the flow over the crest of the dam. Record of daily discharge through the tunnels was furnished by the United States Reclamation Service. The flow over the dam was obtained from a rating table computed by the formula $3.50BH^{1.58}$ (see station description). Discharge Feb. 4–5 interpolated. Water was shut off at the Shoshone dam from 5.30 p. m. Feb. 15 to 2 a. m. Feb. 16, but the gage was read at such times so that this fact does not appear; proper allowance made in determining discharge Feb. 15 and 16. Discharge interpolated Nov. 5–9 and Dec. 2–18, as total flow was going through the sluice gates. These are the only periods during which the sluice gates were open.

Monthly discharge of Shoshone River, including sluices and tunnels, at Corbett dam, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	1,740	358	1,100	67,600	B.
February	550	278	366	20,300	B.
March	470	134	345	21,200	B.
April	1,880	400	735	43,700	B.
May	1,400	371	851	52,300	B.
June	7,220	658	2,380	142,000	B.
July	6,080	2,850	4,420	272,000	B.
August	4,210	1,170	2,220	136,000	B.
September	1,580	609	948	56,400	B.
October	833	521	622	38,200	B.
November	639	346	415	24,700	B.
December	386	344	369	22,700	B.
The year	7,220	134	1,240	897,000	

SOAP CREEK NEAR ST. XAVIER, MONT.

Location.—On the Crow Indian reservation, one-fourth mile above headworks of Soap Creek ditch, in the W. ½ NW. ¼ sec. 2, T. 6 S., R. 32 E., about 9 miles south of St. Xavier, Mont.

Records available.—September 11, 1911, to December 31, 1913.

Drainage area.—Not measured.

Gage.—An overhanging chain gage on left bank about 100 feet above the ford.

Control.—Firm gravel and cobblestones 50 feet below the gage; permanent. Bed of stream is gravel and sand at gage.

Discharge measurements.—Made by wading at the ford 100 feet below the gage.

Winter flow.—Stream frozen during the winter months; winter gage heights of no value.

Diversion.—None above gage.

Discharge measurements of Soap Creek near St. Xavier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	R. R. Randell	3.63	56	Aug. 26	J. M. Ray	3.22	16.9
May 21	do	3.49	35	Oct. 7	do	3.34	22
July 1	do	3.34	24				

Daily gage height, in feet, of Soap Creek near St. Xavier, Mont., for 1913.

[W. G. Warritt, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				3.27			3.54
2							
3							
4						3.34	
5		3.08	3.30				
6					3.28	3.34	
7							
8							3.34
9							
10				3.45			
11						3.49	
12			3.28				
13		3.04			3.27		
14							
15							3.44
16				3.30			
17							
18						3.34	
19			3.30				
20		3.42			3.29		
21							
22							3.34
23				3.10			
24							
25						3.38	
26			3.25	3.22			
27					3.78		
28		3.38					
29							3.44
30	3.04			3.29			
31							

Daily discharge, in second-feet, of Corbett tunnel at Corbett dam, Wyo., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	146	258	74	128	184	85	28	18
2	.....	.....	158	258	49	134	207	84	27	19
3	.....	.....	171	258	49	134	196	84	25	18
4	.....	.....	171	318	49	138	152	85	25	18
5	.....	.....	187	337	54	153	128	29	41	19
6	.....	.....	209	337	85	180	143	29	57	18
7	.....	.....	209	337	154	219	158	94	29	19
8	.....	.....	211	337	267	242	158	101	0	18
9	.....	.....	226	337	337	242	158	101	0	18
10	.....	.....	230	337	344	219	140	101	21	19
11	.....	.....	230	337	347	197	134	94	41	18
12	.....	.....	230	321	365	227	146	85	41	9
13	.....	.....	230	281	378	267	146	87	37	.....
14	.....	.....	230	239	378	276	146	104	33	.....
15	.....	.....	230	211	376	276	129	112	33	.....
16	.....	.....	276	211	384	258	112	63	33	.....
17	.....	.....	306	211	392	241	112	24	33	.....
18	.....	.....	330	211	392	241	112	32	32	.....
19	.....	.....	297	211	400	241	112	37	32	.....
20	.....	.....	244	211	414	251	112	37	32	.....
21	.....	.....	227	204	414	294	88	37	32	.....
22	.....	.....	215	184	414	336	74	37	28	.....
23	.....	.....	236	159	356	321	64	37	24	.....
24	.....	.....	215	140	264	268	53	37	24	.....
25	.....	.....	197	134	222	259	53	37	26	.....
26	.....	.....	197	116	222	303	27	37	28	.....
27	.....	62	225	98	200	331	17	37	25	.....
28	.....	61	281	98	162	331	75	37	19	.....
29	.....	86	310	98	146	286	86	37	18	.....
30	.....	146	322	98	115	226	86	35	18	.....
31	43	.....	290	.....	103	191	.....	28	.....	.....

NOTE.—Discharge record, furnished by United States Reclamation Service, represents the amount of water diverted for irrigation.

Monthly discharge of Corbett tunnel at Corbett dam, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 31	.....	.....	43	85	
April 27–30	146	61	88.8	705	
May	330	146	233	14,300	
June	337	98	230	13,700	
July	414	49	255	15,700	
August	336	128	239	14,700	
September	207	17	117	6,960	
October	112	24	60.1	3,700	
November	57	0	28.1	1,670	
December 1–12	19	9	17.6	419	
The period	.....	.....	.....	71,900	

Discharge measurements of Rottengrass Creek near St. Xavier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 18	R. R. Randell	4.65	32
May 20	do	4.48	27.8
June 30	do	3.87	14.9
Oct. 7	J. M. Ray	3.35	7.4

Daily gage height, in feet, and discharge, in second-feet, of Rottengrass Creek near St. Xavier Mont., for 1913.

[W. H. Ferguson, observer.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	4.4	26	3.9	15	.....	6	3.3	7	.....	14
2	.....	29	.....	16	3.2	6	.....	7	3.8	13
3	4.6	32	4.0	17	.....	6	3.3	7	.....	13
4	.....	30	.....	16	3.3	7	.....	7	.....	14
5	4.5	29	3.9	15	.....	7	.....	7	.....	14
6	.....	28	.....	15	3.3	7	.....	6	.....	15
7	4.4	26	3.9	15	.....	7	.....	6	3.9	15
8	.....	26	.....	14	3.3	7	3.2	6	.....	15
9	4.4	26	3.8	13	.....	8	.....	6	.....	16
10	.....	22	.....	10	3.4	8	3.2	6	4.0	17
11	4.1	19	3.4	8	.....	8	.....	6	.....	17
12	.....	18	3.4	8	3.3	7	.....	6	.....	16
13	4.0	17	.....	9	.....	7	3.25	6.5	.....	15
14	4.6	32	3.6	10	3.4	8	.....	6	3.9	15
15	.....	29	.....	9	.....	8	3.2	6	.....	13
16	4.4	26	3.4	8	3.3	7	.....	7	3.7	11
17	4.1	19	.....	8	.....	6	3.4	8	.....	10
18	4.0	17	3.3	7	3.2	6	.....	8	3.5	9
19	.....	24	3.3	7	.....	6	.....	9	.....	9
20	4.6	32	.....	7	3.2	6	3.5	9	3.5	9
21	4.4	26	3.3	7	.....	7	.....	8	.....	9
22	.....	20	.....	6	3.3	7	3.25	6.5	3.5	9
23	3.9	15	3.2	6	.....	7	.....	10	.....	7
24	4.6	32	.....	6	3.3	7	.....	14	3.4	8
25	.....	25	3.2	6	.....	7	4.1	19	.....	10
26	.....	19	3.3	7	3.25	6.5	.....	14	.....	12
27	3.8	13	.....	7	.....	7	3.6	10	3.8	13
28	.....	13	3.4	8	3.4	8	.....	12	.....	11
29	.....	14	.....	7	.....	8	.....	14	.....	10
30	.....	15	3.3	7	.....	7	3.9	15	3.5	9
31	.....	.....	3.3	7	.....	7	.....	.....	.....	9

Daily discharge determined from a well-defined curve.

Monthly discharge of Rottengrass Creek near St. Xavier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June	32	13	23.3	1,390	A.
July	17	6	9.7	596	B.
August	8	6	7.0	430	B.
September	19	6	8.6	512	B.
October	17	7	12.2	750	B.
The period	.....	.....	.....	3,680	

Daily discharge, in second-feet, of Soap Creek near St. Xavier, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	10	24	20	21	45	39
2	.....	10	24	21	20	37	37
3	.....	11	23	22	20	29	35
4	.....	11	22	23	20	22	33
5	.....	11	22	24	20	22	30
6	.....	11	22	25	20	22	27
7	.....	11	22	26	20	22	24
8	.....	11	21	28	20	25	22
9	.....	10	21	30	20	28	23
10	.....	10	20	32	20	30	24
11	.....	10	20	32	20	33	25
12	.....	10	20	30	20	32	26
13	.....	9.7	20	28	20	31	27
14	.....	12	20	26	20	30	28
15	.....	15	21	24	20	28	29
16	.....	18	21	22	20	26	28
17	.....	21	22	21	21	24	27
18	.....	24	22	20	21	22	26
19	.....	27	22	19	21	22	25
20	.....	30	22	18	21	23	24
21	.....	30	22	16	29	23	23
22	.....	29	21	14	37	24	22
23	.....	29	20	12	45	24	23
24	.....	28	19	14	53	25	24
25	.....	28	19	16	61	25	25
26	.....	27	19	17	69	27	26
27	.....	27	19	18	77	29	27
28	.....	27	19	19	69	31	28
29	.....	26	19	20	61	33	29
30	9.7	25	20	21	53	35	29
31	.....	.....	20	21	.....	37	.....

NOTE.—Discharge determined as follows: May 30 to Sept. 27, from a fairly well defined rating curve Oct. 4 to Nov. 30, from a poorly defined rating curve. Discharge interpolated for days on which gage was not read.

Monthly discharge of Soap Creek near St. Xavier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June	30	9.7	18.6	1,110	C.
July	24	19	20.9	1,290	B.
August	32	12	21.9	1,350	C.
September	77	20	32.0	1,900	C.
October	45	22	27.9	1,720	C.
November	39	22	27.2	1,620	C.
The period	.....	.....	.....	8,990	

ROTTENGRASS CREEK NEAR ST. XAVIER, MONT.

Location.—On the Crow Indian reservation, one-fourth mile above the crossing of the Bighorn canal, in the NW. ¼ sec. 6, T. 5 S., R. 33 E., about 4 miles southeast of St. Xavier, Mont.

Records available.—September 9, 1911, to December 31, 1913.

Gage.—Overhanging chain gage on left bank.

Control.—Likely to change. Bed of stream is composed of sand and silt. The channel is deep and current sluggish for several hundred feet above and below the gage.

Discharge measurements.—Made by wading above the gage.

Winter flow.—Channel freezes during winter months.

Diversions. None.

LITTLE BIGHORN RIVER NEAR WYOLA, MONT.

Location.—On the Crow Indian Reservation, one-fourth mile below proposed headworks of Little Bighorn canal No. 3, in the N. ½ SW. ¼ sec. 28, T. 8 S., R. 35 E., about 4 miles southwest of Wyola about 16 miles above mouth of Lodge Grass Creek.

Records available.—September 7, 1911, to December 31, 1913.

Drainage area.—260 square miles.

Gage.—Overhanging chain gage on right bank.

Control.—Practically permanent. Bed of stream is composed of gravel and cobblestones.

Discharge measurements.—Made by wading at ford below the gage.

Winter flow.—Channel filled with ice during winter months.

Diversion.—None.

Discharge measurements of Little Bighorn River near Wyola, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	W. A. Lamb	[a] 4.18	77	July 5	R. R. Randell	4.90	299
Apr. 22	R. R. Randell	4.70	242	Aug. 24	J. M. Ray	4.40	122
May 23	do	5.38	490	Oct. 10	do	4.36	116

[a] Ice present.

Daily gage height, in feet, of Little Bighorn River near Wyola, Mont., for 1913.

[Leslie Schroeder, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.8	6.4	4.95	4.55	4.35	4.35	4.35
2	.....	4.7	6.4	5.0	4.5	4.35	4.35	4.4
3	.....	4.65	6.2	4.9	4.55	4.35	4.3	4.35
4	.....	4.65	6.2	4.9	4.5	4.30	4.4	4.35
5	.....	4.55	6.1	4.85	4.5	4.30	4.45	4.35
6	.....	4.5	6.0	4.8	4.5	4.3	4.4	4.35
7	.....	4.5	5.9	4.8	4.5	4.3	4.4	4.35
8	.....	4.6	5.9	4.8	4.5	4.3	4.4	4.3
9	.....	4.85	5.85	4.75	4.55	4.25	4.35	4.3
10	.....	5.1	5.8	4.75	4.5	4.3	4.35	4.3
11	.....	5.55	5.7	4.8	4.5	4.25	4.35	4.35
12	.....	5.6	5.6	4.75	4.45	4.3	4.35	4.3
13	4.45	5.5	5.5	4.75	4.45	4.3	4.35	4.3
14	4.50	5.4	5.4	4.75	4.45	4.3	4.35	4.3
15	4.50	5.3	5.4	4.75	4.45	4.4	4.35	4.3
16	4.45	5.25	5.35	4.7	4.4	4.4	4.35	4.25
17	4.5	5.2	5.3	4.7	4.4	4.35	4.3	4.25
18	4.5	5.15	5.2	4.65	4.4	4.35	4.35	4.25
19	4.5	5.35	5.2	4.6	4.4	4.35	4.35	4.3
20	4.6	5.2	5.1	4.6	4.4	4.35	4.35	4.25
21	4.6	5.1	5.15	4.55	4.35	4.35	4.35	4.3
22	4.7	5.1	5.1	4.65	4.4	4.35	4.35	4.25
23	4.55	5.35	5.1	4.65	4.35	4.5	4.35	4.25
24	4.5	5.7	5.1	4.65	4.35	4.5	4.3	4.25
25	4.4	5.9	5.1	4.6	4.35	4.4	4.45	4.25
26	4.45	6.1	5.1	4.6	4.35	4.4	4.35	4.3
27	4.45	6.4	5.1	4.65	4.35	4.4	4.4	4.25
28	4.6	6.5	5.05	4.6	4.35	4.35	4.45	4.25
29	4.7	6.6	5.05	4.5	4.35	4.4	4.4	4.25
30	4.8	6.6	5.05	4.5	4.35	4.35	4.35	4.25
31	.....	6.6	.....	4.55	4.35	.....	4.35	.....

Daily discharge, in second-feet, of Little Bighorn River near Wyola, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	273	1,080	322	192	114	114	114
2	.....	243	1,080	339	176	114	114	122
3	.....	229	951	305	183	114	105	114
4	.....	229	951	305	167	105	122	114
5	.....	202	889	289	163	105	132	114
6	.....	190	828	273	161	105	122	114
7	.....	190	768	273	159	105	122	114
8	.....	215	768	273	157	105	122	105
9	.....	289	739	258	165	98	114	105
10	.....	376	710	258	150	105	114	105
11	.....	577	655	273	146	98	114	114
12	.....	602	602	258	132	105	114	105
13	179	552	552	258	132	105	114	105
14	190	504	504	258	132	105	114	105
15	190	459	504	258	132	122	114	105
16	179	438	482	243	122	122	114	98
17	190	416	459	243	122	114	105	98
18	190	396	416	229	122	114	114	98
19	190	482	416	215	122	114	114	105
20	215	416	376	215	122	114	114	98
21	215	376	396	302	114	114	114	105
22	243	376	376	229	122	114	114	98
23	202	482	376	229	114	142	114	98
24	190	655	376	229	114	142	105	98
25	168	768	376	215	114	122	132	98
26	179	889	376	215	114	122	114	105
27	179	1,080	376	229	114	122	122	98
28	215	1,140	358	215	114	114	132	98
29	243	1,200	358	190	114	122	122	98
30	273	1,200	358	187	114	114	114	98
31	.....	1,200	.....	196	114	.....	114	.....

NOTE.—Discharge determined as follows: To July 28, from a rating curve well defined between 190 and 550 second-feet, fairly well defined at lower stages, and poorly defined at higher stages; July 29 to Aug. 11, by indirect method for shifting channel; Aug. 12 to Nov. 30, from a fairly well-defined rating curve.

Monthly discharge of Little Bighorn River near Wyola, Mont., for 1913.

[Drainage area, 260 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 13–30	273	168	202	0.777	0.52	7,210	A.
May	1,200	190	537	2.07	2.39	33,000	B.
June	1,080	358	582	2.24	2.50	34,600	B.
July	339	187	251	.965	1.11	15,400	B.
August	192	114	136	.523	.60	8,360	C.
September	142	98	114	.438	.49	6,780	B.
October	132	105	116	.446	.51	7,130	B.
November	122	98	105	.404	.45	6,250	B.
The period	.....	.....	.....	.....	.....	119,000	

LITTLE BIGHORN RIVER NEAR CROW AGENCY, MONT.

Location.—On the Crow Indian Reservation at the Chicago, Burlington & Quincy Railroad bridge, 2 miles south of Crow Agency, Mont., in the W. ½ sec. 18, T. 2 S., R. 35 E., about 14 miles above the junction with Bighorn River.

Records available.—March 24, 1905, to June 30, 1906; September 7, 1911, to December 31, 1913.

Drainage area.—1,190 square miles.

Gage.—Vertical staff attached to downstream end of a pile bridge pier. The records from March 24, 1905, to June 30, 1906, were obtained from a chain gage attached to the upstream side of the railroad bridge at Crow Agency, about 2 miles farther downstream. No tributaries enter between these two points.

Control.—Permanent. Bed of the stream is coarse gravel and cobblestones. Current is broken by the piers of the bridge and is sluggish at the gage.

Discharge measurements.—Made from downstream side of the bridge; low-water measurements are made by wading at the ford about 75 feet above the bridge.

Winter flow.—Affected by ice, which forms at the control below the bridge.

Diversion.—Crow Agency ditch diverts water between the station and the old station at Crow agency.

Discharge measurements of Little Bighorn River near Crow Agency, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 21	W. A. Lamb	5.00	96	July 2	R. R. Randell	5.16	502
Apr. 19	R. R. Randell	5.14	583	Aug. 26	J. M. Ray	4.22	158
May 20	do	5.69	981	Oct. 6	do	4.50	202

Daily gage height, in feet, of Little Bighorn River near Crow Agency, Mont., for 1913.

[O. Burgess and A. McLauchlin, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
1	9.1	5.5	7.1	5.15	.....	.....	5.2	5.2
2	8.0	5.6	6.9	5.2	.....	.....	5.2	5.2
3	6.2	5.5	6.9	5.0	.....	.....	5.3	5.4
4	5.2	5.5	6.7	5.0	.....	.....	5.3	5.4
5	5.5	5.3	6.6	4.7	.....	4.5	5.3	5.3
6	6.0	5.3	6.5	4.8	.....	4.5	5.3	5.2
7	7.4	5.1	6.3	4.5	.....	4.5	5.3	5.3
8	5.3	5.1	6.1	4.6	.....	4.5	5.3	5.2
9	5.6	5.1	6.2	4.7	.....	4.6	5.3	5.3
10	5.4	5.3	6.0	4.6	.....	4.6	5.25	5.3
11	5.3	5.5	5.9	4.7	.....	4.7	5.3	5.3
12	5.3	5.7	5.9	4.4	.....	4.7	5.3	5.3
13	5.4	6.1	5.8	4.6	.....	4.7	5.3	5.3
14	5.6	5.8	5.6	4.7	.....	4.8	5.3	5.3
15	5.4	5.7	5.6	4.7	.....	4.8	5.3	5.3
16	5.4	5.7	5.7	4.6	.....	4.8	5.3	5.3
17	5.2	5.7	5.8	4.6	.....	4.7	5.3	5.3
18	5.2	5.6	5.6	4.7	.....	4.7	5.3	5.1
19	5.2	5.6	5.8	4.6	.....	4.7	5.2	5.2
20	5.1	5.7	5.9	4.5	4.3	4.8	5.3	5.2
21	5.3	5.6	5.5	4.6	4.4	4.9	5.2	5.3
22	5.3	5.5	5.5	4.6	4.2	5.0	5.3	5.2
23	5.4	5.5	5.4	4.6	4.1	.0	5.3	.....
24	5.4	5.6	5.1	4.5	4.2	5.0	5.3	.....
25	5.3	5.8	5.3	4.6	4.25	5.0	5.1	.....
26	5.4	6.1	5.3	4.6	4.2	5.05	5.3	.....
27	5.3	6.5	5.2	.....	4.3	5.1	5.3	.....
28	5.2	6.9	5.0	.....	4.3	5.1	5.2	.....
29	5.3	7.0	5.2	.....	4.3	5.1	5.3	.....
30	5.4	7.1	5.2	.....	.....	5.1	5.3	.....
31	.....	6.9	.....	.....	.....	5.2	.....	.....

NOTE.—Gage heights Apr. 1 and 2 probably affected by ice jams below gage. Gage heights for October to December are of doubtful accuracy.

Daily discharge, in second-feet, of Little Bighorn River near Crow Agency, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Day.	Apr.	May.	June.	July.	Aug.
1	.....	830	2,210	505	.....	16	760	980	980	240	.....
2	.....	900	2,010	530	.....	17	640	980	1,060	240	.....
3	1,220	830	2,010	430	.....	18	640	900	900	280	.....
4	565	830	1,820	430	.....	19	640	930	1,060	240	.....
5	760	700	1,730	280	.....	20	530	980	1,140	210	160
6	1,160	700	1,640	330	.....	21	700	900	800	240	180
7	2,560	590	1,460	210	.....	22	700	830	800	240	140
8	700	590	1,300	240	.....	23	760	830	720	240	125
9	900	590	1,380	280	.....	24	760	900	550	210	140
10	760	700	1,220	240	.....	25	700	1,060	640	240	150
11	700	830	1,140	280	.....	26	760	1,300	640	240	140
12	700	980	1,140	180	.....	27	700	1,640	560	.....	160
13	760	1,300	1,060	240	.....	28	640	2,010	450	.....	160
14	900	1,060	900	280	.....	29	700	2,110	530	.....	160
15	760	980	900	280	.....	30	760	2,210	530	.....	.....
						31	.....	2,010	.....	.....	.....

NOTE.—Discharge determined from two fairly well-defined rating curves applicable Apr. 8 to June 20 and July 1 to Aug. 29. Indirect methods used Apr. 3 to 7 and June 21 to 30.

Monthly discharge of Little Bighorn River near Crow Agency, Mont., for 1913.

[Drainage area, 1,190 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 3-30	2,560	590	821	0.690	0.72	45,600	B.
May	2,210	590	1,060	.891	1.03	65,200	B.
June	2,210	450	1,110	.933	1.04	66,000	B.
July 1-26	530	180	283	.238	.23	14,600	B.
Aug. 20-29	180	125	152	.128	.05	3,020	B.

LODGEGRASS CREEK NEAR LODGEGRASS, MONT.

Location.—Above road crossing one-fourth mile above headworks of Lodgegrass ditch, in the SW. ¼ sec. 29, T. 6 S., R. 35 E., about 6 miles southwest of Lodgegrass, Mont.

Records available.—September 9, 1911, to December 31, 1913.

Drainage area.—142 square miles.

Gage.—Overhanging chain gage on left bank. On July 3, 1913, a new gage was installed 50 feet below the old station and at the same datum. The control and channel are practically the same as at the former site.

Control.—Firm gravel and cobblestones at the ford below the gage; permanent. Bed of stream at gage composed of mud and silt. Current sluggish at gage at low stages.

Discharge measurements.—Made by wading at ford below gage.

Winter flow.—Stream freezes over during winter months.

Diversion.—None.

Discharge measurements of Lodgegrass Creek near Lodgegrass, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	W. A. Lamb	[a] 4.5	40	July 3	R. R. Randell	3.98	76
Apr. 21	R. R. Randell	4.01	70	Aug. 25	J. M. Ray	3.43	22
May 22	do	4.44	128	Oct. 9	do	3.54	26

[a] Ice present.

Daily gage height, in feet, and discharge, in second-feet, of Lodgegrass Creek near Lodgegrass, Mont., for 1913.

[Florence Campbell, observer.]

Day.	April.		May.		June.		October.		November.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			4.28	107	6.8	628		29		33
2			3.96	67		628		29	3.6	33
3			4.24	102	6.8	628		29		33
4			4.12	86	6.8	628		29		33
5			4.10	83	6.8	628		29		32
6			4.17	92	6.8	628		28		32
7			4.15	90				28		31
8			4.03	75				28		31
9			4.11	84			3.54	28	3.58	31
10			4.29	109				28		31
11			3.96	67				27		30
12			3.94	64			3.52	27		30
13			3.92	62				27		30
14				115				27		30
15			4.68	168				26		29
16			4.75	180				26	3.55	29
17			4.73	176				25		29
18			4.71	173				25		29
19			4.79	186			3.5	25		28
20			4.67	166				25		28
21	4.01	72		148				26		27
22		82	4.44	130				27		27
23		92	4.35	117				28	3.52	27
24	4.24	102	4.7	171				29		27
25		92	5.8	392				29		27
26	4.09	82		370			3.55	29		26
27	4.07	79	5.6	348				29		26
28	3.85	55	5.7	370				30		26
29	4.03	75	5.8	392				31		25
30		90	5.8	392				31		25
31				510				32		

NOTE.—Discharge determined from a rating curve fairly well defined below 225 second-feet. Discharge interpolated for days for which gage heights are missing. The gage was moved 50 feet downstream July 3 and reset to same datum. The control and channel are the same as at the old station, so that practically the same rating curve is applicable.

Monthly discharge of Lodgegrass Creek near Lodgegrass, Mont., for 1913.

[Drainage area, 142 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 21–30	102	55	82.1	0.578	0.21	1,630	B.
May	510	62	180	1.27	1.46	11,100	B.
June 1–6	628	628	628	4.42	.99	7,470	C.
October	32	25	27.9	.196	.23	1,720	C.
November	33	25	29.2	.206	.23	1,740	C.

LITTLE MISSOURI RIVER BASIN.

LITTLE MISSOURI RIVER NEAR ALZADA, MONT.

Location.—At Walker's ranch, 2 miles below mouth of Thompson Creek, near southwest corner of T. 8 S., R. 60 E., 300 yards below a proposed dam and 4 miles below Alzada, Mont.

Records available.—April 30, 1904, to November 30, 1906; June 18, 1911, to December 31, 1913.

Drainage area.—About 780 square miles.

Gage.—Overhanging chain gage on right bank. During 1911 a vertical staff gage, 150 feet farther downstream on the left bank, was used. Datum of chain gage is 0.08 foot lower than that of staff gage. Control points also different.

Control.—May shift during highwater. Stream sluggish; banks cut 5 to 15 feet in the sandy soil.

Discharge measurements.—At ordinary stages made by wading; at flood stages, from a cable.

Winter flow.—Affected by ice.

Accuracy.—High-water measurements sufficient to define a rating curve for use in making estimates of daily discharge for 1912 and 1913 were obtained during 1914.

Discharge measurements of Little Missouri River near Alzada, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 22	C. S. Heidel	2.47	15.2
Sept. 19	do	4.48	450
20	do	3.03	90
21	do	2.71	38

Daily gage height, in feet, of Little Missouri River near Alzada, Mont., for 1913.

[John Walker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.83	.....	.....	14.1	2.24	2.36	3.15	2.21	2.02	2.41	2.24	2.23
2	2.85	.....	.....	13.0	2.25	2.38	2.90	2.16	2.00	2.35	2.26	2.24
3	2.81	.....	.....	10.8	2.29	2.30	2.48	2.14	1.98	2.32	2.25	2.23
4	2.32	.....	.....	10.1	2.30	2.22	2.42	2.12	1.94	2.31	2.25	2.25
5	1.83	.....	.....	6.2	2.32	2.21	2.35	2.12	1.90	2.38	2.25	2.26
6	1.80	.....	6.8	6.0	2.30	2.20	2.3	2.28	1.90	3.2	2.26	2.26
7	.86	.....	6.6	7.1	2.30	2.75	2.92	3.05	1.89	3.8	2.25	2.25
8	.85	.....	6.8	6.7	2.30	2.48	2.45	4.1	1.87	3.8	2.27	2.25
9	1.84	.....	7.6	4.2	2.29	2.40	2.34	4.1	1.85	2.94	2.27	2.25
10	1.83	.....	8.6	3.5	2.28	2.32	2.31	2.85	1.82	2.66	2.23	2.25
11	1.86	.....	8.9	3.2	2.27	2.28	2.28	2.48	1.80	2.52	2.23	2.27
12	2.80	.....	6.6	2.98	2.27	2.23	2.24	2.36	1.77	2.46	2.23	2.27
13	2.81	.....	5.0	2.95	2.28	3.6	2.23	2.30	1.76	2.41	2.23	2.27
14	2.32	.....	3.7	3.1	2.27	4.0	2.19	2.24	1.78	2.34	2.23	2.27
15	1.85	.....	3.3	3.1	2.28	3.35	2.17	2.20	1.83	2.30	2.24	2.27
16	1.85	.....	3.05	2.96	2.32	2.95	2.17	2.19	7.7	2.29	2.27	2.27
17	2.79	.....	2.90	2.88	2.32	3.2	2.22	2.16	10.5	2.28	2.27	2.27
18	2.81	.....	3.15	2.75	2.35	4.5	2.89	2.15	11.3	2.25	2.27	2.27
19	.....	4.7	2.95	2.70	2.90	3.55	4.2	2.22	6.6	2.24	2.27	2.27
20	.....	5.4	2.65	2.60	3.5	2.68	3.35	2.50	2.98	2.25	2.26	2.30
21	.....	.....	2.65	2.52	3.05	2.48	2.52	2.38	2.68	2.24	2.25	2.30
22	.....	.....	2.65	2.47	2.6	2.38	2.86	2.28	2.55	2.22	2.25	2.30
23	.....	.....	2.64	2.42	2.48	2.38	2.54	2.26	2.98	2.23	2.25	2.30
24	.....	.....	2.64	2.40	2.38	2.34	2.40	2.22	4.8	2.23	2.25	2.31
25	.....	.....	2.64	2.32	2.32	2.30	2.33	2.16	5.5	2.25	2.25	2.32
26	.....	.....	2.64	2.30	2.29	2.32	2.32	2.15	4.1	2.27	2.25	2.32
27	.....	.....	2.54	2.30	2.27	2.31	2.32	2.11	3.05	2.25	2.25	2.32
28	.....	.....	2.45	2.28	2.27	2.30	2.26	2.10	2.77	2.25	2.23	2.32
29	.....	.....	2.46	2.27	2.25	2.79	2.22	2.06	2.60	2.26	2.23	2.32
30	.....	.....	4.9	2.25	2.24	3.1	2.22	2.04	2.49	2.24	2.23	2.32
31	.....	.....	12.4	.....	2.22	.....	2.23	2.03	.....	2.23	.....	2.32

NOTE.—Gage heights Jan. 1 to Mar. 30 are affected by ice.

Daily discharge, in second-feet, of Little Missouri River near Alzada, Mont., for 1912–13.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.										
1	.....	.....	76	13	5.0	2.8	0.8	26	3.0	2.6
2	.....	.....	76	11	17	36	.8	11	3.4	2.8
3	.....	.....	76	10	15	470	.9	7.5	3.8	3.0
4	.....	2,160	52	9.0	50	670	.8	6.2	3.4	2.8
5	.....	2,230	435	8.0	670	1,250	.7	4.6	3.8	2.4
6	.....	4,550	1,570	9.0	1,190	895	.7	183	3.8	2.4
7	.....	3,200	2,040	10	196	115	.6	670	3.4	2.4
8	.....	2,550	2,200	8.0	43	44	.6	538	3.8	2.8
9	.....	1,040	1,040	6.6	20	27	.5	97	3.4	3.0
10	.....	1,390	330	7.5	14	14	.6	40	2.8	3.0
11	.....	1,160	115	43	10	26	.8	27	3.8	2.8
12	.....	925	71	955	11	13	.6	15	3.4	2.8
13	.....	998	59	208	8.0	9.0	.8	10	3.0	3.0
14	.....	1,070	44	57	5.8	8.0	.6	8.0	3.0	3.8
15	.....	1,100	37	62	5.4	6.6	.8	6.2	2.8	3.8
16	.....	504	28	106	5.0	3.4	1.2	5.4	2.6	3.8
17	.....	1,960	25	52	5.4	3.4	6.6	5.4	2.8	3.8
18	.....	2,040	25	24	5.0	159	9.5	3.0	2.8	3.4
19	.....	2,040	21	19	4.6	97	4.2	2.6	2.8	3.4
20	.....	2,020	22	13	3.8	115	5.0	1.2	2.6	3.4
21	.....	2,100	30	10	3.0	50	16	2.0	2.6	4.2
22	.....	1,860	571	8.5	3.0	15	20	2.0	2.6	5.4
23	.....	1,390	801	5.8	2.6	10	46	1.8	2.2	4.6
24	.....	801	864	5.4	4.2	7.0	400	1.4	2.2	4.6
25	.....	604	136	4.2	2.8	4.6	604	1.4	2.2	5.4
26	.....	504	47	3.0	5.4	3.4	736	1.4	2.2	5.4
27	.....	400	31	2.8	4.2	2.4	400	1.4	2.2	5.4
28	.....	295	21	2.2	12	2.0	159	2.0	2.6	5.4
29	.....	136	15	5.0	21	1.6	148	2.0	2.6	5.4
30	.....	106	12	4.6	8.5	1.0	80	2.0	2.6	5.4
31	.....	.....	12	.....	5.0	.9	.....	3.0	.....	5.4
1913.										
1	.....	3,950	4.6	10	106	3.4	0.6	13	4.6	4.2
2	.....	3,400	5.0	11	65	2.2	.5	9.5	5.4	4.6
3	.....	2,440	6.6	7.0	18	1.8	.4	8.0	5.0	4.2
4	.....	2,200	7.0	3.8	13	1.4	.3	7.5	5.0	5.0
5	.....	1,040	8.0	3.4	9.5	1.4	.1	11	5.0	5.4
6	1,220	985	7.0	3.0	7.0	6.2	.1	115	5.4	5.4
7	1,160	1,300	7.0	45	68	88	.1	265	5.0	5.0
8	1,220	1,190	7.0	18	16	365	.1	265	5.8	5.0
9	1,450	400	6.6	12	9.0	365	.0	71	5.8	5.0
10	1,740	183	6.2	8.0	7.5	58	.0	35	4.2	5.0
11	1,840	115	5.8	6.2	6.2	18	.0	21	4.2	5.8
12	1,160	77	5.8	4.2	4.6	10	.0	16	4.2	5.8
13	670	72	6.2	208	4.2	7.0	.0	13	4.2	5.8
14	235	97	5.8	330	2.8	4.6	.0	9.0	4.2	5.8
15	136	97	6.2	148	2.4	3.0	.0	7.0	4.6	5.8
16	88	74	8.0	72	2.4	2.8	1,480	6.6	5.8	5.8
17	65	62	8.0	115	3.8	2.2	2,330	6.2	5.8	5.8
18	106	45	9.5	504	64	2.0	2,630	5.0	5.8	5.8
19	72	39	65	196	400	3.8	1,160	4.6	5.8	5.8
20	34	28	183	37	148	19	77	5.0	5.4	7.0
21	34	21	88	18	21	11	37	4.6	5.0	7.0
22	34	17	28	11	59	6.2	24	3.8	5.0	7.0
23	32	13	18	11	23	5.4	77	4.2	5.0	7.0
24	32	12	11	9.0	12	3.8	604	4.2	5.0	7.5
25	32	8.0	8.0	7.0	8.5	2.2	833	5.0	5.0	8.0
26	32	7.0	6.6	8.0	8.0	2.0	365	5.8	5.0	8.0
27	23	7.0	5.8	7.5	8.0	1.2	88	5.0	5.0	8.0
28	16	6.2	5.8	7.0	5.4	1.0	47	5.0	4.2	8.0
29	16	5.8	5.0	50	3.8	.8	28	5.4	4.2	8.0
30	637	5.0	4.6	97	3.8	.7	18	4.6	4.2	8.0
31	3,100	.....	3.8	.....	4.2	.6	.....	4.2	.....	8.0

NOTE.—Discharge determined from a well-defined rating curve based on discharge measurements made during 1912 to 1914.

Monthly discharge of Little Missouri River near Alzada, Mont., for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet)	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
April 4–30	4,550	106	1,450	77,700	A.
May	2,200	12	351	21,600	A.
June	955	2.2	56.1	3,340	A.
July	1,190	2.6	76.0	4,670	A.
August	1,250	.9	131	8,060	A.
September	736	.5	88.2	5,250	A.
October	670	1.2	54.4	3,340	A.
November	3.8	2.2	2.94	175	A.
December	5.4	2.4	3.80	234	A.
The period				124,000	
1913.					
March 5–31	3,100	16	584	30,100	A.
April	3,950	5.0	597	35,500	A.
May	183	3.8	17.8	1,090	A.
June	504	3.0	65.6	3,900	A.
July	400	2.4	35.9	2,210	A.
August	365	.6	32.3	1,990	A.
September	2,630	.0	327	19,500	A.
October	265	3.8	30.5	1,880	A.
November	5.8	4.2	4.96	295	A.
December	8.0	4.2	6.21	382	A.
The period				96,800	

KNIFE RIVER BASIN.

KNIFE RIVER NEAR BRONCHO, N. DAK.

Location.—At C. D. Smith's ranch, in the SE. ¼ sec. 4, T. 142 N., R. 90 W., at former site of the post office of Broncho; present post office is about 6 miles from old site. Spring Creek enters about 15 miles below station and Elm Creek half a mile above.

Records available.—May 29, 1903, to December 31, 1913.

Drainage area.—1,260 square miles; drainage area at the present site is practically the same as at the original site, 2 miles farther downstream, the area at the lower point being perhaps 5 square miles greater.

Gage.—Chain, on left bank just below observer's house; datum unchanged since March 23, 1905, when station was moved from original site about 2 miles farther downstream.

Channel.—Practically permanent.

Discharge measurements.—At high stages made from car and cable 500 feet below gage; at low stages by wading.

Winter flow.—Affected by ice.

Accuracy.—Results should be fair.

Discharge measurements of Knife River near Broncho, N. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 12	W. B. Stevenson	4.95	120
May 31	do	4.13	40
Aug. 11	do	3.68	6.8

Daily gage height, in feet, of Knife River near Broncho, N. Dak., for 1913.

[C. D. Smith, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	20.2	4.0	4.0	3.7	3.5	3.8	3.6	3.7
2	.....	13.75	4.0	4.0	3.7	3.5	3.8	3.6	3.7
3	.....	11.55	4.0	4.0	3.7	3.5	3.7	3.6	3.7
4	.....	10.0	3.9	3.9	3.7	3.5	3.7	3.6	3.7
5	.....	10.0	3.9	3.9	3.7	3.5	3.6	3.6	3.7
6	.....	10.0	3.9	3.9	3.7	3.5	3.6	3.6	3.7
7	.....	8.3	3.9	3.9	3.7	3.5	3.6	3.6	3.7
8	.....	7.5	3.9	3.8	3.7	3.5	3.6	3.6	3.7
9	6.0	7.0	3.9	3.8	3.7	3.5	3.6	3.6	3.8
10	6.4	6.6	3.9	3.8	3.7	3.6	3.6	3.6	3.8
11	5.8	5.5	3.9	3.8	3.7	3.7	3.6	3.6	3.8
12	5.7	.....	3.9	3.8	3.7	3.7	3.6	3.7	3.8
13	5.7	4.8	3.9	3.8	3.7	3.7	3.6	3.7	3.8
14	5.7	4.7	3.9	3.8	3.7	3.7	3.5	3.7	3.8
15	5.7	4.6	3.9	3.8	3.7	3.7	3.5	3.7	3.8
16	5.7	4.6	3.9	3.8	3.7	3.9	3.5	3.7	3.8
17	5.7	4.3	3.9	3.8	3.7	3.8	3.5	3.7	3.8
18	5.7	4.2	3.9	3.8	3.7	3.8	3.5	3.7	3.7
19	5.7	4.2	4.0	3.8	3.7	3.8	3.5	3.7	3.7
20	5.7	4.2	4.0	3.8	3.7	3.8	3.5	3.7	3.7
21	5.7	4.2	4.1	3.8	3.7	3.8	3.5	3.7	3.7
22	5.7	4.2	4.2	3.8	3.7	3.8	3.5	3.7	3.7
23	5.7	4.1	4.2	3.8	3.7	4.0	3.6	3.7	3.7
24	5.7	4.1	4.2	3.8	3.7	4.0	3.6	3.7	3.7
25	.....	4.1	4.1	3.8	3.6	3.9	3.6	3.7	3.7
26	.....	4.1	4.1	3.8	3.6	3.9	3.6	3.7	3.7
27	.....	4.0	4.1	3.8	3.5	3.9	3.6	3.7	3.7
28	.....	4.0	4.1	3.8	3.5	3.9	3.6	3.7	3.7
29	5.7	4.0	4.1	3.8	3.5	3.8	3.6	3.7	3.7
30	7.45	4.0	4.1	3.8	3.5	3.8	3.6	3.7	.....
31	17.75	.....	4.1	.....	3.5	3.8	.....	3.7	.....

NOTE.—Discharge relation affected by ice during March. Heights for Mar. 12 to 15 were read to top of ice.

Daily discharge, in second-feet, of Knife River near Broncho, N. Dak., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	5,990	27	27	13	6	17	9	13
2	3,087	27	27	13	6	17	9	13
3	2,131	27	27	13	6	13	9	13
4	1,480	22	22	13	6	13	9	13
5	1,480	22	22	13	6	9	9	13
6	1,480	22	22	13	6	9	9	13
7	861	22	22	13	6	9	9	13
8	627	22	17	13	6	9	9	13
9	502	22	17	13	6	9	9	17
10	417	22	17	13	9	9	9	17
11	210	22	17	13	13	9	9	17
12	156	22	17	13	13	9	13	17
13	103	22	17	13	13	9	13	17
14	90	22	17	13	13	6	13	17
15	78	22	17	13	13	6	13	17
16	78	22	17	13	22	6	13	17
17	48	22	17	13	17	6	13	17
18	40	22	17	13	17	6	13	13
19	40	27	17	13	17	6	13	13
20	40	27	17	13	17	6	13	13
21	40	33	17	13	17	6	13	13
22	40	40	17	13	17	6	13	13
23	33	40	17	13	27	9	13	13
24	33	40	17	13	27	9	13	13
25	33	33	17	9	22	9	13	13
26	33	33	17	9	22	9	13	13
27	27	33	17	6	22	9	13	13
28	27	33	17	6	22	9	13	13
29	27	33	17	6	17	9	13	13
30	27	33	17	6	17	9	13	13
31	.....	33	.....	6	17	.....	13	.....

NOTE.—Discharge determined from a curve fairly-well defined below 2,000 second-feet.

Monthly discharge of Knife River near Broncho, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	5,990	27	642	38,200	B.
May	40	22	27.4	1,680	B.
June	27	17	18.7	1,110	B.
July	13	6	11.6	713	B.
August	22	6	14.4	885	B.
September	17	6	8.9	530	B.
October	13	9	11.6	713	B.
November	17	13	14.2	845	B.
The period				44,700	

HEART RIVER BASIN.

HEART RIVER NEAR RICHARDTON, N. DAK.

Location.—In or near sec. 21, T. 138 N., R. 92 W., about 11 miles south of Richardton, opposite observer's house, which is 1 mile below highway bridge at which the station was formerly maintained.

Records available.—May 18, 1903, to December 31, 1913.

Drainage area.—1,250 square miles.

Gage.—Overhanging chain gage was installed May 31, 1913, opposite observer's house, at same site and datum as the gage which was used during 1912 and which was destroyed by flood of March 31, 1913.

Control.—Not permanent.

Discharge measurements.—At high stages made from bridge; at ordinary low stages by wading.

Winter flow.—Affected by ice.

Accuracy.—Sufficient high and medium stage measurements have not yet been made to define the upper part of rating curve.

Discharge measurements of Heart River near Richardton, N. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 13	W. B. Stevenson	25.44	145
May 30	do	24.48	44
Aug. 10	do	23.89	2.1
Sept. 12	do	23.73	.81

Daily gage height, in feet, of Heart River near Richardton, N. Dak., for 1913.

[W. F. Church, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	39.3	24.5	24.4	24.2	23.85	23.9	23.9	24.1	24.1
2	.....	41.9	24.5	24.4	24.2	23.85	23.85	23.9	24.1	24.1
3	.....	34.3	24.5	24.4	24.2	23.85	23.85	23.95	24.1	24.1
4	.....	32.9	24.5	24.4	24.1	23.8	23.85	23.95	24.1	24.1
5	.....	31.2	24.5	24.3	24.1	23.8	23.8	23.95	24.1	24.1
6	.....	30.9	24.4	24.3	24.1	23.8	23.8	23.95	24.1	24.1
7	.....	30.6	24.4	24.3	24.1	23.8	21.8	23.95	24.1	.....
8	.....	29.9	24.4	24.3	24.1	23.8	23.8	24.0	24.1	.....
9	.....	29.5	24.4	24.3	24.1	23.8	23.75	24.0	24.1	.....
10	.....	28.0	24.4	24.2	24.1	23.9	23.75	24.1	24.1	.....
11	.....	27.6	24.4	24.2	24.15	23.9	23.75	24.1	24.1	.....
12	.....	27.1	24.4	24.2	24.15	23.9	23.75	24.1	24.1	.....
13	.....	26.8	24.4	24.2	24.15	24.1	23.75	24.1	24.1	.....
14	.....	25.2	24.4	24.2	24.1	24.1	23.75	24.05	24.1	.....
15	.....	25.1	24.4	24.2	24.1	24.3	23.7	24.05	24.1	.....
16	.....	25.0	24.4	24.3	24.1	24.3	23.7	24.05	24.1	24.0
17	.....	24.8	24.4	24.25	24.1	24.3	23.7	24.0	24.1	.....
18	.....	24.7	24.4	24.25	24.1	24.3	23.7	24.0	24.1	.....
19	.....	24.7	24.5	24.2	24.1	24.3	23.7	24.0	24.1	.....
20	.....	24.7	24.5	24.2	24.1	24.25	23.7	24.0	24.1	.....
21	.....	24.7	24.55	24.15	24.0	24.2	23.7	24.1	24.1	.....
22	.....	24.7	24.55	24.15	24.0	24.15	23.7	24.1	24.1	.....
23	.....	24.7	24.5	24.15	24.0	24.15	23.75	24.1	24.1	.....
24	.....	24.6	24.5	24.15	24.0	24.1	23.8	24.1	24.1	.....
25	.....	24.6	24.5	24.15	24.0	24.1	23.8	24.1	24.1	.....
26	.....	24.6	24.75	24.15	24.0	24.1	23.85	24.1	24.1	.....
27	.....	24.6	24.7	24.15	23.9	24.0	23.85	24.1	24.1	.....
28	.....	24.6	24.7	24.15	23.9	24.0	23.9	24.1	24.1	.....
29	.....	24.5	24.6	24.2	23.9	24.0	23.9	24.1	24.1	.....
30	25.5	24.5	24.6	24.2	23.9	23.9	23.9	24.1	24.1	.....
31	35.43	.....	24.4	.....	23.85	23.9	.....	24.1	.....	.....

NOTE.—Chain gage was destroyed by flood on Mar. 31. Gage heights Mar. 31 to Apr. 13 read on gage at highway bridge about 1 mile above observer's house. Gage heights Apr. 14 to May 30 observed on a temporary staff gage installed near site of chain gage. On May 31 a chain gage was installed at the same site and datum as the gage which was used during 1912 and which was destroyed by flood Mar. 31, 1913. Gage heights Mar. 31 to May 30 have been referred to gage installed May 31. Discharge relation affected by ice in stream during January, February, March, and Dec. 7–31.

Daily discharge, in second-feet, of Heart River near Richardton, N. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3,893	44	36	21	4.5	6	6	15	15
2	.....	4,699	44	36	21	4.5	4.5	6	15	15
3	.....	2,343	44	36	21	4.5	4.5	8	15	15
4	.....	1,910	44	36	15	3	4.5	8	15	15
5	.....	1,408	44	28	15	3	3	8	15	15
6	.....	1,322	36	28	15	3	3	8	15	15
7	.....	1,238	36	28	15	3	3	8	15	.....
8	.....	1,044	36	28	15	3	3	10	15	.....
9	.....	940	36	28	15	3	2	10	15	.....
10	.....	585	36	21	15	6	2	15	15	.....
11	.....	505	36	21	18	6	2	15	15	.....
12	.....	409	36	21	18	6	2	15	15	.....
13	.....	354	36	21	18	15	2	15	15	.....
14	.....	113	36	21	15	15	2	12	15	.....
15	.....	102	36	21	15	28	1	12	15	.....
16	.....	91	36	28	15	28	1	12	15	.....
17	.....	71	36	24	15	28	1	10	15	.....
18	.....	62	36	24	15	28	1	10	15	.....
19	.....	62	44	21	15	28	1	10	15	.....
20	.....	62	44	21	15	24	1	10	15	.....
21	.....	62	48	18	10	21	1	15	15	.....
22	.....	62	48	18	10	18	1	15	15	.....
23	.....	62	44	18	10	18	2	15	15	.....
24	.....	53	44	18	10	15	3	15	15	.....
25	.....	53	44	18	10	15	3	15	15	.....
26	.....	53	66	18	10	15	4.5	15	15	.....
27	.....	53	62	18	6	10	4.5	15	15	.....
28	.....	53	62	18	6	10	6	15	15	.....
29	.....	44	53	21	6	10	6	15	15	.....
30	45	44	53	21	6	6	6	15	15	.....
31	2,760	.....	36	.....	4.5	6	.....	15	.....	.....

NOTE.—Daily discharge Mar. 30–31, estimated on account of ice. Apr. 1 to Dec. 6, discharge determined from a fairly well-defined curve.

Monthly discharge of Heart River near Richardton, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	4,700	44	725	43,100	B.
May	62	36	43.1	2,650	B.
June	36	18	23.8	1,420	B.
July	21	4	13.4	824	B.
August	28	3	12.5	769	C.
September	6	1	2.88	171	C.
October	15	6	12.0	738	C.
November	15	15	15.0	893	C.
The period	.....	.....	.....	50,600	

CANNONBALL RIVER BASIN.

CANNONBALL RIVER NEAR STEVENSON, N. DAK.

Location.—On the Standing Rock Indian Reservation, near south side of sec. 23, T. 133 N., R. 82 W., at M. H. Burdick's house, immediately above the ford, about 1 mile southeast of the Stevenson schoolhouse and about 5 miles above Timmer, N. Dak. This station is about 1 mile above the gage at the old Stevenson station, at which observations are still occasionally made.

Records available.—June 10, 1903, to November 30, 1908; August 9, 1911, to December 31, 1913.

Drainage area.—3,670 square miles.

Gages.—Chain on projecting cantilever timber, on west side of river.

Control.—At the rapids 600 feet below the gage the bed is of clean gravel and stones. Bed of stream composed of gravel and stones, in places covered with silt to the depth of 1 foot. During floods the silt may be washed away and later redeposited at some points.

Discharge measurements.—At low and medium stages made by wading at ford 15 rods below the gage or at the riffle 55 rods below; at medium and high stages measurements may be made by use of the car and cable at the old Stevenson station, about 1 mile farther downstream. The discharge is practically the same at the two points, except that a small draw, which enters midway between the gage and the cable on the north side, carries a small flow for a few hours after a rain.

Winter flow.—Affected by ice.

Discharge measurements of Cannonball River near Stevenson, N. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 10	W. B. Stevenson	15.33	648	Aug. 14	W. B. Stevenson	12.54	1.9
June 19	do	13.10	28	Sept. 16	do	12.41	.41
Aug. 13	do	12.50	1.4				

Daily gage height, in feet, of Cannonball River near Stevenson, N. Dak., for 1913.

[Mrs. M. H. Burdick, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	17.25	13.5	13.75	13.23	12.65	12.5	12.5	12.7	12.65
2	14.2	17.75	13.5	13.65	13.25	12.65	12.4	12.55	12.7	12.6
3	14.2	18.35	13.5	13.45	13.25	12.7	12.4	12.5	12.65	12.55
4	14.1	18.65	13.5	13.35	13.35	12.7	12.45	12.5	12.6	12.5
5	14.0	18.2	13.5	13.65	13.25	12.6	12.4	12.6	12.6	12.5
6	14.0	16.7	13.45	13.35	13.35	12.55	12.42	12.7	12.6	12.55
7	14.0	16.65	13.4	13.35	13.3	12.55	12.6	12.8	12.5	12.6
8	14.0	16.25	13.3	13.3	13.15	12.6	12.7	12.8	12.5	12.55
9	13.9	15.82	13.35	13.15	13.1	12.45	12.8	12.9	12.4	12.6
10	13.9	15.3	13.25	13.15	13.05	12.65	12.7	12.8	12.45	12.55
11	14.0	14.95	13.3	13.05	12.95	12.6	12.6	12.7	12.4	12.6
12	14.0	14.65	13.25	13.05	12.95	12.55	12.55	12.65	12.45	12.6
13	14.1	14.6	13.3	12.95	12.9	12.52	12.45	12.6	12.52	12.55
14	14.2	14.45	13.4	12.9	12.95	12.65	12.32	12.6	12.5	12.65
15	14.1	14.3	13.3	12.95	13.05	12.6	12.35	12.6	12.55	12.6
16	14.1	14.3	13.35	13.2	13.2	12.5	12.4	12.55	12.5	12.5
17	14.4	14.6	13.4	13.75	13.35	12.48	12.35	12.5	12.45	12.5
18	14.3	14.5	13.4	13.95	13.5	12.4	12.3	12.5	12.4	12.45
19	14.3	14.2	13.6	13.15	13.15	12.4	12.3	12.45	12.4	12.4
20	14.5	14.05	13.9	12.85	13.05	12.4	12.3	12.4	12.5	.....
21	14.1	14.1	13.8	12.85	12.92	12.5	12.4	12.4	12.5	.....
22	14.2	14.2	13.7	12.85	12.85	12.6	12.45	12.4	12.55	.....
23	14.3	14.05	13.6	12.95	12.90	12.7	12.4	12.35	12.5	.....
24	14.4	13.9	13.5	12.85	12.85	12.82	12.35	12.35	12.55	.....
25	14.3	13.65	13.8	12.90	.....	12.9	12.3	12.55	12.6	.....
26	14.4	13.4	14.4	12.75	12.7	12.95	12.3	12.65	12.65	.....
27	14.5	13.55	14.5	13.15	12.65	12.8	12.3	13.02	12.65	.....
28	14.65	13.6	14.4	13.35	12.65	12.7	12.35	13.0	12.55	.....
29	14.75	13.55	14.3	13.15	12.65	12.65	12.4	12.9	12.5	12.5
30	16.15	13.55	14.1	13.25	12.6	12.6	12.45	12.8	12.6	.....
31	16.4	.....	14.0	.....	12.6	12.55	.....	.....	.....	.....

NOTE.—Ice in stream affected discharge relation Jan. 1 to Mar. 29 and Dec. 19–31.

Daily discharge, in second-feet, of Cannonball River near Stevenson, N. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12	2,345	69	108	37	3	1	1	4	3
2	12	2,860	69	91	39	3	0	1	4	2
3	12	3,500	69	62	39	4	.4	1	3	1
4	7	3,820	69	50	50	4	.7	1	2	1
5	7	3,340	69	91	39	2	.4	2	2	1
6	7	1,790	62	50	50	1	.5	.4	2	1
7	7	1,740	56	50	44	1	2	7	1	2
8	7	1,366	44	44	29	2	4	7	1	1
9	7	1,022	50	29	25	.7	7	12	.4	2
10	7	677	39	29	21	3	4	7	.3	1
11	12	491	44	21	15	2	2	4	.4	2
12	18	360	50	21	15	1	1	3	.7	2
13	25	341	44	15	12	1	.7	2	1	1
14	35	288	56	12	15	3	.2	2	1	3
15	25	241	44	15	21	2	.3	2	1	2
16	25	241	50	34	34	1	.4	1	1	1
17	56	341	56	108	50	.9	.3	1	1	1
18	44	305	56	148	69	.4	.2	1	.4	.4
19	44	212	83	29	29	.4	.2	.7	.4	.4
20	69	172	137	9	21	.4	.2	.4	1	.....
21	25	185	117	9	13	1	.4	.4	1	.....
22	35	212	99	9	9	2	.7	.4	1	.....
23	44	172	83	15	12	4	.4	.3	1	.....
24	56	137	69	9	9	8	.3	.3	1	.....
25	44	91	117	12	6	12	.2	1	2	.....
26	56	56	272	5	4	15	.2	3	2	.....
27	69	76	305	29	3	7	.2	19	3	.....
28	91	83	272	50	3	4	.3	18	1	.....
29	108	76	241	29	3	3	.4	12	1	.....
30	1,453	76	185	39	2	2	.7	7	2	.....
31	1,690	.....	160	.....	2	1	.....	5	.....	.....

NOTE.—Discharge Mar. 1-29 estimated on account of ice. Discharge Mar. 31 to Dec. 19 determined from a curve that is fairly well defined between gage heights 13 and 19 feet.

Monthly discharge of Cannonball River near Stevenson, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	1,690	7	133	8,180	D.
April	3,820	56	887	52,800	B.
May	305	39	101	6,210	B.
June	148	5	40.7	2,420	B.
July	69	2	23.2	1,430	B.
August	15	.4	3.06	188	B.
September	7	.2	.99	59	C.
October	19	.3	4.08	251	C.
November	4	.3	1.42	84	C.
The period	.....	.....	.....	71,600	

GRAND RIVER BASIN.

NORTH BRANCH OF GRAND RIVER AT HALEY, N. DAK.

Location.—About 20 rods south of the post office at Haley, N. Dak., near northeast corner of sec. 36, T. 129 N., R. 100 W.

Records available.—May 17, 1908, to December 31, 1913.

Drainage area.—500 square miles.

Gage.—Gage heights are obtained by measuring distance from bench mark to water surface by means of a metallic tape weighted at the end.

Channel.—Bed of stream composed of gravel and silt.

Discharge measurements.—At high stages made from car and cable 200 feet below gage; at low stages by wading.

Winter flow.—Affected by ice.

Accuracy.—Results fair except for low stages, when the percentage error is very large.

Discharge measurements of North Branch of Grand River at Haley, N. Dak., in 1918.

[H. N. Lungwitz, hydrographer.]

Date.	Time.	Gage height.	Discharge.	Date.	Time.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 31	8. a. m.	9.65	5,460	Apr. 2	5 p. m.	5.65	506
31	12 m.	9.85	5,810	3	9 a. m.	4.05	292
Apr. 1	9 a. m.	7.95	2,040	3	3 p. m.	3.85	270
1	11 a. m.	7.65	1,760	4	9 a. m.	3.15	218
1	2 p. m.	7.35	1,550	4	5 p. m.	2.75	215
1	5 p. m.	7.25	1,460	5	6 p. m.	2.55	144
2	9 a. m.	5.55	620	[a]Aug. 15	3 p. m.	.69	.21
2	2 p. m.	5.35	562				

[a] Measurement made by W. B. Stevenson.

Daily gage height, in feet, of North Branch of Grand River at Haley, N. Dak., for 1918.

[H. N. Lungwitz, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Nov.	Dec.
1	0.8	0.7	.....	7.55	0.9	0.8	0.8	0.8	0.8	0.7	0.7
2	.....	.8	.....	5.55	.9	.8	.8	.8	.8	.7	.7
3	.....	.8	.....	3.9	.9	.8	.8	.8	.8	.7	.7
4	.....	.8	.....	2.85	.9	.8	.8	.8	.8	.7	.7
5	.....	.8	.....	2.55	.9	.8	.8	.8	.8	.7	.7
6	.....	.8	.....	2.35	.9	.8	.8	.8	.8	.7	.7
7	.....	.8	.....	2.2	.9	.8	.8	.8	.8	.7	.7
8	.....	.8	.....	1.95	.9	.8	.8	.8	.8	.7	.....
9	.....	.....	.....	1.85	.9	.8	.8	.8	.8	.7	.....
10	.....	1.1	1.1	1.75	.9	.8	.8	.8	.8	.7	.....
11	.....	.....	1.1	1.6	.8	.8	.8	.8	.8	.7	.....
12	.8	.....	1.1	1.45	.8	.8	.8	.8	.7	.7	.....
13	.8	.....	1.1	1.35	.8	.8	.8	.8	.7	.7	.....
14	.8	.....	1.1	1.2	.8	.8	1.1	.8	.7	.7	.....
15	.8	.....	1.1	1.1	.8	.8	2.25	.8	.7	.7	.....
16	.8	.....	.....	1.0	.8	.8	2.15	.8	.7	.7	.....
17	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
18	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
19	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
20	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
21	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
22	.7	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
23	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
24	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
25	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
26	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
27	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
28	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
29	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
30	.7	.....	2.0	.9	.8	.8	.8	.8	.7	.7	.....
31	.7	.....	9.85	.....	.....	.....	.8	.8	.....	.7	.....

NOTE.—Discharge relation affected by ice Jan. 1 to Mar. 29 and Nov. 8 to Dec. 31.

Daily discharge, in second-feet, of North Branch of Grand River at Haley, N. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	2,040	3	1	1	1	1	0.3
2	.....	562	3	1	1	1	1	.3
3	.....	281	3	1	1	1	1	.3
4	.....	215	3	1	1	1	1	.3
5	.....	144	3	1	1	1	1	.3
6	.....	90	3	1	1	1	1	.3
7	.....	77	3	1	1	1	1	.3
8	.....	56	3	1	1	1	1	.3
9	.....	48	3	1	1	1	1	.3
10	.....	42	3	1	1	1	1	.3
11	.....	32	1	1	1	1	1	.3
12	.....	24	1	1	1	1	.3	.3
13	.....	18	1	1	1	1	.3	.3
14	.....	12	1	1	1	1	.3	.3
15	.....	8	1	1	1	1	.3	.3
16	.....	5	1	1	1	1	.3	.3
17	.....	3	1	1	1	1	.3	.3
18	.....	3	1	1	1	1	.3	.3
19	.....	3	1	1	8	1	.3	.3
20	.....	3	1	1	81	1	.3	.3
21	.....	3	1	1	72	1	.3	.3
22	.....	3	1	1	1	1	.3	.3
23	.....	3	1	1	1	1	.3	.3
24	.....	3	1	1	1	1	.3	.3
25	.....	3	1	1	1	1	.3	.3
26	.....	3	1	1	1	1	.3	.3
27	.....	3	1	1	1	1	.3	.3
28	.....	3	1	1	1	1	.3	.3
29	.....	3	1	1	1	1	.3	.3
30	60	3	1	1	1	1	.3	.3
31	4,800	.....	1	.....	1	1	.....	.3

NOTE.—Daily discharge Apr. 6 to Oct. 31 determined from a curve poorly defined below 250 second-feet. Discharge Mar. 31 and Apr. 1–5 estimated from current meter measurements made on those days.

Monthly discharge of North Branch of Grand River at Haley, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	2,040	3	123	7,330	B.
May	3	1	1.65	101	D.
June	1	1	1.00	60	D.
July	81	1	6.06	373	C.
August	1	1	1.00	62	D.
September	1	.3	.56	33	D.
October	.3	.3	.30	18	D.
The period	.....	.....	.....	7,980	

GRAND RIVER NEAR WAKPALA, S. DAK.

Location.—On the Standing Rock Indian Reservation, a new steel highway bridge, 4 miles south of Wakpala, S. Dak., a station on Chicago, Milwaukee & St. Paul Railway, in or near sec. 8, T. 19 N., R. 29 E.

Records available.—September 9, 1911, to December 31, 1913.

Drainage area.—5,300 square miles.

Gage.—Standard chain gage on foot guardrail at downstream side of highway bridge.

Control.—Shifting; bed composed of soft silt or quicksand.

Discharge measurements.—Made from highway bridge; at very low stages measurements may be made by wading at the ford 40 rods below the bridge.

Accuracy.—Results poor, owing to infrequency of gage readings and measurements and shifting character of the stream.

Discharge measurements of Grand River near Wakpala, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	W. B. Stevenson	6.11	836	Aug. 17	W. B. Stevenson	3.10	22.6
June 18	do	4.42	188	Sept. 17	do	2.32	0.18
Aug. 16	do	3.29	34	Nov. 1	O. Christianson	2.70	13

Daily gage height, in feet, of Grand River near Wakpala, S. Dak., for 1913.

[George Baine, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				5.8	3.1		2.1	2.7
2	7.6							
3	12.9							
4						2.4	2.3	
5	12.9		3.75	4.35	3.15			
6			3.85	4.35		2.5		
7			2.75				3.9	
8		3.35			2.95			
9	6.11			4.15			4.0	
10			4.15			2.3		
11							3.2	
12		3.25		3.55	3.55			
13	5.05	3.35				2.2	3.1	
14		3.25	3.55					
15								
16		3.25			3.3			
17				3.5	3.1	2.0		
18	4.25		4.4		2.9		2.9	
19			4.2	3.4		2.0		
20			4.1					
21		3.55		3.35				
22					3.0			
23			4.0				2.9	
24		4.15		4.45		1.8		
25					2.7		2.8	
26		3.85	4.5					
27						2.0		
28			6.3			2.2		
29			6.1					
30			5.8	3.8	2.5	2.1		
31		3.85						

Daily discharge, in second-feet, of Grand River near Wakpala, S. Dak., for 1914.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	600	80	90	670	22	2	0.1	13
2	1,300	70	90	565	24	2	.1	.....
3	3,160	70	80	425	26	1	.2	.....
4	3,160	60	80	252	29	1	.2	.....
5	3,160	60	80	180	32	1.5	12	.....
6	2,560	50	90	180	25	2	36	.....
7	1,970	50	80	160	20	1.2	96	.....
8	1,380	40	100	144	15	1	103	.....
9	780	40	120	136	20	1	110	.....
10	690	40	140	136	25	.2	54	.....
11	590	30	120	57	37	.2	28	.....
12	500	30	100	57	57	.1	25	.....
13	410	40	80	57	57	.1	22	.....
14	360	30	60	57	47	.1	22	.....
15	310	30	90	53	40	.1	18	.....
16	260	30	120	52	35	.2	17	.....
17	210	30	160	52	22	.2	15	.....
18	160	40	190	48	13	.2	13	.....
19	150	40	140	43	13	.2	13	.....
20	150	50	130	41	15	.2	13	.....
21	140	60	120	39	17	.1	13	.....
22	140	90	120	43	17	.1	13	.....
23	130	110	110	110	12	.1	13	.....
24	130	140	150	206	8	.1	10	.....
25	120	120	180	176	6	.1	9	.....
25	110	90	220	151	6	.1	10	.....
27	110	90	530	130	4	.1	10	.....
28	100	90	840	111	3	.1	11	.....
29	90	90	780	93	2	.1	12	.....
30	90	90	670	84	2	.1	12	.....
31	.....	90	.....	60	2	.....	12	.....

NOTE.—Discharge determined from a fairly well defined curve. Discharge interpolated or estimated for days for which gage heights are missing.

Monthly discharge of Grand River near Wakpala, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	3,160	90	767	45,700	D.
May	140	30	64.0	3,910	C.
June	840	60	195	11,600	C.
July	670	39	147	9,460	C.
August	57	2	21.1	1,300	B.
September	2	.1	.52	31	D.
October	110	.1	23.3	1,430	C.
The period	.....	.....	.....	73,400	

CHEYENNE RIVER BASIN.

BELLE FOURCHE RIVER NEAR BELLEFOURCHE, S. DAK.

Location.—At the diversion dam of the Belle Fourche irrigation project, in sec. 2, T. 8 N., R. 2 E., 1½ miles below Bellefourche.

Records available.—May 10 to November 30, 1906; January 1, 1912, to December 31, 1913. From May 26, 1903, to June 23, 1906, a station was maintained at the western edge of Bellefourche. The records at the two points are not directly comparable, as Redwater River enters between and water is diverted from Belle Fourche River.

Drainage area.—4,270 square miles.

Gage.—An inclined staff situated 300 feet below the diversion dam shows the flow passing the diversion dam.

Cooperation.—Station maintained and records furnished by United States Reclamation Service.

Daily discharge, in second-feet, of Belle Fourche River near Bellefourche, S. Dak., for 1913.

[William Francisco, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	260	260	330	5,450	450	220	755	185	95	490	275	245
2	260	260	400	5,450	450	220	755	185	95	490	275	245
3	260	260	400	4,180	450	600	450	185	95	490	275	245
4	260	260	400	2,720	442	220	450	185	95	490	275	245
5	260	260	475	2,720	430	280	400	185	95	512	275	245
6	260	260	475	2,720	430	220	300	185	95	420	275	245
7	260	260	475	2,190	430	220	200	185	94	400	275	245
8	260	260	550	1,250	320	450	200	1,350	150	350	275	245
9	260	260	850	1,570	420	380	200	620	185	320	275	245
10	260	260	2,120	1,360	405	290	185	400	200	320	275	245
11	260	260	1,720	1,267	320	290	185	320	210	320	275	245
12	260	260	1,250	970	160	260	170	280	220	320	275	245
13	260	260	1,250	970	635	335	120	240	220	320	270	245
14	260	330	1,040	970	305	290	130	210	220	320	270	245
15	260	330	1,040	970	325	275	150	210	280	320	270	245
16	260	400	625	1,120	305	220	150	280	1,580	320	270	245
17	260	587	475	1,270	290	220	160	200	1,360	320	270	245
18	260	555	475	1,195	290	185	160	160	1,825	320	270	245
19	260	400	475	1,020	290	185	100	150	900	320	270	245
20	260	330	475	1,040	290	185	100	100	630	320	270	245
21	260	320	475	870	290	220	100	100	460	320	270	245
22	260	330	475	870	290	970	95	95	380	320	270	245
23	260	400	475	795	230	755	100	95	360	320	260	245
24	260	400	475	795	225	755	100	95	320	320	260	245
25	260	400	550	720	205	445	160	95	500	320	260	245
26	260	320	550	650	205	355	170	95	620	320	250	245
27	260	320	550	650	205	355	170	95	530	320	245	245
28	260	320	550	580	160	355	170	95	531	320	245	245
29	260	.....	700	515	220	1,697	177	95	540	320	245	245
30	260	.....	1,720	450	220	1,040	185	95	490	320	245	245
31	260	.....	2,725	.....	220	.....	250	95	.....	320	.....	245

NOTE.—Records show the combined flow of the river and canal at the diversion dam.

Monthly discharge of Belle Fourche River near Bellefourche, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	260	260	260	16,000	C.
February	587	260	326	18,100	C.
March	2,720	330	792	48,700	B.
April	5,450	450	1,580	94,000	B.
May	635	160	320	19,700	B.
June	1,700	185	416	24,800	B.
July	755	95	226	13,900	B.
August	1,350	95	221	13,600	B.
September	1,820	94	446	26,500	B.
October	512	320	355	21,800	B.
November	275	245	267	15,900	B.
December	245	245	245	15,100	C.
The year	5,450	94	454	328,000	

NOTE.—Estimates as furnished have been changed slightly to conform to the standard computation rules of United States Geological Survey.

WHITE RIVER BASIN.

WHITE RIVER NEAR INTERIOR, S. DAK.

Location.—On the Pine Ridge Indian Reservation, at steel highway bridge near southwest corner of sec. 7, T. 4 S., R. 18 E., where the county line between Stanley and Pennington counties intersects White River, 3 miles southwest of Interior, S. Dak., a station on Chicago, Milwaukee & St. Paul Railway.

Records available.—June 24, 1904, to November 30, 1906, at old station in T. 3 S., R. 18 E.; August 24, 1911, to December 31, 1913.

Drainage area.—4,090 square miles. The area above present site is about 15 square miles less than area above the station maintained during 1904–1906.

Gage.—A vertical rod attached to lower side of first pier (nearest the shore) at left end of the bridge, installed August 31, 1911, and supposed to read the same at the temporary rod gage which was placed August 24 on a tree on left bank at turn of the river near southwest corner of NW. ¼ sec. 17.

Control.—Probably changes gradually; bed composed of sand and some quicksand; left bank steep and clean; right bank gently sloping and clean; current, medium. At low stages all the water may pass under one span (67-foot); at highest stage the water passes under two 67-foot spans and 120 feet of trestle approach, but probably two-thirds of the flow passes under the two spans.

Discharge measurements.—Made from highway bridge.

Winter flow.—Relation of gage height to discharge probably affected by ice during January, February, March, and December.

Accuracy.—Results fair.

Discharge measurements of White River near Interior, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 6	W. B. Stevenson	6.42	2,130	Aug. 21	W. B. Stevenson	3.98	95
June 14	do	6.27	1,650	Sept. 20	do	3.68	40
15	do	5.11	523	Oct. 28	O. Christianson	3.50	6.2
Aug. 20	do	4.11	144				

Monthly discharge of White River near Interior, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March			20.0	1,230	D.
April	1,790	105	740	44,000	B.
May	2,880	42	316	19,400	B.
June	4,720	26	756	45,000	B.
July	1,250	13	153	9,410	B.
August	1,370	13	281	17,300	B.
September	365	12	58.2	3,460	B.
October	248		52.8	3,250	B.
November	135		42.2	2,510	B.
December	90		22.5	1,380	C.
The period				147,000	

WHITE RIVER NEAR WESTOVER, S. DAK.

Location.—In sec. 32, T. 3 S., R. 29 E., on the Rosebud Indian Reservation at steel highway bridge near Westover about 12 miles south and slightly east from Murdo, S. Dak., a station on Chicago, Milwaukee & St. Paul Railway, and about 1 mile below entrance of Little White River; about 40 rods above location of original station, established in 1911.

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

Drainage area.—7,850 square miles.

Gage.—Standard chain gage on steel highway bridge. Gage zero is 2.0 feet higher than zero of original gage installed in 1911. August 18, 1913, a staff gage reading same as chain gage was fastened to downstream face of left abutment. This gage was installed in order to obtain more frequent and accurate readings.

Control.—Composed of sand and silt; likely to scour and fill at flood stages.

Discharge measurements.—Made from highway bridge.

Winter flow.—Affected by ice.

Discharge measurements of White River near Westover, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 7	W. B. Stevenson	9.88	4,329	Aug. 19	W. B. Stevenson	8.18	899
June 15	do	9.48	3,373	Sept. 18	do	6.98	185
16	do	8.67	1,673	Oct. 30	O. Christianson	6.96	82
Aug. 18	do	8.81	1,940				

Daily gage height, in feet, of White River near Interior, S. Dak., for 1913.

[H. Thompson and George Carlbom, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.9	4.0	6.0	3.5	3.2	3.3	3.41	3.68	3.62
2	.....	5.8	3.9	6.1	3.5	3.2	3.25	3.4	3.68	3.66
3	.....	5.9	3.8	6.75	3.5	3.2	3.22	3.4	3.65	3.9
4	5.0	6.1	3.8	7.45	3.5	3.2	4.02	3.4	3.7	3.95
5	5.4	6.3	3.8	6.6	3.4	3.2	3.98	4.2	3.65	4.45
6	5.6	6.3	3.8	6.0	3.4	3.2	3.66	4.42	4.0	4.4
7	5.4	6.2	3.7	5.5	3.3	3.3	3.88	4.4	4.1	3.95
8	5.3	6.0	3.7	4.9	3.3	3.3	3.65	4.1	3.92	3.78
9	5.2	5.5	3.8	4.4	3.3	3.3	3.55	3.78	3.75	3.9
10	5.1	5.1	3.8	4.4	5.5	6.0	3.45	3.8	3.70	3.96
11	5.1	5.9	3.9	4.4	4.9	5.6	3.32	3.78	3.65	3.94
12	5.0	5.9	3.9	4.4	3.9	5.0	3.18	3.6	3.63	4.1
13	5.0	5.8	6.0	4.7	3.5	4.9	3.3	3.75	3.6	3.98
14	4.8	5.4	6.95	8.0	3.4	5.0	3.3	3.62	3.6	.....
15	4.8	5.0	6.0	5.6	3.4	5.1	3.38	3.6	3.6	.....
16	4.8	4.9	5.3	4.6	3.4	5.4	3.75	3.6	3.6	.....
17	4.9	4.9	4.8	4.2	3.4	6.0	4.7	3.6	3.6	.....
18	4.9	4.7	4.4	4.1	3.4	5.5	4.68	3.59	3.62	.....
19	4.8	4.6	4.1	4.1	5.9	5.0	4.0	3.58	3.62	.....
20	4.8	4.6	4.1	4.0	5.6	4.5	3.7	3.58	3.62	3.9
21	4.8	4.5	4.0	4.0	4.9	4.0	3.52	3.58	3.62	.....
22	4.8	4.8	4.0	3.9	4.1	3.92	3.5	3.58	3.63	.....
23	4.8	4.8	4.0	3.9	3.9	3.85	3.48	3.58	3.7	.....
24	4.8	4.5	3.9	3.9	3.6	3.65	3.65	3.6	3.68	.....
25	4.8	4.3	3.9	3.9	3.4	3.52	3.75	3.6	3.66	.....
26	4.8	4.2	3.9	3.8	3.6	3.5	3.58	3.6	3.64	.....
27	4.8	4.0	4.0	3.8	3.6	3.55	3.52	3.6	3.65	.....
28	4.9	4.0	4.0	3.6	3.4	3.42	3.5	3.68	3.66	.....
29	4.9	4.0	5.0	3.6	3.3	3.42	3.46	3.7	3.65	.....
30	5.0	4.1	4.5	3.5	3.2	3.45	3.4	3.7	3.62	.....
31	5.4	.....	4.5	.....	3.2	3.42	.....	3.69	.....	.....

NOTE.—Discharge relation affected by ice Mar. 4–31 and Dec. 3–31. After Aug. 20 gage record may be assumed to be more accurate, owing to fact that new observer lives nearer the gage and can note sudden changes.

Daily discharge, in second-feet, of White River near Interior, S. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5	1,250	105	1,370	26	13	16	20	19	35
2	5	1,140	75	1,500	26	13	14	20	19	38
3	7	1,250	55	2,630	26	13	14	20	23	33
4	10	1,500	55	3,745	26	13	111	20	33	30
5	20	1,790	55	2,290	20	13	100	170	38	90
6	33	1,790	55	1,370	20	13	39	248	105	55
7	20	1,640	42	850	16	16	71	240	135	18
8	16	1,370	42	460	16	16	38	135	81	15
9	12	850	55	240	16	16	30	53	48	20
10	10	565	55	240	850	1,370	23	55	42	38
11	10	1,250	75	240	460	940	17	53	38	36
12	7	1,250	75	240	75	510	12	33	36	20
13	7	1,140	1,370	365	26	460	16	48	33	15
14	7	765	2,885	4,720	20	510	16	35	33	15
15	7	510	1,370	940	20	565	19	33	33	15
16	7	460	690	320	20	765	48	33	33	.....
17	10	460	410	170	20	1,370	365	33	33	.....
18	10	365	240	135	20	850	356	32	35	.....
19	7	320	135	135	1,250	510	105	32	35	.....
20	7	320	135	105	940	280	42	32	35	.....
21	13	280	105	105	460	105	29	32	35	.....
22	13	410	105	75	135	81	26	32	36	.....
23	13	410	105	75	75	65	25	32	42	.....
24	13	280	75	75	33	38	38	33	41	.....
25	13	205	75	75	20	27	48	33	39	.....
26	16	170	75	55	33	26	32	33	37	.....
27	16	105	105	55	33	30	27	20	38	.....
28	20	105	105	33	20	21	26	19	39	.....
29	20	105	510	33	16	21	24	20	38	.....
30	26	135	280	26	13	23	20	20	35	.....
31	240	.....	280	.....	13	21	.....	19	.....	.....

NOTE.—Discharge Mar. 1–31 and Dec. 3–31 estimated on account of ice. Mean discharge Dec. 16 to 31 estimated at 14 second-feet. Discharge Apr. 1 to Dec. 2 determined from a fairly well defined curve.

Monthly discharge of White River near Westover, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	6,660	193	1,980	118,000	D
May	4,590	166	912	56,100	C.
June	4,360	141	1,030	61,300	C.
July	750	169	283	17,400	C.
August	4,360	118	473	29,100	B.
September	495	97	171	10,200	B.
October	430	166	194	11,900	C.
November	222	141	166	9,870	D.
The period				314,000	

LITTLE WHITE RIVER NEAR WESTOVER, S. DAK.

Location.—At C. H. Kendall's ranch, on the Rosebud Indian Reservation, about 4 miles south of Westover and about 2 miles above mouth of the stream.

Records available.—June 26, 1912, to December 31, 1913.

Drainage area.—1,590 square miles.

Gage.—Standard projecting timber chain gage installed September 18, 1913, about 5 or 6 rods below the cable and on right bank. A staff gage about 10 rods below cable was used during 1913 prior to September 18. A staff gage about 30 rods below the cable was used during 1912. All gages have been referred to the same datum.

Control.—Sandy and shifting.

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

Winter flow.—Affected by ice.

Accuracy.—Gage heights for 1913 considered more accurate than those for 1912, owing to better position of gages. As sufficient measurements were obtained to define a curve, results should be fair.

Discharge measurements of Little White River near Westover, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 8	W. B. Stevenson	2.89	645	Sept. 19	W. B. Stevenson	1.86	47
June 16	do	1.99	78	Oct. 30	O. Christianson	2.09	160
Aug. 19	do	1.98	58				

Daily gage height, in feet, of White River near Westover, S. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	8.2	8.5	7.0	6.9	6.7	7.0	6.9	7.2
2	.....	.....	8.2	8.3	7.0	6.9	6.7	7.0	6.9	7.2
3	.....	9.0	8.2	8.9	7.0	6.9	6.7	7.0	6.9	7.2
4	.....	.....	8.2	9.9	6.9	6.9	6.7	7.0	6.9	7.3
5	.....	.....	8.1	9.5	7.0	6.9	6.7	6.9	6.9	7.3
6	.....	.....	8.0	8.3	6.9	6.9	6.7	6.9	6.9	7.3
7	.....	10.2	8.0	8.9	7.0	6.9	6.7	7.0	6.9	7.4
8	.....	.....	7.8	8.9	7.0	6.9	6.65	7.6	6.9	7.4
9	.....	.....	7.8	8.4	6.9	6.8	6.65	7.5	6.9	7.5
10	.....	.....	7.9	7.9	6.9	6.8	6.6	7.2	6.8	7.7
11	.....	8.5	8.0	7.7	7.5	6.8	6.6	7.0	6.8	7.7
12	9.0	8.0	6.9	8.3	7.4	6.9	6.6	7.0	6.8	7.7
13	.....	10.0	6.9	7.7	7.5	6.9	6.6	7.0	6.8	7.7
14	.....	10.9	6.9	7.3	7.6	7.5	6.6	7.0	6.8	7.7
15	.....	9.5	7.0	8.9	7.5	7.3	6.6	7.0	6.8	7.9
16	.....	9.6	10.0	8.8	8.0	7.3	6.6	7.0	6.8	7.9
17	.....	7.9	9.0	8.3	7.7	7.2	6.6	6.9	6.8	7.9
18	.....	8.0	9.0	7.9	7.4	9.9	7.0	6.9	6.8	7.9
19	.....	8.3	8.5	7.8	7.3	9.0	7.2	6.9	6.8	7.9
20	.....	8.4	8.3	7.6	7.2	8.6	7.7	6.9	6.9	7.9
21	.....	7.2	8.2	7.5	7.5	8.1	7.6	6.9	6.9	7.9
22	.....	7.0	8.1	7.3	7.5	7.8	7.4	6.9	6.9	8.0
23	.....	7.6	8.1	7.0	7.5	7.6	7.2	6.9	7.0	.....
24	.....	7.3	8.1	7.0	7.4	7.4	7.2	6.9	7.0	.....
25	.....	7.2	7.7	6.8	7.3	7.0	7.1	6.9	7.1	.....
26	.....	7.1	7.7	7.4	7.2	6.9	7.0	6.9	7.0	.....
27	.....	7.9	7.5	7.3	7.1	6.9	7.0	6.9	7.0	.....
28	.....	8.4	7.4	7.3	7.0	6.7	7.0	6.9	7.0	.....
29	.....	8.4	7.8	7.1	6.9	6.7	6.9	6.9	7.0	.....
30	.....	8.3	7.7	7.0	6.9	6.7	6.8	6.9	7.0	.....
31	.....	.....	.....	.....	6.9	6.7	.....	6.9	.....	.....

NOTE.—Discharge relation probably affected by ice during January, February, March, and December.

Daily discharge, in second-feet, of White River near Westover, S. Dak., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	655	970	1,230	193	166	118	193	166
2	1,230	970	1,095	193	166	118	193	166
3	2,290	970	2,075	193	166	118	193	166
4	2,980	970	4,360	166	166	118	193	166
5	3,670	855	3,440	193	166	118	166	166
6	4,360	750	1,095	193	166	118	166	166
7	5,050	750	2,075	193	166	118	193	166
8	3,900	570	2,075	193	166	108	430	166
9	2,980	570	1,230	166	141	108	375	166
10	2,075	655	655	166	141	97	254	141
11	1,375	750	495	375	141	97	193	141
12	750	166	1,095	330	166	97	193	141
13	4,590	166	495	375	166	97	193	141
14	6,660	166	290	430	375	97	193	141
15	3,440	193	2,075	375	290	97	193	141
16	3,670	4,590	1,875	750	290	97	193	141
17	655	2,290	1,095	495	254	97	166	141
18	750	2,290	655	330	4,360	193	166	141
19	1,095	1,375	570	290	2,290	254	166	141
20	1,230	1,095	430	254	1,530	495	166	166
21	254	970	375	375	855	430	166	166
22	193	855	290	375	570	330	166	166
23	430	855	193	375	430	254	166	193
24	290	855	193	330	330	254	166	193
25	254	495	141	290	193	222	166	222
26	222	495	330	254	166	193	166	193
27	655	375	290	222	166	193	166	193
28	1,230	330	290	193	118	193	166	193
29	1,230	570	222	166	118	166	166	193
30	1,095	495	193	166	118	141	166	193
31	.....	862	.....	166	118	.....	166	.....

NOTE.—Discharge determined from a fairly well-defined curve. Discharge interpolated on days for which gage heights are missing.

Daily gage height, in feet, of Little White River near Westover, S. Dak., for 1913.

[Mrs. C. H. Kendall, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	3.3	2.0	2.0	1.95	1.9	1.9	1.9	2.0	2.2
2	.....	.....	.....	3.2	2.0	2.0	1.95	1.9	1.9	1.9	2.1	2.5
3	.....	.....	.....	3.3	2.0	.....	1.95	1.9	1.95	1.9	2.1	2.5
4	.....	.....	.....	3.3	.....	2.02	.....	1.9	1.9	1.9	.....	2.5
5	2.9	.....	.....	3.3	2.1	2.0	1.95	1.9	1.9	1.9	2.1	2.4
6	2.9	.....	.....	.....	2.1	2.0	1.95	1.9	1.9	1.9	2.1	2.5
7	2.9	.....	2.6	.....	.....	2.0	1.95	1.9	1.9	1.9	2.1	2.45
8	2.9	.....	2.5	2.9	2.1	.....	1.95	1.9	1.9	1.9	2.1	2.45
9	2.9	.....	.....	2.9	2.0	2.0	1.95	1.9	1.9	1.9	2.1	2.45
10	2.9	.....	.....	2.95	2.0	2.0	2.2	1.95	1.9	.....	2.1	2.4
11	2.9	.....	.....	2.85	2.2	2.0	2.25	1.92	1.9	1.9	2.1	2.4
12	.....	2.9	.....	2.4	2.1	2.0	2.4	1.9	1.9	.....	2.14	2.4
13	.....	2.95	.....	2.5	2.1	2.0	2.0	1.9	1.9	1.9	2.12	2.4
14	.....	2.95	.....	2.7	2.2	2.0	2.0	1.9	1.9	.....	2.1	2.4
15	.....	2.95	.....	.....	2.0	2.0	2.0	1.9	1.92	1.9	2.1	2.4
16	.....	.....	.....	2.7	2.0	2.0	2.0	1.9	1.9	1.9	2.1	2.4
17	.....	.....	.....	2.6	2.0	2.1	2.55	1.9	1.9	1.9	2.12	2.45
18	.....	.....	.....	2.6	2.0	2.05	2.3	1.9	.....	.....	2.2	2.5
19	.....	.....	.....	2.4	.....	2.0	2.0	2.0	1.9	1.9	2.2	2.5
20	.....	.....	.....	.....	2.0	2.0	1.95	1.9	1.9	1.9	2.2	2.5
21	.....	.....	.....	2.4	2.05	2.2	1.9	1.8	1.9	1.9	2.2	.....
22	.....	.....	.....	2.3	2.0	2.2	1.9	1.8	1.9	1.9	2.2	2.5
23	2.9	.....	.....	2.3	2.0	2.1	1.9	1.75	1.9	1.9	2.2	2.5
24	2.9	.....	.....	2.4	2.0	2.0	2.1	1.9	1.9	1.9	2.22	2.5
25	2.95	.....	.....	2.6	.....	2.0	2.0	1.9	1.9	1.9	2.22	2.5
26	2.9	.....	.....	2.6	2.1	2.0	2.0	1.9	1.9	1.95	2.2	2.5
27	2.95	.....	.....	.....	2.2	2.05	.....	1.95	1.9	1.95	2.2	2.45
28	2.95	.....	3.2	2.0	2.2	2.05	1.95	1.9	1.9	2.0	2.2	2.6
29	2.9	.....	3.3	2.0	2.7	.....	1.9	1.9	1.9	.....	2.18	2.7
30	.....	.....	3.3	2.0	2.7	2.08	1.9	1.9	1.9	2.0	.....	3.0
31	.....	.....	3.4	.....	2.58	.....	1.9	.....	.....	2.0	.....	3.0

NOTE.—Discharge relation probably affected by ice during January, February, March, and December.

Daily discharge, in second-feet, of Little White River near Westover, S. Dak., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	962	75	75	62	49	49	49	75
2	884	75	75	62	49	49	49	113
3	962	75	75	62	49	62	49	113
4	962	94	83	62	49	49	49	113
5	962	113	75	62	49	49	49	113
6	962	113	75	62	49	49	49	113
7	807	113	75	62	49	49	49	113
8	653	113	75	62	49	49	49	113
9	653	75	75	62	49	49	49	113
10	691	75	75	161	62	49	49	113
11	614	161	75	189	54	49	49	113
12	281	113	75	281	49	49	49	132
13	349	113	75	75	49	49	49	123
14	499	161	75	75	49	49	49	113
15	499	75	75	75	49	54	49	113
16	499	75	75	75	49	49	49	113
17	422	75	113	385	49	49	49	123
18	422	75	94	217	49	49	49	161
19	281	75	75	75	75	49	49	161
20	281	75	75	62	49	49	49	161
21	281	94	161	49	35	49	49	161
22	217	75	161	49	35	49	49	161
23	217	75	113	49	31	49	49	161
24	281	75	75	113	49	49	49	172
25	422	75	75	75	49	49	49	172
26	422	113	75	75	49	49	62	161
27	217	161	94	75	62	49	62	161
28	75	161	94	62	49	49	75	161
29	75	499	100	49	49	49	75	151
30	75	499	105	49	49	49	75	161
31	.....	407	.....	49	49	.....	75	.....

NOTE.—Discharge determined from a fairly well defined curve.

Monthly discharge of Little White River near Westover, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	962	75	498	29,600	B.
May	499	75	134	8,240	B.
June	161	75	87.3	5,190	B.
July	385	49	94.3	5,800	B.
August	75	31	49.4	3,040	B.
September	62	49	49.6	2,950	B.
October	75	49	53.2	3,270	C.
November	172	75	134	7,970	C.
The period				66,100	

NIOBRARA RIVER BASIN.

NIOBRARA RIVER NEAR LYNCH, NEBR.

Location.—At the highway bridge in sec. 2, T. 32 N., R. 10 W., 5 miles south of Lynch. Nearest tributary, Red Bird Creek, enters below.

Records available.—August 1 to December 31, 1913.

Drainage area.—Approximately 9,800 square miles.

Gage.—Vertical staff.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Diversions.—Prior to September 1, 1912, there were approved diversions from Niobrara River of 306 second-feet for irrigation and 2,037 second-feet for power above the station, and 900 second-feet for power below. In Wyoming there are adjudicated diversions of 24 second-feet from the Niobrara and its tributaries.

Cooperation.—Station maintained in cooperation with the State engineer, who furnishes the field data.

Discharge measurements of Niobrara River near Lynch, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 29	D. P. Weeks, jr	2.00	897	Nov. 16	D. P. Weeks, jr	2.15	1,410
Aug. 21	do	2.10	1,150	Dec. 13	W. M. Jefferys	2.10	(a)
Sept. 19	Weeks and Follansbee.	2.31	1,330				

a River frozen.

Daily gage height, in feet, of Niobrara River near Lynch, Nebr., for 1913.

[N. E. Baker, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	2.1	2.3	2.0	2.1	16	2.3	.....	2.2	.....	2.3
2	2.2	2.2	2.4	.....	2.4	17	2.0	.....	.....	2.3	2.2
3	2.2	2.2	2.3	2.1	2.3	18	2.2	.....	2.2	2.2	2.1
4	2.2	2.2	2.3	2.1	2.4	19	2.2	.....	2.0	2.1	2.5
5	2.3	2.2	.....	2.0	2.3	20	2.3	2.3	2.2	2.1	2.4
6	2.3	2.1	.....	1.9	2.3	21	2.2	2.3	2.2	2.2	2.4
7	2.3	2.1	.....	2.0	2.3	22	2.2	2.3	2.1	2.3	.....
8	2.2	2.2	.....	1.9	2.3	23	2.3	2.4	2.0	2.2	.....
9	2.6	2.2	.....	2.1	2.2	24	2.0	2.4	2.2	2.1	.....
10	2.6	2.4	.....	2.1	.....	25	2.2	2.5	.....	2.1	.....
11	2.5	2.3	.....	.....	2.3	26	2.1	2.4	2.2	2.3	.....
12	2.2	2.2	.....	2.3	2.1	27	2.1	2.4	1.9	2.2	.....
13	2.3	2.2	2.2	2.3	2.1	28	2.1	2.5	2.0	2.2	2.4
14	2.2	2.3	2.3	2.3	2.2	29	2.1	2.4	.....	2.3	2.2
15	2.2	2.2	2.3	2.4	2.3	30	2.0	2.3	.....	2.2	.....
						31	2.1	.....	2.0	.....	.....

NOTE.—Channel shifted to opposite side Sept. 27. Ice present during the great part of December.

Daily discharge, in second-feet, of Niobrara River near Lynch, Nebr., for 1913.

Day.	Aug.	Sept.	Oct.	Nov.	Day.	Aug.	Sept.	Oct.	Nov.
1	970	1,150	1,370	1,200	16	1,330	1,240	1,370	1,410
2	1,050	1,240	1,480	1,250	17	1,050	1,270	1,370	1,580
3	1,050	1,240	1,370	1,300	18	1,240	1,300	1,370	1,470
4	1,050	1,240	1,370	1,300	19	1,240	1,330	1,180	1,360
5	1,140	1,240	1,360	1,200	20	1,330	1,330	1,370	1,360
6	1,140	1,150	1,360	1,170	21	1,240	1,330	1,370	1,470
7	1,140	1,150	1,350	1,260	22	1,240	1,330	1,270	1,580
8	1,050	1,240	1,350	1,170	23	1,330	1,480	1,180	1,470
9	1,550	1,240	1,340	1,360	24	1,000	1,480	1,370	1,360
10	1,670	1,440	1,340	1,360	25	1,240	1,600	1,370	1,360
11	1,550	1,330	1,330	1,470	26	1,150	1,480	1,370	1,580
12	1,240	1,240	1,330	1,580	27	1,150	1,480	1,120	1,470
13	1,330	1,240	1,320	1,580	28	1,150	1,600	1,200	1,470
14	1,240	1,330	1,430	1,580	29	1,150	1,480	1,200	1,580
15	1,240	1,240	1,430	1,710	30	1,050	1,370	1,200	1,470
					31	1,150		1,200	

NOTE.—Discharge determined by shifting channel methods.

Monthly discharge of Niobrara River near Lynch, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
August	1,670	970	1,210	74,400
September	1,600	1,150	1,330	79,100
October	1,480	1,120	1,320	81,200
November	1,710	1,170	1,420	84,500
The period				319,000

NIOBRARA RIVER AT NIOBRARA, NEBR.

Location.—At Government highway bridge spanning main channel in the SE. ¼ sec. 18, T. 32 N., R. 56 W., half a mile from the depot at Niobrara. The station is 1½ miles above the mouth. No tributaries enter below.

Records available.—August 19, 1910, to July 26, 1913, when station was discontinued in favor of station near Lynch, Nebr. From May 11, 1902, to October 25, 1902, a station was maintained at a highway bridge 1 mile southwest of Niobrara.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Extremely shifting. Station is possibly within the influence of backwater from Missouri River.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes backwater for short periods.

Diversions.—Prior to September 1, 1912, there were approved diversions of 561 second-feet for irrigation and 2,755 second-feet for power from Niobrara River above the station. There are also approved diversions of 180 second-feet for irrigation and 453 second-feet for power from tributaries entering above. In Wyoming there are adjudicated diversions of 24 second-feet from the Niobrara and tributaries.

Accuracy.—Owing to the shifting channel and the fact that no discharge measurements were made during 1913, no estimates of discharge have been made.

Cooperation.—Field data furnished by State engineer.

Daily gage height, in feet, of Niobrara River at Niobrara, Nebr., for 1913.

[A. T. Reid, observer.]

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1	1.9	1.7	1.8	1.8	16	1.8	1.7	1.8	2.0
2	1.8	2.0	1.8	1.8	17	1.7	1.7	1.9	2.0
3	1.7	2.1	1.9	1.8	18	1.7	1.7	1.9	2.1
4	1.8	2.0	1.8	1.8	19	1.7	1.8	1.9	2.0
5	1.8	1.9	1.8	1.8	20	1.8	2.1	1.8	2.0
6	1.6	1.8	1.8	1.8	21	1.7	2.0	1.9	2.1
7	1.8	1.8	1.7	1.8	22	1.7	1.9	2.0	2.0
8	1.7	1.9	1.8	1.9	23	2.0	1.9	2.0	2.0
9	1.8	2.0	1.8	1.9	24	2.1	1.8	1.9	2.1
10	1.8	1.9	1.8	1.9	25	1.9	1.8	1.8	2.1
11	1.7	1.8	1.9	2.2	26	1.8	1.8	1.8	2.0
12	1.9	1.9	1.8	2.1	27	1.7	1.7	1.9	.....
13	2.2	3.0	1.8	2.6	28	1.6	1.7	2.0	.....
14	2.0	2.1	1.8	1.9	29	1.7	1.8	1.9	.....
15	1.9	1.6	1.8	2.0	30	1.7	1.7	1.8	.....
					31	.....	1.8	.....	.....

BIG SIOUX RIVER BASIN.

ROCK RIVER AT LUVERNE, MINN.

Location.—At Chicago, Rock Island & Pacific Railway bridge at Luverne, 3½ mile above mouth of Elk Creek.

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

Drainage area.—440 square miles.

Gage.—Vertical staff gage.

Control.—Shifting at high stages; probably permanent at low stages.

Winter flow.—Affected by ice; observations discontinued.

Regulation.—Low rock dam above gage does not regulate the flow, but raises water level about 2 feet; discharge relation not affected thereby.

Accuracy.—Owing to the liability to shift, the records can not be considered better than fair.

Discharge measurements of Rock River at Luverne, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 23	S. B. Soulé	4.07	342
Sept. 27	B. J. Peterson	1.51	9.2
27	.....do	1.51	9.1

Daily gage height, in feet, of Rock River at Luverne, Minn., for 1913.

[C. W. Pinkerton, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	2.2	2.45	2.6	2.55	1.95	1.5	1.55	1.65
2	2.0	2.2	2.4	2.35	2.3	1.9	1.5	1.5	1.6
3	1.95	2.15	2.35	2.2	2.1	1.95	1.5	1.5	1.6
4	1.9	2.15	2.25	2.15	1.95	1.85	1.5	1.6	1.6
5	1.8	2.1	2.15	2.1	1.85	1.8	1.5	1.6	1.6
6	1.85	2.05	2.1	2.0	1.8	1.8	1.5	1.6	1.6
7	1.85	2.05	2.05	1.95	1.7	1.8	1.5	1.6	1.6
8	1.8	2.1	1.9	1.9	1.7	1.7	1.55	1.65	1.6
9	1.8	2.1	1.9	1.8	1.7	1.7	1.6	1.6	1.6
10	1.8	2.1	1.9	1.8	1.65	1.7	1.65	1.6	1.6
11	1.75	2.0	1.9	1.85	1.7	1.65	1.7	1.6	1.6
12	1.8	2.0	1.85	1.85	1.7	1.6	1.7	1.6	1.6
13	1.8	2.1	1.8	1.8	1.65	1.6	1.7	1.6	1.6
14	2.4	2.2	1.8	1.9	1.6	1.55	1.7	1.6	1.55
15	2.9	2.3	1.8	1.9	1.6	1.5	1.7	1.6	1.5
16	4.2	2.45	1.8	1.85	1.6	1.5	1.65	1.6	1.5
17	4.2	2.5	1.75	1.8	1.55	1.5	1.65	1.6	1.5
18	4.3	2.45	1.7	1.8	1.55	1.5	1.6	1.6	1.5
19	3.7	2.4	1.7	1.7	1.55	1.5	1.6	1.6	1.5
20	3.1	2.8	1.8	1.7	2.2	1.5	1.6	1.6	1.5
21	2.55	3.0	1.75	1.7	1.75	1.5	1.6	1.6	.....
22	2.25	4.3	1.8	1.65	2.3	1.5	1.6	1.6	.....
23	2.4	4.0	1.9	1.6	3.2	1.5	1.6	1.65	.....
24	2.9	3.5	1.85	1.6	3.8	1.55	1.6	1.7	.....
25	3.5	2.9	1.8	1.65	3.3	1.55	1.55	1.7	.....
26	3.65	2.9	1.8	1.65	2.9	1.55	1.55	1.7	.....
27	3.2	2.9	2.0	1.6	2.65	1.5	1.55	1.7	.....
28	2.85	3.0	3.4	1.6	2.45	1.5	1.55	1.7	.....
29	2.5	3.1	4.1	1.6	2.25	1.6	1.6	1.65	.....
30	2.3	2.8	3.25	1.7	2.1	1.5	1.6	1.65	.....
31	.....	2.55	.....	2.2	2.05	.....	1.55	.....	.....

Daily discharge, in second-feet, of Rock River at Luverne, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	32	49	74	92	86	28	8	9	12
2	32	49	69	64	59	25	8	8	10
3	28	44	64	49	40	28	8	8	10
4	25	44	54	44	28	22	8	10	10
5	19	40	44	40	22	19	8	10	10
6	22	36	40	32	19	19	8	10	10
7	22	36	36	28	14	19	8	10	10
8	19	40	25	25	14	14	9	12	10
9	19	40	25	19	14	14	10	10	10
10	19	40	25	19	12	14	12	10	10
11	16	32	25	22	14	12	14	10	10
17	19	32	22	22	14	10	14	10	10
13	19	40	19	19	12	10	14	10	10
14	69	49	19	25	10	9	14	10	9
15	134	59	19	25	10	8	14	10	8
16	394	74	19	22	10	8	12	10	8
17	394	80	16	19	9	8	12	10	8
18	416	74	14	19	9	8	10	10	8
19	285	69	14	14	9	8	10	10	8
20	167	118	19	14	49	8	10	10	8
21	86	150	16	14	16	8	10	10	8
22	54	416	19	12	59	8	10	10	8
23	69	350	25	10	185	8	10	12	7
24	134	245	22	10	306	9	10	14	7
25	245	134	19	12	205	9	9	14	7
26	275	134	19	12	134	9	9	14	7
27	185	134	32	10	98	8	9	14	7
28	126	150	225	10	74	8	9	14	6
29	80	167	372	10	54	10	10	12	6
30	59	118	195	14	40	8	10	12	6
31	.....	86	.....	49	36	.....	9	.....	6

NOTE.—Discharge determined from a fairly well-defined curve. Discharge Dec. 21–31 estimated.

Monthly discharge of Rock River at Luverne, Minn., for 1913.

[Drainage area, 440 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	416	16	115	0.261	0.29	6,840	B.
May	416	32	101	.230	.27	6,210	B.
June	372	14	52.9	.120	.13	3,150	B.
July	92	10	25.0	.057	.07	1,540	B.
August	306	9	53.6	.122	.14	3,300	B.
September	28	8	12.5	.028	.03	744	B.
October	14	8	10.2	.023	.03	627	B.
November	14	8	10.8	.025	.03	643	B.
December	12	6	8.5	.019	.02	523	B.
The period						23,600	

PLATTE RIVER BASIN.

NORTH PLATTE RIVER ABOVE PATHFINDER RESERVOIR, WYO.

Location.—About 25 miles above Pathfinder dam, in sec. 27, T. 26 N., R. 84 W., three-fourths mile below mouth of Black Canyon, and 900 feet below mouth of Lost Creek, the nearest tributary. Backwater from Pathfinder reservoir reaches within 2½ miles of station.

Records available.—October 7 to December 4, 1913.

Drainage area.—Approximately 8,700 square miles (measured from Land Office map).

Gage.—Friez automatic gage.

Control.—Should be permanent, as station is at the lower end of a pool 600 feet long and just above rapids.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes backwater and records are discontinued.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions of 58 second-feet from the North Platte between Saratoga and the station above Pathfinder, and diversions of 1,270 second-feet from intervening tributaries.

Accuracy.—Conditions are excellent, and the base data, which are all that are available, are reliable.

Cooperation.—Station maintained in cooperation with the United States Reclamation Service.

The following discharge measurement was made by R. H. Fletcher:

October 12.—Gage height, 1.17 feet; discharge, 505 second-feet.

Daily gage height, in feet, of North Platte River above Pathfinder reservoir, Wyo., for 1913.

[H. J. Slack, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	1.15	0.95	11	1.21	1.27	.....	21	1.13	1.27	.....
2	.....	1.25	.79	12	1.19	1.24	.....	22	1.15	1.24	.....
3	.....	1.33	.92	13	1.17	1.24	.....	23	1.16	1.17	.....
4	.....	1.30	.80	14	1.15	1.27	.....	24	1.19	1.03	.....
5	.....	1.30	.....	15	1.16	1.30	.....	25	1.20	1.01	.....
6	.....	.....	.....	16	1.25	1.31	.....	26	.....	.99	.....
7	1.42	.....	.....	17	1.26	1.29	.....	27	.....	1.10	.....
8	1.33	1.30	.....	18	1.20	1.25	.....	28	.....	1.37	.....
9	1.30	1.30	.....	19	1.17	1.20	.....	29	.....	1.18	.....
10	1.24	1.27	.....	20	1.18	1.24	.....	30	.....	1.05	.....

NORTH PLATTE RIVER AT PATHFINDER, WYO.

Location.—One-third mile south of Pathfinder, one-fourth mile below Pathfinder dam, and 800 feet below the mouth of the canyon, in sec. 24, T. 29 N., R. 84 W. The nearest tributary, Canyon Creek, enters 2 miles above.

Records available.—May 9, 1905, to December 31, 1913.

Drainage area.—12,000 square miles (measured from Land Office map).

Gage.—Chain gage.

Control.—Permanent.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes slight backwater for short periods.

Regulation.—The Pathfinder dam forms a reservoir of 1,025,000 acre-feet capacity. This reservoir materially changes the natural run-off of the river, as is seen by a comparison with records of inflow. These latter are based on evaporation losses, change of stage in the reservoir, and the outflow.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions of 279 second-feet from tributaries entering the North Platte between the station above Pathfinder and this station. Near Whalen, 150 miles below, the water from the Pathfinder reservoir is diverted by the Interstate canal and used to irrigate land in Nebraska and Wyoming.

Cooperation.—Records furnished by United States Reclamation Service.

Discharge measurements of North Platte River at Pathfinder, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 22	H. D. Comstock	3.13	1,320
31	do	4.70	2,700
June 10	do	5.01	3,530
26	do	4.73	3,070

Daily gage height, in feet, of North Platte River at Pathfinder, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	−0.6	−0.6	3.9	4.85	4.8	4.65	4.15	2.3	−0.6	− 0.6
2	.....	− .4	− .6	− .6	3.8	5.25	4.8	4.65	4.15	2.3	− .6	− .6
3	.....	1.4	− .6	.6	3.8	5.25	4.8	4.65	4.15	2.3	− .6	− .6
4	.....	1.35	− .6	− .6	3.85	5.25	4.8	4.65	4.05	2.3	− .6	− .6
5	.....	1.4	− .6	− .6	4.5	5.25	4.8	4.6	4.05	2.3	− .6	− .6
6	.....	1.4	− .6	− .6	4.5	5.0	4.8	4.6	4.05	2.3	− .6	− .6
7	.....	1.4	− .6	− .6	4.4	5.0	4.8	4.6	4.1	2.3	− .6	− .6
8	.....	1.25	− .6	− .6	4.4	5.0	5.3	4.65	4.1	2.3	− .6	− .6
9	.....	− .4	− .6	− .6	4.4	5.0	4.7	4.6	4.05	2.3	− .6	− .6
10	.....	− .4	− .6	− .6	4.4	5.05	4.5	4.7	4.05	2.3	− .6	− .6
11	.....	− .4	− .6	− .6	4.3	5.0	4.45	4.7	4.6	2.3	− .6	− .6
12	1.35	− .4	− .6	2.45	4.25	5.05	4.45	4.7	4.6	2.3	− .6	− .6
13	1.35	− .4	− .6	− .6	4.0	5.0	4.4	4.7	4.6	−0.6	− .6	− .6
14	1.35	− .4	− .6	− .6	4.05	5.05	4.4	4.7	4.6	− .6	− .6	− .6
15	1.35	− .4	− .6	− .6	4.3	5.05	4.45	4.65	4.6	− .6	− .6	− .6
16	1.35	− .6	− .6	− .6	3.85	5.05	4.6	4.65	4.55	− .6	− .6	− .6
17	1.35	− .6	− .6	− .6	2.8	5.0	4.8	4.65	4.75	− .6	− .6	− .6
18	1.35	− .6	− .6	− .6	2.8	5.05	4.75	4.65	4.75	− .6	− .6	− .6
19	1.35	− .6	− .6	− .6	2.85	5.0	4.7	4.65	4.7	− .6	− .6	− .6
20	1.35	− .6	− .6	− .6	2.6	5.05	4.65	4.65	4.7	− .6	− .6	− .6
21	1.35	− .6	− .6	− .6	2.6	4.85	4.65	4.7	4.0	− .6	− .6	− .6
22	1.35	− .6	− .6	− .6	2.65	4.85	4.65	4.1	3.95	− .6	− .6	− .6
23	1.35	− .6	− .6	− .6	3.7	4.8	4.65	4.1	3.95	− .6	− .6	− .6
24	1.35	− .6	− .6	− .6	3.7	4.85	4.65	4.1	3.95	− .6	− .6	− .6
25	1.35	− .6	− .6	− .6	3.7	4.85	4.65	4.1	2.95	− .6	− .6	− .6
26	1.4	− .6	− .6	− .6	3.75	4.8	4.65	4.1	2.95	− .6	− .6	− .6
27	1.5	− .6	− .6	− .6	3.7	4.85	4.7	4.05	2.35	− .6	− .6	− .6
28	1.45	− .6	.....	− .6	3.7	4.8	4.7	4.4	2.3	− .6	− .6	− .6
29	1.45	.....	.....	− .6	3.75	4.8	4.7	4.35	2.3	− .6	− .6	− .6
30	1.4	.....	− .6	3.9	4.7	4.85	4.65	4.15	2.3	− .6	− .6	− .6
31	1.4	.....	− .6	.....	4.65	.....	4.7	4.15	.....	− .6	.....	− .6

Daily discharge, in second-feet, of North Platte River at Pathfinder, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	354	340	3	3	2,140	3,170	3,200	3,040	2,420	760	4	5
2	354	20	3	3	2,000	3,780	3,200	3,000	2,480	760	4	5
3	396	320	3	3	2,030	3,820	3,200	3,000	2,420	760	4	5
4	396	310	3	3	1,900	3,740	3,200	3,000	2,320	760	4	5
5	375	310	3	3	2,690	3,820	3,200	2,970	2,300	760	4	5
6	375	320	3	4	2,800	3,340	3,200	2,940	2,300	760	5	5
7	375	320	3	4	2,220	3,470	3,200	2,940	2,370	760	5	5
8	365	270	3	4	2,700	3,300	3,520	2,980	2,360	760	5	5
9	355	15	3	4	2,700	3,470	3,400	2,970	2,330	760	5	5
10	355	2	3	4	2,700	3,500	2,840	3,060	2,300	760	5	5
11	345	2	3	4	2,300	3,500	2,760	3,070	2,810	760	5	5
12	313	2	3	770	2,550	3,500	2,760	3,070	2,990	760	5	5
13	313	2	3	210	2,390	3,500	2,720	3,070	2,940	194	5	5
14	313	2	3	5	2,430	3,500	2,700	3,070	2,950	4	5	5
15	313	2	3	5	2,570	3,240	2,730	3,020	2,940	4	5	5
16	313	2	3	20	1,960	3,540	2,850	3,000	2,910	4	5	5
17	313	2	3	20	1,180	3,500	3,170	3,000	3,120	4	5	5
18	313	2	3	5	1,100	3,500	3,170	3,000	3,140	4	5	5
19	313	2	3	20	1,120	3,500	3,080	3,000	3,100	4	5	5
20	313	2	3	5	950	3,500	3,020	3,000	3,070	4	5	5
21	313	2	3	5	950	2,860	3,000	3,060	2,280	4	5	5
22	310	2	3	20	970	3,260	3,000	2,450	2,220	4	5	5
23	310	2	3	5	1,630	3,230	3,000	2,360	2,200	4	5	5
24	310	2	3	5	1,920	3,230	3,000	2,340	2,200	4	5	5
25	310	2	3	10	1,920	3,260	3,000	2,360	1,280	4	5	5
26	320	2	3	5	1,950	3,230	3,000	2,360	1,220	4	5	5
27	350	2	3	5	1,950	3,230	3,030	2,340	900	4	5	5
28	360	2	3	5	1,920	3,230	3,050	2,650	775	4	5	5
29	360	.....	3	10	1,950	3,200	3,050	2,670	760	4	5	5
30	350	.....	3	1,810	2,890	3,230	3,030	2,440	760	4	5	5
31	340	.....	3	.....	3,040	.....	3,040	2,420	.....	4	.....	5

Monthly discharge of North Platte River at Pathfinder, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	396	310	339	20,800
February	340	2	80.8	4,490
March	3	3	3.0	184
April	1,810	3	99.3	5,910
May	3,040	950	2,050	126,000
June	3,820	2,860	3,400	202,000
July	3,520	2,700	3,040	187,000
August	3,070	2,340	2,830	174,000
September	3,140	760	2,270	135,000
October	760	4	303	18,600
November	5	4	4.8	286
December	5	5	5.0	307
The year	3,820	2	1,210	875,000

NOTE.—Table shows outflow from Pathfinder reservoir.

Daily inflow, in second-feet, to Pathfinder reservoir at Pathfinder, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	410	390	410	2,810	4,580	8,010	1,810	960	170	780	690	390
2	390	560	430	7,530	4,860	8,020	1,740	800	270	790	700	390
3	320	400	440	7,970	4,980	8,750	1,390	980	170	650	700	390
4	340	350	550	7,590	4,980	8,050	800	920	190	630	700	390
5	350	420	550	6,670	3,750	7,560	1,240	710	360	430	700	580
6	340	410	460	5,420	3,900	6,300	1,080	560	260	610	700	390
7	320	340	570	5,370	4,380	5,700	950	820	290	610	710	390
8	330	370	580	6,850	4,310	4,750	780	550	370	610	710	390
9	320	430	610	7,230	4,810	4,140	800	890	330	810	710	200
10	320	430	620	6,430	4,830	5,110	980	340	370	800	710	390
11	310	450	740	4,070	5,000	4,420	470	700	450	660	720	390
12	280	430	660	3,350	5,320	4,650	770	700	520	680	730	200
13	300	460	670	2,810	6,200	4,750	630	460	420	710	730	200
14	280	410	810	2,680	6,190	4,520	380	630	430	730	550	200
15	290	460	960	4,420	6,440	4,290	680	400	370	660	550	200
16	280	460	990	6,110	5,380	3,950	520	450	600	630	730	200
17	300	500	900	6,620	5,230	3,400	650	720	890	480	740	200
18	280	520	960	7,590	5,110	3,110	370	450	730	640	740	390
19	330	530	980	6,630	4,650	2,890	1,020	450	410	640	740	390
20	330	480	850	6,880	4,490	2,950	830	460	330	640	740	390
21	340	430	1,010	6,720	5,060	2,500	1,000	250	270	650	740	390
22	340	400	880	6,010	4,570	2,710	1,070	440	310	490	740	390
23	340	460	910	6,190	4,180	2,720	940	350	270	660	560	200
24	340	470	760	5,400	4,490	2,120	1,060	500	280	660	560	200
25	340	500	760	4,550	4,470	2,280	1,650	320	330	660	560	200
26	350	450	630	4,160	4,620	1,730	2,340	470	420	670	560	200
27	370	460	630	2,880	5,240	2,650	1,630	360	580	340	570	400
28	360	490	640	2,460	5,750	2,370	1,370	220	460	680	570	400
29	360	.....	810	2,940	8,020	2,310	1,210	190	470	680	570	400
30	400	.....	1,150	3,410	7,450	1,730	1,060	350	510	340	570	200
31	380	.....	1,860	.....	8,440	.....	730	310	.....	680	.....	400

NOTE.—Daily inflow computed from records of outflow, evaporation losses, and change in stage of water in reservoir.

Monthly inflow to Pathfinder reservoir at Pathfinder, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	410	280	334	20,500
February	560	340	445	24,700
March	1,860	410	767	47,200
April	7,970	2,460	5,320	317,000
May	8,440	3,750	5,229	321,000
June	8,750	1,730	4,280	255,000
July	2,340	370	1,030	63,300
August	980	190	539	33,100
September	890	170	394	23,400
October	810	340	635	39,000
November	740	550	667	39,700
December	580	200	324	19,900
The year	8,750	170	1,660	1,200,000

NORTH PLATTE RIVER AND INTERSTATE CANAL AT WHALEN, WYO.

Location.—At head of the Interstate canal at Whalen, in sec. 11, T. 26 N., R. 65 W. Nearest important tributary is Cottonwood Canyon Creek, an intermittent stream which enters 1½ miles below.

Records available.—May 1, 1909, to December 31, 1913. These records represent the discharge passing the overfall weir at Whalen and also amount of water passing the headgates of the canal, which are located just above Whalen weir.

Drainage area.—Not measured.

Gage.—To determine the flow over the weir a vertical staff is used, its zero being at the weir crest. The discharge is then computed by a weir formula. There are also four sluice gates in the dam, through which the discharge is computed. In the river, 75 feet downstream from the crest gage, is a second gage, with zero 10 feet below that of the weir gage. The second gage is only used in computing the discharge through the gates when the openings are submerged. The discharge through the headgates of the canal is computed from the nine gate openings. A vertical staff located in the canal, 1,000 feet below the headgates, is used in computing the discharge when the headgate openings are submerged.

Discharge measurements.—In order to check the coefficients used in the discharge computations, a car and cable have been erected 1 mile downstream.

Regulation.—The discharge represents chiefly the effect of the Pathfinder reservoir which stores water for use in the Interstate canal.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions from North Platte River of 319 second-feet between the Pathfinder reservoir and the Wyoming-Nebraska line, exclusive of the diversion by United States Reclamation Service. It is not known what percentage of these diversions is above the stations.

Cooperation.—Records furnished by United States Reclamation Service.

Daily discharge, in second-feet, of North Platte River and Interstate canal at Whalen, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	770	525	410	1,070	1,540	2,340	2,910	2,810	3,050	1,080	294	215
2	759	500	400	1,680	1,380	2,790	2,940	2,810	2,360	984	300	175
3	705	460	400	1,950	1,290	3,580	2,940	2,810	2,220	984	308	180
4	863	425	430	2,010	2,630	3,600	2,940	2,810	2,360	1,080	305	190
5	640	425	420	1,730	2,640	3,600	2,900	2,820	2,180	1,050	294	225
6	565	400	400	1,520	2,550	3,550	2,920	2,990	2,190	1,050	294	175
7	360	370	500	1,280	2,680	3,720	2,930	2,860	2,120	1,050	295	175
8	390	370	500	1,220	3,050	3,270	2,970	2,840	2,120	926	290	215
9	410	370	525	1,240	2,690	3,480	2,910	2,690	2,360	926	285	175
10	490	390	575	1,230	2,950	3,340	3,050	2,650	2,130	867	280	180
11	446	375	575	1,120	3,160	3,470	3,290	2,700	2,130	869	280	190
12	495	425	600	1,030	2,320	3,330	2,790	2,850	1,720	869	275	275
13	495	495	625	962	2,880	3,610	2,630	2,840	1,670	818	260	225
14	332	570	625	943	2,900	3,450	2,500	2,810	2,580	818	260	185
15	500	520	650	991	3,020	3,710	2,400	2,810	2,570	818	255	195
16	650	405	650	1,280	2,770	3,500	2,410	2,810	3,150	818	255	210
17	700	405	700	2,260	2,920	3,270	2,320	2,810	3,160	656	255	195
18	750	420	700	2,180	2,700	3 170	3,260	2,830	2,860	555	255	205
19	750	425	750	2,130	2,210	2,870	3,340	2,920	2,860	458	245	205
20	750	520	750	2,290	1,680	2,870	3,340	2,830	2,930	433	240	195
21	750	413	700	2,120	1,570	2,970	3,500	2,830	2,990	425	235	205
22	750	545	680	2,060	1,530	3,380	3,060	2,830	2,750	399	235	215
23	725	500	600	1,980	1,460	2,960	3,030	2,830	2,750	382	235	225
24	700	500	400	1,780	1,300	3,000	2,870	2,520	2,320	369	235	225
25	700	500	375	1,600	1,300	3,100	2,950	2,200	2,320	364	170	245
26	700	430	400	1,350	1,550	3,200	2,860	2,100	2,240	352	165	238
27	775	370	400	1,330	1,830	3,200	2,930	2,120	2,110	329	170	238
28	700	430	350	1,220	1,870	3,220	3,550	2,120	1,510	329	255	255
29	700	.....	350	1,070	1,780	3,130	3,150	2,120	1,400	306	225	238
30	675	.....	400	1,120	1,980	3,080	2,980	2,200	1,340	301	210	196
31	600	.....	900	.....	2,030	.....	2,810	2,360	.....	301	.....	190

Monthly discharge of North Platte River and Interstate canal at Whalen, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	863	332	632	38,900
February	570	370	446	24,800
March	900	350	540	33,200
April	2,290	943	1,520	90,400
May	3,230	1,290	2,230	137,000
June	3,720	2,340	3,270	195,000
July	3,550	2,320	2,950	181,000
August	2,990	2,100	2,660	164,000
September	3,160	1,340	2,350	140,000
October	1,080	301	676	41,600
November	308	165	255	15,200
December	275	175	208	12,800
The year	3,720	165	1,480	1,070,000

Daily discharge, in second-feet, of Interstate canal at Whalen, Wyo., for 1913.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	410	.....	645	1,008	1,051	1,303	1,200
2	.....	400	.....	700	1,060	1,078	1,310	1,200
3	.....	400	.....	700	1,150	1,078	1,303	1,200
4	.....	430	.....	709	1,195	1,078	1,303	1,200
5	.....	420	.....	757	1,200	1,130	1,303	1,200
6	.....	400	.....	846	1,112	1,194	1,305	1,200
7	.....	375	.....	882	1,265	1,246	1,318	1,200
8	.....	.....	.....	891	1,270	1,288	1,338	1,200
9	.....	.....	.....	901	1,245	1,318	1,338	1,200
10	.....	.....	.....	887	1,245	1,281	1,338	1,200
11	.....	.....	.....	711	1,220	1,296	1,252	1,235
12	225	.....	.....	679	1,142	1,335	940	1,227
13	485	.....	.....	436	1,155	1,321	946	1,240
14	570	.....	.....	309	1,207	1,345	940	1,155
15	520	.....	.....	312	1,207	1,345	940	870
16	405	.....	.....	320	1,047	1,360	940	645
17	405	.....	465	369	1,161	726	963	786
18	420	.....	518	381	1,219	105	963	786
19	425	.....	517	358	1,185	0	963	800
20	520	.....	517	391	1,136	0	963	670
21	413	.....	517	257	1,136	281	963	580
22	545	.....	.....	242	1,136	606	963	580
23	500	.....	.....	242	1,143	786	963	580
24	500	.....	.....	263	1,092	820	1,017	580
25	500	.....	.....	368	956	902	1,055	580
26	430	.....	.....	491	951	1,144	1,090	580
27	370	.....	.....	563	951	1,150	1,135	580
28	430	.....	.....	781	976	1,260	1,130	580
29	.....	.....	387	904	1,026	1,282	1,130	580
30	.....	.....	440	960	1,026	1,290	1,130	284
31	.....	.....	.....	902	.....	1,303	1,180	.....

NOTE.—No flow on days for which no discharge is given. Prior to Mar. 8 flow was not used for irrigation, but was merely carried to Sand Point wasteway.

Monthly discharge of Interstate Canal at Whalen, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
February 12–28	570	225	451	15,200
May	960	242	586	36,000
June	1,270	951	1,130	67,200
July	1,360	0	1,010	62,100
August	1,338	940	1,120	68,900
September	1,240	284	897	53,400

NORTH PLATTE RIVER AT HENRY, NEBR.

Location.—At Henry post office, on the west line of sec. 3, T. 23 N., R. 58 W., within half a mile of Nebraska-Wyoming line.

Records available.—May 11, 1912, to November 13, 1913.

Drainage area.—Not measured.

Gage.—Three vertical staffs, one in each of the three separate channels. The datum of first two gages is the same; that for the gage in third channel is 1 foot lower to avoid negative readings.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Winter flow.—No data; observations discontinued.

Diversions.—Prior to September 1, 1912, there was an approved diversion of 220 second-feet from the North Platte between the Wyoming-Nebraska State line and this station.

Accuracy.—Channel shifts daily and the estimates with a few exceptions represent discharge measurements.

Cooperation.—Data as published furnished by the State engineer.

Daily discharge, in second-feet, of North Platte River at Henry, Nebr., for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2,450	1,750	954	1,410	517	16	2,680	1,040	1,860	1,540	1,230	.....
2	.....	1,850	1,370	2,080	1,320	a516	17	2,640	1,070	1,930	2,830	1,190	.....
3	.....	1,840	1,550	2,130	1,020	516	18	a2,470	3,360	1,970	2,540	1,150	.....
4	2,470	a1,800	1,530	1,230	1,340	559	19	a2,310	4,140	1,890	2,150	a1,130	.....
5	2,110	1,750	1,620	1,240	a1,380	511	20	2,140	3,370	1,930	2,350	1,110	.....
6	a2,090	1,850	1,390	1,270	1,430	544	21	2,150	3,420	2,080	2,380	706	.....
7	a2,070	1,670	1,670	1,330	1,480	560	22	2,190	2,900	1,890	2,600	a719	.....
8	a2,060	1,800	1,720	1,150	1,490	508	23	2,350	2,310	1,770	2,620	732	.....
9	a2,050	1,750	1,680	1,180	1,580	a488	24	1,950	2,270	1,710	2,620	718	.....
10	2,030	1,550	1,650	1,070	1,410	468	25	2,130	2,300	1,760	2,460	727	.....
11	2,000	1,630	1,660	1,190	1,460	540	26	2,340	2,180	1,270	2,170	a735	.....
12	2,060	a1,490	1,680	a1,160	a1,300	532	27	2,330	1,950	1,080	2,190	743	.....
13	2,120	1,350	2,110	1,120	1,150	496	28	2,560	2,140	1,100	a2,000	730	.....
14	2,500	1,270	1,890	1,150	1,170	.....	29	2,200	2,360	1,110	1,800	707	.....
15	2,440	1,180	1,860	1,530	1,240	.....	30	2,080	2,060	986	1,290	681	.....
							31	.....	2,060	1,030	.....	599	.....

a Interpolated.

NOTE.—Daily discharges given are actual discharge measurements, with the exception of a few days when discharge was interpolated.

Monthly discharge of North Platte River at Henry, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
June 4-30	2,680	1,950	2,240	120,000
July	4,140	1,040	2,070	127,000
August	2,110	986	1,630	100,000
September	2,830	954	1,780	106,000
October	1,580	599	1,090	67,000
November 1-13	560	468	520	13,400
The period	.....	.....	.....	533,000

NORTH PLATTE RIVER NEAR MITCHELL, NEBR.

Location.—At highway bridge 1 mile south of Mitchell, on line between secs. 27 and 28, T. 23 N., R. 56 W. The nearest tributary is Spottedtail Creek, an intermittent stream that enters just below the station.

Records available.—June 3, 1901, to June 30, 1913. From May 29, 1897, to October 31, 1900, a station was maintained near Gehring. Though no tributaries enter between the two points, the records are not directly comparable during the irrigation season, as water is diverted for irrigation.

Drainage area.—24,400 square miles.

Gage.—Chain-gage datum lowered 1.00 foot on May 3, 1902, to avoid negative readings.

Control.—Shifting since 1911.

Discharge measurements.—Made from bridge.

Winter flow.—River frozen over; observations discontinued.

Regulation.—The Pathfinder reservoir of United States Reclamation Service controls the flow at this station to a certain extent.

Diversions.—Prior to September 1, 1912, there were approved diversions of 1,968 second-feet from North Platte River between this station and Henry, and diversions to 75 second-feet from intervening tributaries.

Accuracy.—No discharge measurements made during 1912; one measurement made in 1913 showed old rating curve no longer applicable; estimates of discharge not prepared.

Cooperation.—The field data furnished by State engineer.

The following discharge measurement was made by Boden and Cass:
April 8, 1913.—Gage height, 2.95 feet; discharge, 2,850 second-feet.

Daily gage height, in feet, of North Platte River near Mitchell, Nebr., for 1913.

[B. H. Newbold, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Day.	Mar.	Apr.	May.	June.	July.
1	.....	3.2	2.4	.....	2.4	16	.....	2.6	2.4	2.3	.....
2	.....	3.3	2.3	2.2	2.4	17	3.3	2.7	2.4	2.3	.....
3	.....	3.4	2.3	2.2	2.4	18	3.4	2.8	.....	2.3	.....
4	.....	3.6	.....	2.4	2.4	19	3.4	2.8	2.3	2.3	.....
5	.....	3.1	2.5	2.6	2.0	20	3.3	.....	2.3	2.3	.....
6	.....	.....	2.6	2.5	.....	21	3.3	2.7	2.3	2.3	.....
7	.....	3.0	2.5	2.4	2.3	22	3.3	2.7	2.4	.....	.....
8	.....	3.0	2.4	.....	2.1	23	.....	2.7	2.5	2.3	.....
9	.....	3.0	2.4	2.4	2.1	24	3.6	2.7	2.5	2.4	.....
10	3.2	3.1	2.4	2.3	2.1	25	3.4	2.7	.....	2.4	.....
11	3.2	3.0	2.4	2.3	.....	26	3.4	2.6	2.3	2.4	.....
12	3.2	3.0	2.4	2.3	.....	27	3.4	.....	2.3	2.4	.....
13	3.3	.....	2.7	2.3	.....	28	3.3	2.6	2.3	2.4	.....
14	3.3	2.8	2.6	2.3	.....	29	3.3	2.4	2.2	.....	.....
15	3.3	2.6	2.6	.....	.....	30	.....	2.4	2.2	2.4	.....
						31	3.2	.....	2.2	.....	.....

NORTH PLATTE RIVER AT NORTH PLATTE, NEBR.

Location.—At highway bridge half a mile north of North Platte, in sec. 28, T. 14 N., R. 30 W., 1 mile below mouth of Scout Creek and 4½ miles above junction with the South Platte.

Records available.—February 25, 1895, to September 30, 1913.

Drainage area.—28,500 square miles.

Gage.—A staff gage installed October 15, 1910. From October 5, 1894, to May 31, 1910, the gage was a vertical staff at the railroad bridge, 2 miles east of North Platte. On March 25, 1910, the station was moved 2 miles upstream to its present site, and a chain gage reading to a different datum was installed. This gage was stolen July 1, 1910, and records interrupted until October 15, 1910, when present gage, reading to a different datum, was placed in position.

Control.—Shifting.

Discharge measurements.—Made from highway bridge.

Winter flow.—The river frequently freezes to the bottom during winter, as it is very shallow.

Diversions.—Prior to September 1, 1912, there were approved diversions of 3,626 second-feet from the North Platte between this station and Mitchell and diversions of 927 second-feet from intervening tributaries.

Accuracy.—Estimates obtained by indirect method for shifting channels, and can be considered only approximate.

Cooperation.—Field data furnished by the State engineer.

Discharge measurements of North Platte River at North Platte, Nebr., in 1913.

[Hydrographer, C. J. McNamara.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 31	3.80	5,040	June 29	2.80	982	Sept. 28	3.60	3,070
Apr. 15	3.70	4,610	July 14	2.40	300	Oct. 18	3.30	1,960
Apr. 30	3.70	3,910	Aug. 2	2.80	1,240	Nov. 2	3.00	1,330
May 16	3.90	4,390	Aug. 17	2.50	526	Nov. 16	3.20	1,620
June 1	2.90	1,350	Aug. 31	2.40	350	Sept. 30	3.20	1,730
June 15	3.30	2,130	Sept. 14	2.70	682	Dec. 15	2.80	988

Daily gage height, in feet, of North Platte River at North Platte, Nebr., for 1913.

[Hendy and Ogier, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.45	2.85	2.70	3.00	2.35	3.5	3.1	3.25
2	.....	3.40	2.75	2.60	2.95	2.40	3.45	3.1	3.2
3	.....	3.40	2.8	2.80	2.90	2.40	3.45	3.1	3.35
4	.....	3.35	2.70	2.70	2.90	2.40	3.4	3.1	3.45
5	.....	3.30	2.60	2.60	2.90	2.50	3.3	3.1	3.5
6	.....	3.20	2.60	2.55	2.85	2.45	3.3	3.1	3.6
7	.....	3.20	2.50	2.40	2.85	.....	3.2	3.1	3.9
8	.....	3.20	2.60	2.40	2.75	2.50	3.2	3.1	3.6
9	.....	3.20	2.55	2.60	2.75	2.55	3.25	.....	3.4
10	.....	3.55	2.60	2.50	2.70	2.75	3.2	3.1	3.2
11	.....	3.60	2.75	2.75	2.60	2.80	3.35	3.1	3.2
12	.....	3.55	3.30	2.50	2.60	2.85	3.3	3.1	2.85
13	.....	3.50	3.35	2.85	2.60	2.80	3.3	3.1	2.8
14	3.80	3.55	3.45	2.80	2.65	.....	3.3	3.2	2.8
15	3.66	3.60	3.40	2.65	2.75	2.75	3.3	3.2	2.8
16	3.61	3.85	3.10	2.65	2.55	2.95	3.25	.....	2.75
17	3.65	4.00	3.30	2.55	.....	2.95	3.2	3.2	2.8
18	3.50	3.85	2.95	2.50	2.65	3.00	3.3	3.1	2.75
19	3.36	3.76	3.00	2.40	2.75	3.05	3.3	3.1	2.85
20	3.30	3.75	3.05	2.60	2.80	2.90	3.3	3.2	2.9
21	3.30	3.75	3.05	2.60	2.80	3.20	3.25	3.25	.....
22	3.30	3.65	3.00	2.60	2.75	3.40	3.3	3.1	.....
23	3.35	3.55	3.00	3.75	2.75	3.40	3.3	.....	.....
24	3.30	3.50	2.9	3.50	.....	3.40	3.3	3.1	.....
25	3.30	3.40	2.9	3.50	2.70	3.50	3.3	3.1	.....
26	3.20	3.40	2.80	3.45	2.60	3.50	3.3	3.1	.....
27	3.75	3.30	2.65	3.30	2.50	3.50	3.2	3.15	.....
28	3.65	3.30	2.65	3.30	2.50	3.50	3.2	3.2	.....
29	3.55	2.9	2.55	3.20	2.50	3.60	3.1	3.2	.....
30	3.50	2.8	2.50	3.00	2.40	3.50	3.2	.....	.....
31	.....	2.9	.....	.....	.....	.....	3.2	.....	.....

Daily discharge, in second-feet, of North Platte River at North Platte, Nebr., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2,990	1,240	824	1,600	340	2,650	1,500	1,820
2	.....	2,790	1,090	687	1,500	380	2,500	1,500	1,700
3	.....	2,760	1,160	928	1,440	380	2,470	1,500	2,100
4	.....	2,580	1,020	785	1,400	380	2,250	1,500	2,400
5	.....	2,400	900	654	1,360	480	1,950	1,500	2,550
6	.....	2,100	900	580	1,230	430	1,950	1,500	2,900
7	.....	2,050	780	420	1,190	455	1,700	1,500	4,050
8	.....	2,000	900	406	995	480	1,700	1,500	2,900
9	.....	1,950	840	570	965	530	1,820	1,500	2,250
10	.....	2,920	900	456	860	740	1,700	1,500	1,700
11	.....	3,060	1,090	687	704	800	2,100	1,500	1,700
12	.....	2,850	2,170	420	680	875	1,950	1,500	1,060
13	.....	2,670	2,320	759	660	800	1,950	1,500	980
14	5,000	2,760	2,620	665	692	680	1,950	1,700	980
15	4,440	2,880	2,470	635	788	740	1,950	1,700	980
16	4,200	4,120	1,700	653	550	1,060	1,820	1,700	915
17	4,320	4,800	2,170	582	580	1,080	1,700	1,700	980
18	3,760	4,120	2,320	558	630	1,210	1,950	1,500	915
19	3,190	3,500	1,460	496	740	1,340	1,950	1,500	1,060
20	2,960	3,700	1,540	680	800	1,100	1,950	1,700	1,130
21	2,930	3,700	1,520	700	800	1,750	1,820	1,820	.....
22	2,860	3,300	1,410	720	740	2,370	1,950	1,500	.....
23	2,990	2,940	1,390	3,140	740	2,400	1,950	1,500	.....
24	2,800	2,770	1,210	2,410	710	2,430	1,950	1,500	.....
25	2,740	2,470	1,210	2,470	680	2,790	1,950	1,500	.....
26	2,410	2,470	1,050	2,380	580	2,790	1,950	1,500	.....
27	4,240	2,170	852	2,020	480	2,790	1,700	1,600	.....
28	3,760	2,170	852	2,070	480	2,800	1,700	1,700	.....
29	3,380	1,320	736	1,920	480	3,080	1,500	1,700	.....
30	3,200	1,160	600	1,600	380	2,700	1,700	1,730	.....
31	.....	1,320	.....	1,600	380	.....	1,700	.....	.....

NOTE.—Daily discharge determined from a series of parallel curves and by indirect method for shifting channels.

Monthly discharge of North Platte River at North Platte, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr. 14–30	5,000	2,410	3,480	117,000	C.
May	4,800	1,160	2,740	168,000	C.
June	2,620	600	1,320	78,600	C.
July	3,140	406	1,080	66,400	C.
August	1,600	380	833	51,200	C.
September	3,080	340	1,340	79,700	C.
October	2,650	1,500	1,930	119,000	B.
November	1,820	1,500	1,540	91,600	B.
Dec. 1–20	4,050	915	1,750	69,400	B.
The period	.....	.....	.....	841,000	

PLATTE RIVER NEAR COLUMBUS, NEBR.

Location.—At Meridian Bridge, 3 miles south of Columbus, on line between sec. 36, T. 17 N., R. 1 W., and sec. 31, T. 17 N., R. 1 E., about 10 miles below mouth of Prairie Creek, and 5 miles above mouth of Loup River.

Records available.—June 4, 1895, to December 31, 1913.

Drainage area.—56,900 square miles.

Gage.—Chain gage installed July 25, 1910. The bridge and the original gage previously used were washed out early in 1910. The new gage is at the same point as the old, but its datum is possibly slightly different. The datum of the original gage was unchanged up to the time of its destruction.

Control.—Extremely shifting; at this point the river flows in the channels known as the main, middle, and south channels. The gage is in main channel.

Discharge measurements.—Made from bridges spanning each channel.

Winter flow.—River freezes over; observations discontinued.

Diversions.—Prior to September 1, 1912, there were approved diversions of 4,888 second-feet for irrigation and 1,500 second-feet for power from Platte River between junction of the two branches and Columbus, and this diversion, together with the evaporation from the wide shallow channels, frequently causes the flow to cease at this point during the late summer and fall.

Accuracy.—Results for 1913 should be fair.

Cooperation.—Station maintained in cooperation with State engineer, by whom the field data were furnished.

Discharge measurements of Platte River near Columbus, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	D. P. Weeks, jr	3.60	5,110	June 18	D. P. Weeks, jr	1.60	14
Apr. 6	do	3.90	5,120	25	do	2.20	326
13	do	4.15	6,710	July 2	do	1.80	[a] 40
20	do	3.60	3,930	10	do		[b] 0
27	do	3.85	5,160	28	do		[b] 0
May 4	do	3.75	4,070	Nov. 23	Weeks and Jefferys	2.29	312
11	do	3.40	3,000	29	W. M. Jefferys	2.35	844
18	do	3.30	2,370	Dec. 12	do	[c] 3.40	274
25	do	3.60	3,070	20	do		[d]
June 8	do	3.10	1,610				

[a] Discharge estimated.
[b] River dry.
[c] Relation of gage height to discharge affected by ice.
[d] No measurement; river frozen.

Daily gage height, in feet, of Platte River near Columbus, Nebr., for 1913.

[W. B. Benson, observer.]

Day.	Mar.	Apr.	May.	June.	Oct.	Nov.	Dec.
1		4.0		2.95		2.7	2.85
2		4.0		2.75		2.55	2.85
3		4.15	4.75	2.65		2.6	3.0
4		4.2	3.95	2.65		2.75	
5		4.0	3.9	2.7		2.85	
6		3.85		2.9		2.9	3.8
7		3.55	3.55	3.0			3.8
8		3.4	3.4	3.1	2.2	2.35	3.65
9		3.5	3.6	2.75	3.22	1.95	3.25
10		4.05	3.5	2.55	2.4	2.15	3.0
11		4.05	3.4	2.25	2.3	2.0	3.35
12		4.0	3.3	2.0		1.85	3.45
13		4.1	3.35	2.0		1.85	3.2
14		3.9	3.35	1.75		2.1	3.4
15		3.8	3.25	1.6		2.25	3.35
16		3.8	3.3	1.8		2.4	3.2
17		3.8	3.35	1.7		2.4	2.65
18		3.7	3.3	1.5		2.4	2.7
19	3.60	3.6		1.25		2.35	
20		3.55	3.35			2.45	2.45
21		3.4	3.5	2.65		2.5	
22		3.3	3.7	2.6	2.4		
23	3.15		3.6	2.3	2.4	2.35	
24	3.1	3.8	3.55	2.5	2.5	2.5	
25	3.3	4.0	3.6	2.0	2.5		
26	3.15	3.85	3.4	2.0	2.5	2.45	
27	3.0	3.7	3.3		2.7	2.45	
28	2.85	3.65	3.15	2.0			
29	4.05	3.45	3.0		2.3	2.4	
30	3.45	3.45	2.8	1.85		2.8	
31	4.2		2.75		2.6		

NOTE.—River dry July 1 to Oct. 7, and during at least a part of the period from Oct. 12 to 21. Ice present during last half of December.

Daily discharge, in second-feet, of Platte River near Columbus, Nebr., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Oct.	Nov.	Dec.
1	.....	5,800	3,000	1,320	70	.....	850	1,800
2	.....	5,800	4,000	925	40	.....	638	1,800
3	.....	6,720	10,600	775	35	.....	700	2,300
4	.....	7,050	5,500	775	30	.....	925	.....
5	.....	5,800	5,200	850	25	.....	1,100	.....
6	.....	4,920	4,290	1,200	20	.....	1,200	.....
7	.....	3,380	3,380	1,450	15	.....	810	.....
8	.....	2,750	2,750	1,750	10	300	420	.....
9	.....	3 150	3 600	925	5	2,120	145	.....
10	.....	6 100	3 150	638	.....	465	262	.....
11	.....	6,100	2,750	338	.....	375	170	.....
12	.....	5,800	2,400	170	.....	325	98	.....
13	.....	6,400	2,580	170	.....	270	98	.....
14	.....	5,200	2,580	58	.....	215	225	.....
15	.....	4,650	2,220	20	.....	160	338	.....
16	.....	4,650	2,400	75	.....	105	465	.....
17	.....	4,650	2,580	40	.....	50	465	.....
18	.....	4,100	2,400	10	.....	.....	465	.....
19	5,110	3,600	2,490	.....	.....	.....	420	.....
20	4,450	3,380	2,580	388	.....	155	520	.....
21	3,800	2,750	3,150	775	.....	310	575	.....
22	3,150	2,400	4,100	700	.....	465	498	.....
23	2,500	3,520	3,600	375	.....	465	420	.....
24	2,260	4,650	3,380	575	.....	575	640	.....
25	2,910	5,800	3,600	170	.....	575	685	.....
26	2,300	4,920	2,750	170	.....	575	730	.....
27	1,750	4,100	2,400	170	.....	850	820	.....
28	1,280	3,850	1,900	170	.....	612	872	.....
29	6,460	2,950	1,450	134	.....	375	900	.....
30	3,110	2,950	1,000	98	.....	538	1,650	.....
31	7,180	.....	925	.....	.....	700	.....	.....

NOTE.—Discharge determined as follows: Mar. 19–31 and Nov. 24–28, by indirect method; Apr. 1 to Nov. 23, from a well-defined rating curve; Nov. 24–28, from a curve based on one measurement. Discharge interpolated for days for which gage heights are missing. Observer records zero flow during July, August, and September. However, a discharge measurement of July 2 gives 40 second-feet, and there may have been a slight flow until July 10, when hydrographer found stream dry.

Monthly discharge of Platte River near Columbus, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 19–31	7,180	1,280	3,560	91,800	C.
April	7,050	2,400	4,600	274,000	B.
May 3–31	10,600	925	3,180	196,000	B.
June	1,750	.....	507	30,200	B.
October	2,120	.....	341	21,000	C.
November	1,650	98	603	35,900	C.
December	.....	.....	[a] 500	30,700	D.

[a] Estimated.

PLATTE RIVER NEAR FREMONT, NEBR.

Location.—At highway bridge 1½ miles south of Fremont, in sec. 35, T. 17 N., R. 8 E.

Records available.—April 12 to November 7, 1913.

Drainage area.—Not measured.

Gage.—Painted on south abutment of bridge. Second gage established July 28, 1913, with datum 2.00 feet lower. All previous readings reduced to second datum.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Winter flow.—No data.

Diversions.—Prior to September 1, 1912, there were approved diversions of 2,500 second-feet for power and irrigation and 4,000 second-feet for power from Platte River between the mouth of Loup River and this station. Below there were approved diversions of 2,500 second-feet for power.

Accuracy.—Measurements insufficient for estimates of discharge.

Cooperation.—Field data furnished by the State engineer.

Discharge measurements of Platte River near Fremont, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 10	Weeks and Leonard	1.90	2,450	Sept. 8	D. P. Weeks, jr.	1.65	1,510
Aug. 9	D. P. Weeks, jr.	1.40	1,290	11	Weeks and Leonard	1.72	1,690
27	G. K. Leonard	1.70	1,710	17	G. K. Leonard	1.85	1,890

Daily gage height, in feet, of Platte River near Fremont, Nebr., for 1913.

[G. K. Leonard, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.72	.....	1.65	1.62	1.54	2.05	2.00
2	.....	2.85	2.60	1.65	1.58	1.52	2.00	.....
3	.....	3.58	2.92	1.75	.....	1.55	1.95	2.00
4	.....	3.48	2.70	.....	1.50	1.55	1.95	2.09
5	.....	3.28	2.60	.....	1.40	1.55	.....	2.20
6	.....	3.15	2.90	.....	1.40	1.55	.....	2.35
7	.....	2.88	2.70	2.35	1.42	.....	.....	2.35
8	.....	2.90	.....	2.12	1.40	1.60	.....	.....
9	.....	2.80	2.61	1.85	1.40	1.65	.....	.....
10	.....	2.90	2.35	1.85	.....	1.66	2.10	.....
11	.....	.....	2.22	1.95	1.72	1.74	2.12	.....
12	3.40	2.95	2.11	1.80	1.76	1.74	.....	.....
13	.....	2.95	1.94	.....	1.95	1.73	2.10	.....
14	3.32	2.98	2.00	1.68	1.99	.....	2.11	.....
15	3.19	2.92	.....	1.66	1.90	1.92	2.10	.....
16	3.26	2.92	.....	1.70	2.05	1.85	2.00	.....
17	3.15	2.93	2.15	1.65	2.45	1.83	2.00	.....
18	3.11	2.95	2.22	1.60	.....	1.75	.....	.....
19	3.09	.....	2.16	1.59	2.00	1.70	.....	.....
20	.....	.....	2.00	1.50	1.85	1.70	.....	.....
21	2.88	3.05	2.75	1.60	1.78	1.70	2.12	.....
22	2.85	3.00	.....	1.65	1.70	1.75	2.29	.....
23	2.60	2.90	2.50	1.95	1.66	1.82	2.40	.....
24	3.08	.....	2.50	1.85	.....	.....	2.26	.....
25	3.35	.....	2.34	1.68	1.69	1.97	2.20	.....
26	.....	2.78	2.20	1.70	1.70	1.99	.....	.....
27	3.30	2.70	1.95	.....	1.70	1.95	2.20	.....
28	.....	2.62	1.81	1.68	1.66	.....	.....	.....
29	2.98	2.45	.....	1.65	1.60	1.97	2.35	.....
30	2.84	2.35	1.80	1.65	1.59	2.05	2.15	.....
31	.....	2.28	.....	1.62	.....	.....	2.00	.....

PLATTE RIVER NEAR LESHARA, NEBR.

Location.—Two miles southeast of Leshara, in sec. 34, T. 16 N., R. 9 E., 7 miles above entrance of Otoe Creek.

Records available.—May 19, 1911, to July 19, 1913.

Drainage area.—Not measured.

Gage.—Chain.

Control.—Extremely shifting.

Discharge measurements.—Made from highway bridge.

Winter flow.—Data too meager to determine.

Diversions.—Prior to September 1, 1912, there were approved diversions of 2,500 second-feet for power and irrigation and 4,000 second-feet for power from Platte River between the mouth of Loup River and this station. Below there were approved diversions of 2,500 second-feet for power.

Accuracy.—Estimates obtained by indirect method for shifting channels and can be considered only fair.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Platte River near Leshara, Nebr., in 1913.

[D. P. Weeks, jr., hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 17	3.45	6,380	May 30	3.90	12,000	June 7	3.42	5,900
Apr. 12	4.10	11,700	10	3.80	7,630	17	2.75	2,210
19	3.88	8,750	17	3.80	8,280	28	2.65	2,300
26	4.17	12,100	24	3.72	7,890	July 3	2.45	2,130

Daily gage height, in feet, and discharge, in second-feet, of Platte River near Leshara, Nebr., for 1913.

[H. W. Eggers, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	4.20	11,500	3.80	11,100	3.04	4,590	2.54	2,230
2	.....	.....	4.00	10,300	3.82	11,500	3.15	4,990	2.42	2,010
3	.....	.....	3.80	9,240	3.90	12,000	3.50	6,400	2.45	2,130
4	.....	.....	4.17	11,500	4.35	14,100	3.45	6,130	2.60	2,500
5	.....	.....	4.25	12,100	4.07	11,800	3.40	5,870	2.63	2,590
6	.....	.....	4.10	11,200	3.20	6,580	3.44	6,000	2.60	2,500
7	.....	.....	4.00	10,700	3.85	9,350	3.42	5,900	2.54	2,350
8	.....	.....	3.85	9,840	3.86	8,860	3.40	5,620	2.85	3,250
9	.....	.....	3.88	10,100	3.90	8,550	3.35	5,220	2.80	3,100
10	4.50	.....	3.90	10,300	3.80	7,630	3.28	4,740	2.63	2,590
11	4.28	.....	4.00	11,000	3.70	7,300	3.00	3,590	2.66	2,680
12	4.60	.....	4.10	11,700	3.85	8,150	2.80	2,800	2.70	2,800
13	4.20	.....	4.05	11,100	3.75	7,750	2.70	2,450	2.65	2,650
14	4.26	.....	4.25	12,000	3.78	8,000	2.65	2,240	2.60	2,500
15	4.08	.....	4.15	11,100	3.90	8,700	2.60	2,060	2.55	2,380
16	3.55	.....	4.00	9,990	3.70	7,800	2.65	2,080	2.70	2,800
17	3.45	6,380	3.60	7,550	3.80	8,300	2.75	2,210	2.57	2,420
18	3.20	5,340	3.90	8,800	3.67	7,650	2.80	2,430	2.50	2,250
19	3.00	4,620	3.88	8,750	3.65	7,550	2.65	2,050	2.40	2,050
20	3.40	6,300	3.8	8,300	3.71	7,850	2.80	2,490	.....	.....
21	4.00	9,400	3.73	8,200	3.80	8,300	2.83	2,610	.....	.....
22	3.10	5,180	3.75	8,550	3.66	7,600	3.60	5,680	.....	.....
23	3.09	5,220	3.83	9,240	3.75	8,050	3.13	3,720	.....	.....
24	3.35	6,350	3.90	9,900	3.72	7,900	3.30	4,430	.....	.....
25	3.55	7,350	4.10	11,400	3.65	7,500	3.00	3,330	.....	.....
26	3.50	7,200	4.17	12,100	3.63	7,350	2.90	3,020	.....	.....
27	3.20	5,860	4.05	11,400	3.56	6,980	2.70	2,400	.....	.....
28	3.15	5,740	4.00	11,400	3.35	6,000	2.65	2,300	.....	.....
29	3.35	6,660	3.83	10,700	3.28	5,670	2.55	2,100	.....	.....
30	3.95	9,840	3.58	9,520	3.16	5,150	2.60	2,320	.....	.....
31	3.80	9,080	.....	.....	3.10	4,870	.....	.....	.....	.....

NOTE.—Daily discharge determined from a series of parallel curves and by indirect method for shifting channels.

Monthly discharge of Platte River near Leshara, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 17-31	9,840	4,620	6,700	199,000	C.
April	12,100	7,550	10,300	613,000	C.
May	14,100	4,870	8,250	507,000	C.
June	6,400	2,050	3,730	222,000	C.
July 1-19	3,250	2,010	2,510	94,600	C.
The period				1,640,000	

NORTH SPRING CREEK NEAR SARATOGA, WYO.

Location.—At Boock's ranch, in sec. 19, T. 16 N., R. 85 W., 14 miles southwest of Saratoga. Nearest tributary, Methodist Creek, enters a few miles below.

Record available.—August 23 to October 30, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made by wading.

Winter flow.—No data.

Diversions.—Prior to July 1, 1914, there were adjudicated diversions of 78 second-feet from North Spring Creek. It is not known what part of these is above the station.

Accuracy.—Only base data available, as the station has not been completely rated. These data are considered reliable.

Cooperation.—Station maintained in cooperation with Sierra Madre Land & Water Co.

Discharge measurements of North Spring Creek near Saratoga, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 23	Robert Follansbee	0.55	9.3
Oct. 30	R. H. Fletcher	.50	4.2

Daily gage height, in feet, of North Spring Creek near Saratoga, Wyo., for 1913.

[R. A. Ainsworth, observer.]

Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.
1	.....	0.55	0.45	11	.....	0.55	0.55	21	.....	0.55	.....
2	.....	.55	.45	12	.....	.55	.55	22	.....	.55	.....
3	.....	.55	.45	13	.....	.55	.55	23	0.55	.55	.....
4	.....	.55	.45	14	.....	.55	.50	24	.55	.55	.....
5	.....	.62	.45	15	.....	.55	.46	25	.55	.55	.....
6	.....	.55	.51	16	.....	.55	.45	26	.58	.51	.....
7	.....	.55	.55	17	.....	.55	.45	27	.58	.50	.....
8	.....	.55	.55	18	.....	.55	.45	28	.55	.45	.....
9	.....	.65	.55	19	.....	.55	.45	29	.55	.....	.....
10	.....	.55	.55	20	.....	.55	.....	30	.55	.....	0.50
								31	.56	.....	.....

JACK CREEK AT MATHESON'S RANCH, NEAR SARATOGA, WYO.

Location.—At Matheson's ranch, about sec. 36, T. 17 N., R. 86 W., about 14 miles southwest of Saratoga. Nearest tributary, North Jack Creek, enters some distance below.

Records available.—August 23 to November 21, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made from footbridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater; records discontinued.

Diversions.—Prior to July 1, 1914, there were adjudicated diversions of 95 second-feet from Jack Creek. It is not known what part of these is above the station.

Accuracy.—Base data only available, as station has not been completely rated. These data are considered reliable.

Cooperation.—Station maintained in cooperation with the Sierra Madre Land & Water Co.

Discharge measurements of Jack Creek at Matheson's ranch, near Saratoga, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 23	Robert Follansbee	.....	[a] 2.5
Oct. 31	R. H. Fletcher	0.52	6.5

[a] Estimated.

Daily gage height, in feet, of Jack Creek at Matheson's ranch, near Saratoga, Wyo., for 1913.

Day.	Aug.	Sept.	Oct.	Nov.	Day.	Aug.	Sept.	Oct.	Nov.
1	.....	0.38	0.44	0.50	16	.....	0.36	0.48	0.40
2	.....	.38	.48	.52	17	.....	.36	.51	.52
3	.....	.35	.46	.55	18	.....	.35	.46	.51
4	.....	.38	.40	.52	19	.....	.35	.52	.52
5	.....	.39	.62	.....	20	.....	.36	.50	.52
6	.....	.40	.52	.50	21	.....	.35	.52	.48
7	.....	.39	.46	.48	22	.....	.38	.50	.....
8	.....	.40	.51	.48	23	0.32	.40	.49	.....
9	.....	.45	.52	.45	24	.30	.41	.50	.....
10	.....	.45	.49	.50	25	.30	.40	.56	.....
11	.....	.39	.50	.46	26	.29	.41	.48	.....
12	.....	.39	.49	.58	27	.32	.41	.55	.....
13	.....	.36	.56	.56	28	.34	.40	.....	.....
14	.....	.36	.59	.52	29	.35	.42	.55	.....
15	.....	.41	.55	.40	30	.36	.44	.52	.....
					31	.40	.....	.52	.....

ROCK CREEK NEAR ARLINGTON, WYO.

Location.—At highway bridge in sec. 25, T. 19 N., R. 79 W., 1½ miles upstream from Arlington post office; 1 mile below the mouth of Overland Creek, the nearest tributary.

Records available.—April 22, 1911, to December 2, 1913.

Drainage area.—70 square miles (measured from Forest atlas).

Gage.—Bristol automatic gage referred to same datum as original gage.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—One small ditch diverts water above the station for irrigation.

Accuracy.—Estimates obtained by indirect method for shifting channels, and can be considered only fair, except for months when measurements indicated no shift, for which they are probably good.

Cooperation.—Field data furnished through courtesy of Rock Creek Conservation Co., which maintained station.

Discharge measurements of Rock Creek near Arlington, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Jan. 4	Cummings and Gordon.	1.2	24	July 4	F. T. Cummings	1.95	107
May 3	do	1.9	119	13	do	1.6	54
	C. E. Turner	2.6	289	29	do	1.55	43
19	F. T. Cummings	2.8	280	Aug. 5	do	1.4	30
June 2	do	3.0	577	13	do	1.3	26
12	do	2.6	432	Dec. 6	Cummings and Gordon		15
18	do	2.45	303	Sept. 1	M. N. Grant	1.3	13

Daily gage height, in feet, of Rock Creek near Arlington, Wyo., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.30	1.85	3.20	2.08	1.48	1.28	1.30	1.30	1.67
2		1.25	1.85	3.20	2.04	1.50	1.30	1.26	1.30	1.82
3		.85	1.80	3.05	1.98	1.55	1.30	1.26	1.34	
4		.80	1.75	2.95	1.96	1.55	1.28	1.37	1.35	
5		.80	1.76	2.90	1.94	1.68	1.44	1.46	1.31	
6		.90	1.85	2.85	1.90	1.72	1.35	1.40	1.26	
7		.85	2.05	2.80	1.94	1.52	1.36	1.28	1.27	
8		.80	2.02	2.65	1.85	1.50	1.42	1.35	1.36	
9		.70	2.05	2.80	1.85	1.47	1.44	1.28	1.30	
10		.90	2.20	2.95	1.80	1.46	1.38	1.25	1.27	
11		.95	2.35	2.90	1.85	1.45	1.30	1.37	1.30	
12		.80	2.65	2.65	1.80	1.46	1.28	1.33	1.26	
13		.95	2.76	2.50	1.76	1.40	1.28	1.38	1.26	
14		1.00	2.65	2.70	1.77	1.37	1.29	1.40	1.26	
15		1.10	2.50	2.85	1.73	1.35	1.30	1.35	1.30	
16		1.00	2.45	2.80	1.71	1.32	1.30	1.27	1.40	
17		.97	2.35	2.65	1.76	1.31	1.30	1.20	1.30	
18		1.00	2.65	2.65	1.70	1.33	1.27	1.22	1.30	
19	0.93	1.00	2.75	2.65	1.69	1.30	1.25	1.30	1.28	
20	.90	1.05	2.55	2.50	1.68	1.30	1.25	1.34	1.28	
21	.86	1.00	2.45	2.45	1.68	1.28	1.26	1.30	1.30	
22	.90	1.12	2.45	2.45	1.70	1.28	1.28	1.30	1.58	
23	.95	1.00	2.70	2.45	1.81	1.28	1.28	1.30	1.68	
24	.92	1.00	3.00	2.45	1.78	1.28	1.28	1.30	1.56	
25	.85	.92	3.20	2.55	1.67	1.28	1.22	1.27	1.52	
26	.80	1.13	3.40	2.50	1.62	1.28	1.27	1.32	1.45	
27	.80	1.40	3.45	2.30	1.60	1.26	1.30	1.47	1.41	
28	.80	1.51	3.25	2.25	1.60	1.24	1.30	1.31	1.33	
29	.82	1.75	3.25	2.25	1.58	1.23	1.30	1.45	1.62	
30	.80	1.80	3.35	2.12	1.50	1.24	1.28	1.32	1.64	
31	.90		3.40		1.50	1.26		1.30		

Daily discharge, in second-feet, of Rock Creek near Arlington, Wyo., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	36	110	680	142	38	12	13	13	.....
2	.....	31	110	680	130	40	13	11	13	.....
3	.....	8	100	600	116	45	13	11	15	.....
4	.....	6	92	555	108	45	12	16	16	.....
5	.....	6	94	535	104	61	21	22	14	.....
6	.....	10	110	515	97	67	16	18	11	.....
7	.....	8	150	495	104	42	16	12	12	.....
8	.....	6	144	232	88	40	19	16	16	.....
9	.....	4	150	505	88	37	21	12	13	.....
10	.....	10	180	585	80	36	17	10	12	.....
11	.....	12	218	565	88	35	13	16	13	.....
12	.....	6	308	450	80	36	12	14	11	.....
13	.....	12	346	377	74	30	12	17	11	.....
14	.....	14	308	457	75	28	12	18	11	.....
15	.....	18	245	472	69	26	13	16	13	.....
16	.....	14	218	475	66	24	13	12	18	.....
17	.....	13	180	390	74	23	13	8	13	.....
18	.....	14	245	385	64	23	12	9	13	.....
19	11	14	268	385	63	20	10	13	12	.....
20	10	16	200	321	61	19	10	15	12	.....
21	8	14	172	298	61	16	11	13	13	.....
22	10	20	172	294	64	16	12	13	.....	.....
23	12	14	268	291	82	16	12	13	.....	.....
24	11	14	405	288	77	15	12	13	15	.....
25	8	11	520	317	60	14	9	12	.....	.....
26	6	20	650	291	53	14	12	14	.....	.....
27	6	46	710	222	50	12	13	23	.....	.....
28	6	59	622	201	50	11	13	14	.....	.....
29	7	92	650	195	48	10	13	22	.....	.....
30	6	100	740	155	40	10	12	14	.....	.....
31	10	.....	800	.....	40	10	.....	13	.....	.....

NOTE.—Discharge determined from a series of fairly well defined parallel curves and by indirect method.

Monthly discharge of Rock Creek near Arlington, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 19–31	12	6	8.5	219	C.
April	100	6	21.6	1,290	C.
May	800	92	306	18,800	B.
June	680	155	407	24,200	B.
July	142	40	77.3	4,750	A.
August	67	10	27.7	1,700	A.
September	21	9	13.3	791	B.
October	23	8	14.3	879	B.
November	.....	.....	13.7	815	C.
The period	.....	.....	.....	53,400	

SWEETWATER RIVER NEAR ALCOVA, WYO.

Location.—At Schoonmaker's ranch, in sec. 17, T. 29 N., R. 86 W., 27 miles west of Alcova. Backwater from Pathfinder reservoir comes to a point 5 miles below. Nearest tributary, Dry Creek, enters 6 miles below.

Records available.—August 28 to December 1, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made from bridge one-fourth mile below during high water and by wading at low stages.

Winter flow.—Ice causes backwater; records discontinued.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions of 120 second-feet from Sweetwater River, all above the station. There were also diversions of 84 second-feet from tributaries entering above.

Accuracy.—Field data only available, as the station has not been completely rated. These data are considered reliable.

Cooperation.—Station maintained in cooperation with United States Reclamation Service.

Discharge measurements of Sweetwater Creek near Alcova, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 28	Robert Follansbee	0.50	24.6
Oct. 14	R. H. Fletcher	.69	52.9

Daily gage height, in feet, of Sweetwater River near Alcova, Wyo., for 1913.

[Oliver W. Stevens, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.52	0.70	0.70	0.70	16	.....	0.50	0.70	0.70	.....
2	.....	.50	.70	.70	.....	17	.....	.50	.70	.70	.....
3	.....	.52	.70	.70	.....	18	.....	.50	.70	.70	.....
4	.....	.52	.70	.70	.....	19	.....	.50	.70	.70	.....
5	.....	.52	.70	.70	.....	20	.....	.52	.70	.70	.....
6	.....	.52	.70	.70	.....	21	.....	.52	.70	.70	.....
7	.....	.50	.70	.70	.....	22	.....	.52	.70	.70	.....
8	.....	.50	.70	.70	.....	23	.....	.52	.70	.85	.....
9	.....	.50	.70	.70	.....	24	.....	.52	.70	.70	.....
10	.....	.50	.70	.70	.....	25	.....	.55	.70	.70	.....
11	.....	.50	.70	.70	.....	26	.....	.55	.72	.70	.....
12	.....	.50	.70	.70	.....	27	.....	.60	.75	.70	.....
13	.....	.50	.70	.69	.....	28	0.50	.60	.72	.70	.....
14	.....	.50	.70	.70	.....	29	.50	.60	.71	.70	.....
15	.....	.50	.70	.70	.....	30	.52	.65	.70	.70	.....
						31	.55	.....	.70	.....	.....

LARAMIE RIVER AT GLENDEVEY, COLO.

Location.—At highway bridge one-eighth mile west of Glendevey, in sec. 36, T. 10 N., R. 76 W., in Medicine Bow National Forest. McIntyre Creek enters a short distance below and Spring Creek above.

Records available.—June 24, 1904, to October 31, 1905; August 18, 1910, to October 19, 1913.

Drainage area.—102 square miles (measured from Clason's 1911 sectional map of Colorado).

Gage.—Automatic gage installed by State engineer November 17, 1910; replaced vertical staff previously used. The datum of gages has remained constant.

Control.—Permanent.

Discharge measurements.—Made from cable at bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—There are court decrees for diversions of 65 second-feet from Laramie River above the station and for 749 second-feet from tributaries entering above. Of the latter amount, 688 second-feet is for diversion into the Cache la Poudre basin. During 1913 a total of 15,200 acre-feet were diverted to the Cache la Poudre.

Cooperation.—Complete records since 1911 furnished by State engineer.

Discharge measurements of Laramie River at Glendevey, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	Thos. Grieve	2.10	48	Aug. 2	Thos. Grieve	2.10	44
May 9	do	2.68	202	11	M. E. Bunger	2.05	29
26	do	3.02	297	17	R. I. Meeker	2.00	30
June 7	do	2.80	219	Sept. 10	M. E. Bunger	2.00	33
20	do	2.65	175	27	do	2.10	38.5
July 23	R. I. Meeker	2.36	84	Oct. 12	R. I. Meeker	2.10	41
29	Thos. Grieve	2.20	53				

Daily gage height, in feet, of Laramie River at Glendevey, Colo., for 1913.

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

Daily discharge, in second-feet, of Laramie River at Glendevey, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	142	342	85	40	25	36
2	.....	112	290	72	40	22	36
3	.....	98	290	72	36	25	36
4	.....	85	272	72	40	22	54
5	.....	98	255	72	40	25	54
6	.....	127	272	63	36	28	40
7	.....	189	238	54	36	31	36
8	.....	142	206	63	36	31	36
9	.....	173	222	63	36	31	31
10	.....	222	238	72	31	31	31
11	.....	238	255	72	31	28	31
12	.....	255	206	63	31	28	31
13	.....	238	189	54	31	28	31
14	.....	173	174	47	31	25	36
15	.....	173	174	47	31	25	31
16	.....	158	174	47	31	25	31
17	.....	173	174	54	31	25	31
18	.....	189	174	72	28	25	25
19	.....	189	206	72	28	25	25
20	.....	158	189	54	28	22	.....
21	72	142	174	47	25	25	.....
22	85	127	174	47	28	25	.....
23	54	158	142	72	28	31	.....
24	47	189	127	127	31	31	.....
25	47	222	174	85	28	31	.....
26	40	255	158	72	28	31	.....
27	63	325	127	63	28	36	.....
28	112	325	127	54	28	31	.....
29	142	325	127	47	31	31	.....
30	142	342	98	47	31	36	.....
31	.....	360	.....	40	31	.....	.....

Monthly discharge of Laramie River at Glendevey, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 21–30	142	40	80.4	1,590
May	360	85	197	12,100
June	342	98	199	11,800
July	127	40	63.6	3,910
August	40	25	31.9	1,960
September	36	22	27.8	1,650
October 1–19	54	25	34.8	1,310
The period	.....	.....	.....	34,320

LARAMIE RIVER NEAR JELM, WYO.

Location.—At Boswell's ranch, in sec. 15, T. 12 N., R. 77 W., 4 miles south of Jelm post office, one-fourth mile below Colorado-Wyoming line.

Records available.—May 7, 1911, to November 30, 1913. From June 22, 1904, to October 31, 1905, a station was maintained at Decker's ranch, one-half mile south of State line. The records at the two stations are practically comparable, as there are no tributaries nor diversions of any consequence between.

Drainage area.—365 square miles (Clason's 1911 sectional map of Colorado).

Gage.—In 1911 an automatic recording gage was installed by the State engineer of Colorado. This is referred to same datum as the vertical staff used at first.

Control.—Practically permanent.

Discharge measurements.—Made from bridge at ordinary stages; low-water measurements made by wading.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—Between this station and that at Glendevey, Colo., there are court decrees for diversions of 236 second-feet from Laramie River and 204 second-feet from intervening tributaries. These diversions are all in Colorado.

Accuracy.—Conditions are favorable for accurate results; estimates should be excellent.

Cooperation.—Complete records furnished by State engineer of Colorado.

Discharge measurements of Laramie River near Jelm, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 24	R. I. Meeker	1.30	114	June 15	Thos. Grieve	2.05	380
24	Thos. Grieve	1.45	140	21	C. E. Turner	1.97	334
25	....do	1.34	128	July 22	R. I. Meeker	1.36	113
27	....do	1.40	136	Aug. 9	M. E. Bunger	1.15	63
29	....do	1.70	252	17	R. I. Meeker	1.02	44
May 8	....do	2.20	467	Sept. 2	Robert Follansbee	.99	41
14	R. I. Meeker	2.35	514	2	M. E. Bunger	1.00	39
22	C. E. Turner	2.06	371	30	....do	1.22	76
24	Thos. Grieve	2.45	599	Oct. 3	....do	1.22	78
28	....do	2.72	777	12	R. I. Meeker	1.20	78
30	R. I. Meeker	2.82	850	Nov. 25	....do	1.06	66

Daily gage height, in feet, of Laramie River near Jelm, Wyo., for 1913.

[C. D. Oviatt, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.0	2.8	1.6	1.3	1.0	1.15	1.1
2	.....	1.95	2.65	1.55	1.25	.95	1.15	1.1
3	.....	1.8	2.55	1.5	1.2	.90	1.15	1.1
4	.....	1.75	2.55	1.5	1.2	.90	1.3	1.1
5	.....	1.8	2.45	1.45	1.2	1.0	1.4	1.1
6	.....	1.95	2.45	1.4	1.15	1.05	1.3	1.1
7	.....	2.15	2.45	1.35	1.15	1.1	1.2	1.1
8	.....	2.15	2.3	1.35	1.15	1.05	1.2	1.15
9	.....	2.1	2.3	1.35	1.1	1.1	1.2	1.1
10	.....	2.3	2.35	1.4	1.15	1.1	1.2	1.1
11	.....	2.35	2.4	1.45	1.1	1.0	1.15	1.1
12	.....	2.4	2.25	1.35	1.1	1.0	1.2	1.05
13	.....	2.45	2.15	1.3	1.1	1.0	1.2	1.1
14	.....	2.3	2.05	1.3	1.1	1.0	1.2	1.1
15	.....	2.15	2.0	1.35	.....	1.05	1.15	1.05
16	.....	2.15	2.0	1.3	.....	1.0	1.15	1.0
17	.....	2.15	2.0	1.35	.....	1.0	1.2	1.1
18	.....	2.25	2.0	1.5	.....	1.0	1.15	1.05
19	.....	2.3	2.1	1.55	.....	1.0	1.1	1.1
20	.....	2.2	2.0	1.4	.....	1.0	1.15	1.05
21	1.65	2.1	2.0	1.4	.....	1.0	1.1	1.05
22	1.6	2.1	1.95	1.3	.....	1.15	1.05	1.05
23	1.4	2.25	1.85	1.5	1.0	1.2	1.1	1.1
24	1.35	2.4	1.75	1.7	1.0	1.15	1.15	1.15
25	1.4	2.5	1.9	1.55	1.0	1.2	1.1	1.1
26	1.4	2.6	1.9	1.4	1.0	1.2	1.1	1.1
27	1.4	2.75	1.8	1.4	.95	1.2	1.2	1.1
28	1.5	2.75	1.75	1.35	1.0	1.15	1.1	1.15
29	1.7	2.75	1.8	1.3	1.0	1.15	1.1	1.1
30	1.95	2.85	1.65	1.25	1.0	1.15	1.15	1.05
31	.....	2.9	.....	1.3	1.0	.....	1.15	.....

NOTE.—Gage heights from automatic gage, except those for Sept. 12 to 23, inclusive, which represent rod-gage readings.

Daily discharge, in second-feet, of Laramie River near Jelm, Wyo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		356	836	194	102	42	67	57
2		334	734	168	90	35	67	57
3		269	668	161	77	28	67	57
4		250	668	161	77	28	102	57
5		269	606	146	77	42	130	57
6		334	606	130	67	50	102	57
7		434	606	116	67	57	77	57
8		434	516	116	67	50	77	67
9		406	516	116	57	57	77	57
10		516	546	130	67	57	77	57
11		546	576	146	57	42	67	57
12		576	488	116	57	42	77	50
13		606	434	102	57	42	77	57
14		516	381	102	57	42	77	57
15		434	356	116	57	50	67	50
16		434	356	102	57	42	67	42
17		434	356	116	42	42	77	57
18		488	356	161	42	42	67	50
19		516	406	178	42	42	57	57
20		461	356	130	42	42	67	50
21	212	406	356	130	42	42	57	50
22	194	406	334	102	42	67	50	50
23	130	488	290	161	42	77	57	57
24	116	576	250	230	42	67	67	67
25	130	636	311	178	42	77	57	57
26	130	701	311	130	42	77	57	57
27	130	801	269	130	35	77	77	57
28	161	801	250	116	42	67	57	67
29	230	801	269	102	42	67	57	57
30	334	871	212	90	42	67	67	50
31		906		102	42		67	

Monthly discharge of Laramie River near Jelm, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 21–30	334	116	177	3,510
May	906	250	516	31,700
June	836	212	441	26,200
July	230	90	135	8,300
August	102	35	55.3	3,400
September	77	28	52.0	3,090
October	130	50	71.4	4,390
November	67	42	55.9	3,330
The period				83,900

BIRDWOOD CREEK NEAR SUTHERLAND, NEBR.

Location.—At highway bridge in sec. 2, T. 15 N., R. 33 W., 16 miles north of Sutherland. Nearest tributary, West Birdwood Creek, enters 2 miles below.

Records available.—August 26 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff; gage was moved upstream September 1, 1913.

Control.—Somewhat shifting.

Discharge measurements.—Made from pile bent bridge.

Winter flow.—No data.

Diversions.—Prior to September 1, 1912, there were approved diversions of 117 second-feet from Birdwood Creek below station; none above station.

Accuracy.—Flow very uniform as creek is fed by springs; measurements during period sufficient to insure very good results.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Birdwood Creek near Sutherland, Nebr., in 1913.

[Hydrographer, C. J. McNamara.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Aug. 26	1.30	135	Oct. 19	3.05	172
31	1.00	174	Nov. 2	3.05	172
Sept. 13	3.00	171	Dec. 12	3.00	174
26	3.05	172			

Daily gage height, in feet, and discharge, in second-feet, of Birdwood Creek near Sutherland, Nebr., for 1913.

[C. J. McNamara, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.0	170	3.05	172	3.05	172	3.05	172
2	3.0	170	3.05	172	3.05	172	3.05	172
3	3.0	170	3.05	172	3.05	172	3.05	172
4	3.0	170	3.05	172	3.05	172	3.05	172
5	3.0	170	3.05	172	3.05	172	3.05	172
6	3.0	170	3.05	172	3.05	172	3.05	172
7	3.0	170	3.05	172	3.05	172	3.05	172
8	3.0	170	3.05	172	3.05	172	3.05	172
9	3.0	170	3.05	172	3.05	172	3.05	172
10	3.05	173	3.05	172	3.05	172	3.05	172
11	3.0	170	3.05	172	3.05	172	3.0	174
12	3.0	170	3.05	172	3.05	172	3.0	174
13	3.0	170	3.05	172	3.05	172	3.0	174
14	3.0	170	3.05	172	3.05	172	3.05	185
15	3.0	170	3.05	172	3.05	172	3.05	185
16	3.12	177	3.05	172	3.05	172	3.05	185
17	3.1	176	3.05	172	3.05	172	3.05	185
18	3.05	173	3.05	172	3.05	172	3.05	185
19	3.0	170	3.05	172	3.05	172	3.08	192
20	3.0	170	3.05	172	3.05	172	3.08	192
21	3.0	170	3.05	172	3.05	172	3.08	192
22	3.0	170	3.05	172	3.05	172	3.08	192
23	3.12	177	3.05	172	3.05	172	3.12	200
24	3.10	176	3.05	172	3.05	172	3.12	200
25	3.05	173	3.05	172	3.05	172	3.12	200
26	3.0	170	3.05	172	3.05	172	3.12	200
27	3.0	170	3.05	172	3.05	172	3.12	200
28	3.05	173	3.05	172	3.05	172	3.05	185
29	3.05	173	3.05	172	3.05	172	3.05	185
30	3.05	173	3.05	172	3.05	172	3.05	185
31	.....	.....	3.05	172	.....	.....	3.05	185

Monthly discharge of Birdwood Creek near Sutherland, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September	177	170	171	10,200	A.
October	172	172	172	10,600	A.
November	172	172	172	10,200	A.
December	200	172	183	11,300	A.

SOUTH FORK OF SOUTH PLATTE RIVER AT LAKE GEORGE, COLO.

Location.—At highway bridge in sec. 19, T. 12 S., R. 71 W., one-fourth mile below Lake George, in Pike national forest, about 2 miles above mouth of Caylor Gulch; no tributary between outlet of lake and the station.

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

Drainage area.—Not measured.

Gage.—Automatic recording gage installed in 1911, reading to the same datum as the original staff gage.

Control.—A 2-foot timber-crib dam 50 feet below the gage.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater during the winter months and measurements are made to determine the flow.

Regulation.—The discharge at the station is controlled naturally to some extent by the dam at the outlet of Lake George. The lake has an area of one-half square mile and is used as an ice pond. It is controlled to a greater extent by Antero reservoir, located 45 miles upstream.

Diversions.—There are court decrees for diversions of 1,076 second-feet from the South Fork above Lake George. Besides these, Antero reservoir has a decree for storage of 85,600 acre-feet from the South Fork and tributaries. The Antero water all passes the Lake George station, as it is finally diverted from the South Platte. There are decrees for diversions of 1,926 second-feet from tributaries above Lake George.

Accuracy.—Conditions favorable for accurate results; estimates considered reliable.

Cooperation.—Station maintained in cooperation with United States Forest Service and the State engineer.

Discharge measurements of South Fork of South Platte River at Lake George, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 16	M. E. Bunger	1.65	37.6	June 4	R. H. Fletcher	1.92	86
June 3	R. H. Fletcher	2.06	122	Nov. 5	do	1.68	48
4	do	1.92	85				

Daily gage height, in feet, of South Fork of South Platte River at Lake George, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.80	2.05	2.6	2.45	.....	.....	1.4
2	.....	2.00	2.0	2.55	2.45	2.1	.....	1.4
3	.....	1.97	1.8	2.5	2.45	.....	1.6	1.4
4	.....	1.84	1.8	2.5	2.45	2.1	1.7	.....
5	.....	1.85	1.85	2.5	2.4	.....	1.7	1.4
6	.....	1.85	1.9	2.5	2.4	1.95	1.4	.....
7	.....	1.80	1.9	2.4	2.4	.....	.....	1.4
8	.....	1.90	1.85	2.25	2.55	.....	1.4	1.4
9	.....	2.15	1.85	2.2	2.7	1.8	1.45	.....
10	.....	2.25	1.95	2.2	2.8	1.8	.....	1.4
11	.....	2.35	2.0	2.2	2.7	1.8	.....	.....
12	.....	2.55	2.05	2.4	2.7	1.8	1.6	1.4
13	.....	2.60	2.0	.....	2.6	1.7	1.7	1.4
14	.....	2.05	1.9	2.65	2.6	1.75	1.7	1.4
15	.....	1.85	1.75	2.45	2.65	1.75	.....	.....
16	.....	1.85	1.7	2.35	2.65	1.75	1.5	1.4
17	.....	1.90	1.9	2.4	2.65	.....	1.4	1.4
18	.....	1.85	2.55	2.4	2.5	1.6	.....	1.4
19	.....	2.35	2.35	2.4	2.55	1.6	.....	.....
20	.....	2.55	2.55	2.45	2.6	1.65	1.6	1.4
21	.....	2.45	2.6	2.55	2.4	.....	.....	1.4
22	.....	2.42	2.7	2.6	2.2	1.65	.....	.....
23	.....	2.38	2.9	2.7	2.2	.....	.....	.....
24	1.20	2.38	3.2	2.6	2.1	.....	.....	.....
25	1.27	2.32	3.0	2.65	2.0	.....	.....	.....
26	1.30	2.30	2.85	2.6	.....	.....	1.4	.....
27	1.30	2.28	2.8	2.55	.....	1.4	1.4	.....
28	1.38	2.20	2.8	2.55	2.00	1.4	.....	.....
29	1.50	2.0	2.8	.....	.....	1.4	.....	.....
30	1.66	2.1	2.7	2.65	2.20	1.5	1.4	.....
31	1.70	.....	2.6	2.5	.....	1.8	.....	.....

NOTE.—Gage heights prior to Sept. 25 taken chiefly from automatic gage; after that date from staff gage.

Daily discharge, in second-feet, of South Fork of South Platte River at Lake George, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	65	114	315	248	140	57	26
2	.....	103	103	292	248	126	49	26
3	.....	97	65	270	248	126	41	26
4	.....	72	65	270	248	126	52	26
5	.....	74	74	270	227	111	52	26
6	.....	74	83	270	227	93	26	26
7	.....	65	83	227	227	83	26	26
8	.....	83	74	171	292	74	26	26
9	.....	140	74	154	365	65	30	26
10	.....	171	93	154	415	65	33	26
11	.....	208	103	154	365	65	37	26
12	.....	292	114	227	365	65	41	26
13	.....	315	103	279	315	52	52	26
14	.....	114	83	340	315	58	52	26
15	.....	74	58	248	340	58	43	26
16	.....	74	52	208	340	58	33	26
17	.....	83	83	227	340	50	26	26
18	.....	74	292	227	270	41	31	26
19	.....	208	208	227	292	41	36	26
20	.....	292	292	248	315	46	41	26
21	.....	248	315	292	227	46	38	26
22	.....	236	365	315	154	46	35	26
23	.....	219	470	365	154	41	32	26
24	15	219	645	315	126	37	29	26
25	18	196	525	340	103	33	26	26
26	20	188	442	315	103	29	26	26
27	20	181	415	292	103	26	26	26
28	25	154	415	292	103	26	26	26
29	33	103	415	315	126	26	26	26
30	48	126	365	340	154	33	26	26
31	52	.....	315	270	.....	65	.....	26

NOTE.—Discharge determined from a well-defined rating curve. Discharge estimated for days for which gage heights are missing.

Monthly discharge of South Fork of South Platte River at Lake George, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 24–31	52	15	28.9	459	B.
June	315	65	152	9,040	B.
July	645	52	223	13,700	B.
August	365	154	265	16,300	B.
September	415	103	245	14,600	B.
October	140	26	62.9	3,879	B.
November	57	26	35.8	2,130	B.
December	26	26	26.0	1,600	C.
The period				61,700	

SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.

Location.—In sec. 25, T. 7 S., R. 70 W., in Pike National Forest, three-quarters of a mile east of South Platte, about 300 feet below junction of North and South forks. No tributary enters between forks and station or for several miles below.

Records available.—March 28, 1902, to December 31, 1913. Records at Platte Canyon and at Deansbury, a few miles below, extend back to 1887, with the exception of the years 1893 and 1894. The earlier records, 1887–1892, were taken by the State engineer, and records from 1895 to 1898 were taken under direction of the Denver Power & Irrigation Co.

Drainage area.—2,610 square miles (measured from Hayden atlas).

Gage.—An automatic recording gage installed by the State engineer March 14, 1910. From March 28, 1902, to May 7, 1905, the gage was at the highway bridge. On the latter date it was moved to its present site, 150 feet below. It is probable that the new gage read to a somewhat different datum. The recording gage is referred to datum of gage established in 1905.

Control.—Practically permanent during 1913.

Discharge measurements.—Made from car and cable during high water and by wading at low stages.

Winter flow.—Ice causes backwater during a portion of the winter months and measurements are made to determine the flow.

Regulation.—The flow is controlled to a certain extent by the Cheesman reservoir, which is situated on the South Fork about 20 miles above forks and has a capacity of approximately 80,000 acre-feet.

Diversions.—No water is diverted between this station and that on the North Fork at South Platte. Between the station on the South Fork near Lake George and South Platte the Cheesman reservoir has a court decree for 80,000 acre-feet for municipal purposes. This water all passes the gaging station, as it is diverted from the South Platte farther downstream. There are decrees for diversions of 1,400 second-feet from intervening tributaries and a reservoir decree for 46,000 acre-feet.

Accuracy.—Conditions are favorable for accurate results and the estimates are considered reliable.

Cooperation.—Station maintained in cooperation with the State engineer.

Discharge measurements of South Platte River at South Platte, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 1	R. H. Fletcher	2.00	180	Sept. 29	Robert Follansbee	2.46	351
May 15	Raymond Richards	2.84	540	Dec. 5	R. H. Fletcher	2.92	383
June 16	R. H. Fletcher	3.57	825	29	do	2.2	139
Aug. 8	do	2.68	454				

Daily gage height, in feet, of South Platte River at South Platte, Colo., for 1913.

[Miss A. Vermillion, observer.]

Day.	Jan.	Feb.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	2.00	3.10	3.10	3.3	2.9	2.6	2.65	2.15	1.78
2	.....	.....	2.05	3.15	3.35	3.4	2.9	2.65	2.8	2.1	1.9
3	.....	.....	1.90	3.00	3.20	3.6	2.85	2.65	2.95	2.25	1.82
4	.....	.....	1.70	2.85	3.20	3.5	2.8	2.65	2.9	2.35	1.66
5	.....	.....	1.80	2.75	3.10	3.4	2.8	2.7	2.7	2.2	2.4
6	.....	.....	1.85	2.95	3.30	3.4	2.9	2.65	2.55	2.15	2.7
7	.....	.....	1.85	3.10	3.70	3.3	.....	2.55	2.55	2.15	2.55
8	.....	.....	1.80	2.95	3.80	3.2	2.75	2.65	2.5	2.05	2.35
9	.....	.....	1.65	2.90	3.90	3.2	2.65	2.65	2.45	2.05	2.25
10	.....	.....	1.60	2.95	3.80	3.2	2.85	2.7	2.4	2.0	.....
11	.....	.....	1.70	3.05	4.00	3.2	2.9	3.0	2.35	2.05	.....
12	.....	.....	1.75	3.10	4.00	3.3	2.9	3.15	2.35	2.05	.....
13	4.50	.....	1.90	3.20	4.10	2.8	2.85	3.0	3.65	2.1	.....
14	.....	.....	2.25	3.00	4.00	2.7	2.8	2.95	2.3	2.15	.....
15	.....	.....	3.10	2.80	3.70	2.7	2.8	3.0	2.1	2.05	1.9
16	.....	.....	3.30	2.80	3.55	2.7	2.85	3.0	2.1	1.95	1.94
17	.....	.....	3.35	2.85	.....	2.95	3.4	2.9	2.15	2.0	1.73
18	.....	.....	3.15	2.90	.....	3.1	2.9	2.75	2.05	2.0	1.81
19	.....	.....	3.05	2.95	.....	3.5	3.4	2.6	2.05	2.1	1.85
20	.....	.....	3.10	2.85	.....	3.6	3.3	2.35	2.05	2.15	1.94
21	.....	.....	3.40	2.75	3.40	3.8	2.25	2.3	2.1	2.25	.....
22	.....	.....	3.20	2.70	.....	3.7	3.3	2.3	2.1	2.05	2.0
23	.....	.....	3.10	2.85	4.15	3.9	3.6	2.25	2.1	1.85	1.82
24	.....	.....	2.80	2.95	4.1	4.2	3.0	2.25	2.2	1.75	1.80
25	.....	4.3	2.80	2.85	3.95	4.3	2.95	2.25	2.25	1.95	.....
26	.....	.....	2.75	3.05	3.95	4.3	2.9	2.25	2.15	1.92	.....
27	.....	.....	2.75	3.10	3.95	4.2	2.85	2.25	2.1	1.95	.....
28	.....	.....	2.85	2.95	3.85	3.8	2.75	2.3	2.1	2.0	.....
29	.....	.....	2.95	3.10	3.7	3.1	2.6	2.45	1.95	2.1	.....
30	.....	.....	3.05	3.10	3.4	3.0	2.55	2.45	2.05	1.82	3.4
31	.....	.....	.....	3.10	.....	2.95	2.55	.....	2.15	.....	2.9

NOTE.—Ice present Jan. 1 to Mar. 31 and Dec. 5 to 31.

Daily discharge, in second-feet, of South Platte River at South Platte, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	190	633	633	719	547	421	442	241	135
2	206	654	741	762	547	442	505	223	164
3	164	590	676	848	526	442	569	280	145
4	117	526	676	805	505	442	547	319	108
5	140	484	633	762	505	463	463	260	339
6	152	569	719	762	547	442	400	241	395
7	152	633	891	719	510	400	400	241	354
8	140	569	934	676	484	442	380	206	314
9	106	547	977	676	442	442	359	206	276
10	95	569	934	676	526	463	339	190	250
11	117	612	1,020	676	547	590	319	206	160
12	129	633	1,020	719	547	655	319	206	160
13	164	676	1,060	505	526	590	870	223	220
14	280	590	1,020	463	505	569	299	241	145
15	633	505	891	463	505	590	223	206	117
16	719	505	827	463	526	590	223	177	117
17	741	526	1,100	569	762	547	241	190	124
18	655	547	1,280	633	547	484	206	190	128
19	612	569	1,450	805	762	421	206	223	117
20	633	526	1,380	848	719	319	206	241	95
21	762	484	762	934	280	299	223	280	95
22	676	463	921	891	719	299	223	206	95
23	633	526	1,080	977	848	280	223	152	140
24	505	569	1,060	1,110	590	280	260	129	140
25	505	526	999	1,150	569	280	280	177	140
26	484	612	999	1,150	547	280	241	169	152
27	484	633	999	1,110	526	280	223	177	152
28	526	569	956	934	484	299	223	190	117
29	569	633	891	633	421	359	177	223	140
30	612	633	762	590	400	359	206	145	140
31	.....	633	.....	569	400	.....	241	.....	140

NOTE.—Discharge computed from a rating curve well defined throughout. Discharge estimated for days for which gage heights are missing by comparison with records of Denver Union Water Co. at Platte Canyon. Discharge during December estimated from measurements, temperature records, and comparison with records of Denver Union Water Co.

Monthly discharge of South Platte River at South Platte, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	108	6,640	C.
February	.....	.....	83	4,610	C.
March	.....	.....	90	5,530	C.
April	762	95	397	23,600	A.
May	676	463	572	35,200	A.
June	1,450	633	943	56,100	A.
July	1,150	463	761	46,800	A.
August	848	280	544	33,400	A.
September	655	280	426	25,300	A.
October	870	177	324	19,900	A.
November	319	129	212	12,600	A.
December	395	95	171	10,500	C.
The year	1,450	.....	387	280,000	

NOTE.—Monthly means for January, February, and March based on records of the Denver Union Water Co. at Platte Canyon, decreased 1.4 per cent on account of the difference in drainage area.

SOUTH PLATTE RIVER AT DENVER, COLO.

Location.—At the Sixteenth Street viaduct in Denver, 500 feet below mouth of Cherry Creek.

Records available.—May 7, 1895, to November 30, 1913.

Drainage area.—3,840 square miles.

Gage.—Automatic recording gage installed August 12, 1909, and moved 100 feet upstream in April, 1913. The original gage was located at the Twenty-third Street viaduct. In July, 1895, a new gage was installed at the Fifteenth Street bridge. In August, 1898, an inclined staff gage was placed on the opposite side of the river, but referred to the same datum. This gage was destroyed by high water in June, 1900, and for remainder of the year the gage installed in July, 1895, was used. This gage was stolen and a new one placed between the Fifteenth and Sixteenth Avenue bridges May 15, 1901, reading to same datum. This gage also was stolen and was replaced on June 10, 1903, by a vertical staff near the same place, and having the same datum. The automatic gage is referred to practically the same datum as the preceding vertical staff.

Control.—Shifting.

Discharge measurements.—Made from the Fifteenth Street bridge during high water and by wading at low-water stages.

Winter flow.—Seldom affected by ice.

Diversions.—Between this station and the one at South Platte there are court decrees for diversions from South Platte River of 2,226 second-feet and from intervening tributaries of 1,466 second-feet.

Cooperation.—Records since 1907 furnished by State engineer; considered only approximate for 1913.

Discharge measurements of South Platte River at Denver, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 21	Bunger and Hezmalhalch	.....	130	May 24	M. E. Bunger	2.75	170
Feb. 10	....do	.....	138	July 2	Bunger and Hezmalhalch	2.90	319
Apr. 22	Bunger and Bundy	4.60	1,185	25	....do	4.60	1,303
29	....do	4.20	814	Oct. 2	D. L. Bundy	3.20	285
May 5	Bunger and Chrisman	3.90	669	Nov. 11	Thos. Grieve, jr.	2.78	233
23	M. E. Bunger	2.82	187	12	M. E. Bunger	2.70	220

Daily gage height, in feet, of South Platte River at Denver, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.4	3.55	3.25	2.6	3.15	.....	.....	.....
2	4.4	3.85	2.95	2.5	2.95	3.15	3.2	.....
3	4.35	3.5	3.10	3.0	3.2	.....	.....	.....
4	4.2	3.35	3.15	3.0	3.3	.....	.....	.....
5	3.9	3.3	3.20	3.0	3.1	3.35	2.95	.....
6	3.85	3.25	3.10	2.75	3.05	.....	3.0	3.0
7	3.85	4.1	2.95	2.75	3.05	.....	.....	3.0
8	3.7	4.15	2.80	2.8	3.2	3.1	.....	.....
9	3.7	4.0	2.90	2.7	3.2	.....	3.1	2.9
10	3.7	4.1	2.90	3.05	3.25	3.2	.....	.....
11	3.7	4.0	2.7	3.4	3.25	.....	2.75	.....
12	3.5	4.15	2.7	3.3	3.55	3.45	2.7	2.7
13	3.5	4.5	2.7	3.15	3.35	3.3	2.6	.....
14	3.6	4.15	2.7	3.0	3.0	.....	.....	2.7
15	3.5	3.6	2.7	2.9	2.95	2.7	.....	.....
16	3.3	3.7	3.1	2.85	3.0	2.65	2.6	.....
17	3.15	3.7	3.1	2.75	2.9	.....	.....	.....
18	3.1	4.45	3.8	3.65	2.8	.....	.....	.....
19	3.25	4.65	4.4	3.2	2.7	2.7	.....	.....
20	3.2	4.6	3.5	2.8	2.7	.....	2.5	.....
21	3.1	4.95	3.6	2.85	2.6	.....	.....	2.5
22	3.0	4.0	3.5	3.6	2.4	2.75	.....	.....
23	2.65	3.9	3.8	3.25	.....	.....	2.5	.....
24	2.75	4.0	3.7	3.25	3.2	2.55	.....	.....
25	2.85	3.9	4.7	3.2	3.0	.....	2.5	.....
26	2.7	3.6	4.2	3.3	2.5	2.8	.....	.....
27	2.8	3.4	3.5	3.25	2.4	.....	2.45	.....
28	3.1	3.4	3.5	3.2	2.4	.....	.....	2.7
29	3.4	3.35	3.2	3.15	2.4	3.2	.....	.....
30	3.5	3.3	3.0	3.35	2.3	3.0	2.4	.....
31	3.6	.....	2.6	3.1	.....	2.95	.....	.....

Daily discharge, in second-feet, of South Platte River at Denver, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	995	462	337	137	296	.....	.....	.....
2	995	621	226	116	226	269	360	.....
3	958	438	278	242	316	.....	.....	.....
4	845	371	296	242	358	.....	.....	.....
5	650	350	316	242	278	341	280	.....
6	621	331	278	170	260	.....	300	310
7	621	775	226	170	260	.....	.....	310
8	538	810	182	182	316	253	.....	.....
9	538	710	210	158	316	.....	350	275
10	538	775	210	260	337	285	.....	.....
11	538	710	158	404	337	.....	230	.....
12	438	810	158	358	482	381	215	215
13	438	1,075	158	296	381	330	190	.....
14	486	810	158	242	242	.....	.....	215
15	438	486	158	210	226	160	.....	.....
16	350	538	278	196	242	145	190	.....
17	294	538	278	170	210	.....	.....	.....
18	276	1,035	635	540	182	.....	.....	.....
19	331	1,202	1,115	316	158	170	.....	.....
20	312	1,160	455	182	158	.....	170	.....
21	276	1,675	510	196	137	.....	.....	170
22	242	780	455	510	98	190	.....	.....
23	148	705	635	337	192	.....	170	.....
24	170	780	570	337	285	150	.....	.....
25	196	705	1,405	316	225	.....	170	.....
26	158	510	940	358	113	210	.....	.....
27	182	404	455	337	95	.....	155	.....
28	276	404	455	316	95	.....	.....	215
29	392	381	316	296	95	345	.....	.....
30	438	358	242	381	80	280	145	.....
31	486	.....	510	278	.....	255	.....	.....

Monthly discharge of South Platte River at Denver, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
May	995	148	457	28,100
June	1,680	331	690	41,100
July	1,400	158	407	25,000
August	540	116	274	16,800
September	482	80	233	13,900
October (15 days)	381	145	251	7,470
November (13 days)	360	145	225	5,800
December (7 days)	310	170	244	3,390

SOUTH PLATTE RIVER NEAR KERSEY, COLO.

Location.—At highway bridge in sec. 9, T. 5 N., R. 64 W., 1¾ miles north of Kersey, 2 miles below entrance of Lone Tree Creek, an intermittent stream, and 3 miles below mouth of Cache la Poudre River.

Records available.—April 27, 1901, to October 31, 1903; March 1, 1905, to November 30, 1913.

Drainage area.—9,500 square miles.

Gage.—A chain gage placed in the fall of 1906 in each of the two channels in which the river flows. These gages were referred to a datum slightly different from that of the original gage, but have remained permanent since. The original gage, a vertical staff, was used until June 14, 1906, when the observer moved it 20 feet south. This gage was placed 0.30 foot too high and all readings were corrected by that amount until the chain gages were placed in position.

Control.—Shifting.

Discharge measurements.—Made from the bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes slight backwater for a few days during the winter.

Diversions.—Between this station and Denver there are court decrees for diversions of 3,764 second-feet from the South Platte and 17,000 second-feet from intervening tributaries, besides numerous flood-water decrees.

Accuracy.—Measurements during 1913 inadequate for estimates of discharge; only base data available.

Cooperation.—Records furnished by State engineer.

Discharge measurements of South Platte River near Kersey, Colo., in 1913.

Date.	Hydrographer.	Gage No. 1.		Gage No. 2.	
		Gage height.	Discharge.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
Mar. 20	M. E. Bunger	3.20	378	3.30	422
May 3	do	3.85	476	4.00	862
June 20	do	2.35	58	2.05	57
Nov. 15	Grieve and Hezmalhalch	3.10	275	3.20	288
19	Bunger and Chrisman	3.00	258	3.15	278

Daily gage height, in feet, of South Platte River near Kersey, Colo., for 1913.

[Mrs. J. C. Maisner, observer.]

Gage No. 1.

Day.	Jan.	Feb.	Mar.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.25	3.55	3.4	3.3	2.4	2.3	2.3	3.4	3.2
2	3.2	3.42	.....	3.3	2.4	2.25	2.3	3.4	3.3
3	3.22	3.38	.....	2.7	2.4	2.35	2.4	3.6	3.3
4	3.25	3.38	.....	2.35	2.4	2.4	2.4	3.75	3.3
5	3.2	3.3	.....	2.35	2.35	2.3	2.4	3.8	3.4
6	4.52	3.3	.....	2.3	2.3	2.2	2.4	3.8	3.4
7	4.35	3.28	.....	2.9	2.25	2.25	2.4	3.7	3.4
8	4.55	3.32	.....	2.6	2.25	2.25	2.4	3.5	3.3
9	4.5	5.45	.....	2.5	2.25	2.25	2.55	3.45	3.3
10	4.5	4.48	.....	2.5	2.25	2.25	2.55	3.3	3.2
11	4.5	3.35	.....	2.5	2.25	2.25	2.6	3.3	3.2
12	4.5	3.28	.....	2.4	2.2	2.3	2.55	3.3	3.2
13	4.48	3.32	.....	2.35	2.2	2.3	2.6	3.3	3.2
14	4.35	3.32	.....	2.45	2.25	2.35	2.9	3.3	3.2
15	4.32	.....	.....	2.35	2.25	2.3	2.8	3.3	3.2
16	3.75	3.4	.....	2.4	2.25	2.3	3.05	3.4	3.2
17	3.55	3.48	.....	2.3	2.25	2.4	3.3	3.3	3.15
18	3.55	3.5	.....	2.3	2.3	2.3	3.5	3.2	3.1
19	3.6	3.5	.....	2.35	2.3	2.3	3.4	3.2	3.15
20	3.5	3.42	.....	2.5	3.0	2.35	3.3	3.15	3.15
21	3.45	3.4	.....	2.7	3.0	2.35	3.25	3.1	3.15
22	3.4	3.3	.....	3.2	2.5	2.5	3.2	3.1	3.1
23	3.48	3.3	.....	2.9	2.4	2.4	3.2	3.5	3.1
24	3.5	3.28	.....	2.65	3.1	2.4	3.2	3.1	3.1
25	3.5	3.3	.....	2.5	3.5	2.4	3.3	3.3	3.1
26	3.52	3.42	.....	2.4	3.65	2.4	3.6	3.3	3.1
27	3.5	3.48	.....	2.3	3.5	2.35	3.5	3.1	3.15
28	3.52	3.42	.....	2.3	3.4	2.3	3.5	3.1	3.15
29	3.5	.....	.....	2.3	2.85	2.25	3.45	3.2	3.15
30	3.5	.....	.....	2.35	2.6	2.25	3.4	3.2	.....
31	3.6	.....	.....	.....	2.45	2.3	.....	3.2	.....

NOTE.—Channel No. 1—River frozen over Jan. 6 to Jan. 16, Feb. 9 and 10.

Gage No. 2.

Day.	Jan.	Feb.	Mar.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.32	3.5	3.4	3.5	2.1	2.2	2.1	3.4	3.25
2	3.32	3.42	.....	3.5	2.1	2.3	2.2	3.4	3.3
3	3.3	3.32	.....	2.35	2.1	2.2	2.3	3.6	3.3
4	3.3	3.32	.....	2.0	2.15	2.2	2.3	3.7	3.35
5	3.3	3.3	.....	2.5	2.05	2.3	2.3	3.8	3.35
6	4.12	3.35	.....	2.0	2.0	2.25	2.3	3.8	3.4
7	4.5	3.3	.....	2.75	2.0	2.25	2.3	3.7	3.4
8	4.78	3.35	.....	2.3	2.0	2.0	2.3	3.5	3.3
9	4.68	5.35	.....	2.25	2.25	2.5	2.5	3.4	3.3
10	4.68	4.48	.....	2.3	2.25	2.5	2.55	3.3	3.2
11	4.68	3.4	.....	2.25	2.0	2.3	2.6	3.3	3.2
12	4.6	3.4	.....	2.15	2.0	2.1	2.5	3.2	3.2
13	4.6	3.38	.....	2.2	2.0	2.1	2.55	3.2	3.15
14	4.35	3.42	.....	2.15	2.0	2.15	2.85	3.15	3.1
15	4.38	.....	.....	2.1	2.5	2.1	2.85	3.2	3.1
16	3.82	3.5	.....	2.1	2.25	2.1	3.3	3.35	3.1
17	3.5	3.58	.....	2.0	2.5	2.2	3.25	3.3	3.3
18	3.6	3.6	.....	2.25	2.1	2.15	3.4	3.25	3.3
19	3.55	3.62	.....	2.3	2.15	2.2	3.35	3.3	3.3
20	3.55	3.55	.....	2.3	3.0	2.2	3.3	3.2	3.00
21	3.55	3.5	.....	2.55	3.1	2.2	3.25	3.2	3.5
22	3.5	3.45	.....	3.05	2.3	2.50	3.15	3.25	3.25
23	3.5	3.4	.....	2.6	2.3	2.35	3.1	3.2	3.25
24	3.6	3.3	.....	2.3	2.9	2.35	3.35	3.2	3.0
25	3.58	3.35	.....	2.2	3.4	2.3	3.3	3.2	3.0
26	3.6	3.4	.....	2.05	3.6	2.2	3.55	3.1	3.25
27	3.6	3.4	.....	2.0	3.4	2.2	3.5	3.1	3.5
28	3.55	3.4	.....	1.9	3.1	2.2	3.4	3.1	3.5
29	3.5	.....	.....	1.95	2.8	2.1	3.4	3.2	3.5
30	3.48	.....	.....	2.0	2.6	2.15	3.4	3.25	.....
31	3.5	.....	.....	.....	2.4	2.15	.....	3.25	.....

NOTE.—Channel No. 2—River frozen over Jan. 6 to 16; ice gorged, Feb. 9 and 10.

SOUTH PLATTE RIVER AT JULESBURG, COLO.

Location.—At highway bridge 1 mile south of Julesburg, about sec. 33, T. 12 N., R. 44 W. No important tributaries between station and Colorado-Nebraska State line, 1 mile distant. All tributaries for 100 miles or more above station are intermittent.

Records available.—April 2, 1902, to November 16, 1906; May 12, 1908, to November 28, 1913.

Drainage area.—20,600 square miles.

Gage.—When station was reestablished in 1908 it was located at new highway bridge, 2,000 feet upstream from the original station. The datum of chain gage has remained unchanged since 1908.

Control.—Shifting; frequent measurements required.

Discharge measurements.—Made from pile bridge during high water and by wading at low-water stages.

Winter flow.—Ice causes backwater during winter months.

Diversions.—Between Kersey and Julesburg there are court decrees for diversions of 5,316 second-feet from the South Platte and diversions of 1,240 second-feet from intervening tributaries, including Lodgepole Creek in Nebraska and Wyoming, and Crow Creek in Wyoming. There are also numerous flood-water decrees. Between State line and the mouth diversions of 206 second-feet from the South Platte have been granted in Nebraska.

Accuracy.—Sufficient measurements were not secured during 1913 to allow estimates to be made, and only base data are available.

Cooperation.—Records for 1913 furnished by State engineer

Discharge measurements of South Platte River at Julesburg, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
July 24	Robert Follansbee	0.55	*a* 21
Nov. 19	Grieve and Hezmalhalch	.80	42

a Discharge estimated.

Daily gage height, in feet, of South Platte River at Julesburg, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.6	0.65	0.75	0.55	0.55	0.6	.....
2	.....	2.5	.7	.6	.50	.6	.55	.....
3	.....	2.5	.65	.5	.50	.6	.55	0.75
4	.....	2.2	.65	.5	.50	.6	.....	.75
5	.....	2.0	.65	.5	.50	.55	.....	1.1
6	.....	1.7	.6	.5	.50	.55	.6	.9
7	.....	1.6	.6	.5	.6	.55	.5	.....
8	.....	1.6	.6	.45	.6	.55	.5	.85
9	.....	1.5	.6	.45	.5	.6	.55	.85
10	.....	1.4	.65	.5	.5	.....	.55	.....
11	.....	1.3	.65	.5	.6	.....	.....	.9
12	2.3	1.25	.7	.5	.6	.....	.55	.9
13	2.3	1.25	.7	.45	.55	.....	.55	.9
14	2.2	1.2	.7	.45	.55	.....	.5	.9
15	2.15	1.2	.7	.45	.5	.....	.5	.9
16	2.05	1.1	.6	.45	.5	.....	.55	.....
17	2.0	1.1	.55	.45	.5	.....	.6	.9
18	2.0	1.05	.55	.5	.5	.....	.6	.8
19	1.95	1.0	.55	.5	.5	.....	.....	.8
20	2.0	1.0	.6	.5	.55	.....	1.05	.8
21	1.9	.9	.65	.5	.55	.....	.6	.85
22	2.0	.9	.5	.5	.6	.....	.6	.85
23	2.1	.9	.5	.5	.65	.....	.6	.85
24	2.3	.8	.5	.55	.65	.....	.6	.85
25	2.5	.8	.4	.5	.6	.6	.....	.85
26	2.6	.8	.5	.5	.6	.65	.....	.85
27	2.6	.8	.5	.....	.6	.7	.6	.85
28	2.7	.8	.5	.6	.6	.7	.6	.90
29	2.65	.7	.8	.6	.55	.65	.6	.....
30	2.6	.65	.9	.6	.55	.6	.55	.....
31	.....	.65	.....	.6	.....	.....	.6	.....

NOTE.—Gage moved 100 feet south on July 24; referred to correct datum. Old gage found to read 0.03 feet high.

TARRYALL CREEK NEAR JEFFERSON, COLO.

Location.—At Robbins ranch, in sec. 6, T. 9 S., R. 74 W., about 10 miles southeast of Jefferson. Rock Creek enters half a mile below station.

Records available.—June 27, 1912, to December 4, 1913. From October 18, 1910, to June 28, 1911, a station was maintained within a quarter of a mile of this point, but the relation between the two gages is not known.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Practically permanent.

Discharge measurements.—Made by wading.

Winter flow.—Ice causes severe backwater during winter months; records discontinued.

Diversions.—There are court decrees for diversions of 314 second-feet from Tarryall Creek above the station and 220 second-feet below. The Tarryall Canal & Reservoir Co. has a provisional decree for storage of 68,000 acre-feet from Tarryall and tributaries above the station and a decree for a supply diversion amounting to 450 second-feet. This diversion has not yet been made. The Boreas ditch diverts a small amount of water from headwaters of Blue River to Tarryall Creek at its headwaters. There are decrees for diversions of 926 second-feet from tributaries entering above the station.

Accuracy.—Owing to the high altitude of the drainage basin (9,500 to 13,000 feet), alternate melting and freezing cause considerable diurnal fluctuations during the high-water period, and the mean daily gage based on morning and evening readings, as well as the maximum stage for the 24 hours, maybe somewhat in error. For that reason the estimates can not be considered better than good. Rating curve excellent.

Cooperation.—Station maintained in cooperation with the Tarryall Canal & Reservoir Co.

Discharge measurements of Tarryall Creek near Jefferson, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 15	Robert Follansbee	0.92	120
24	R. H. Fletcher	.42	49
25	....do	.22	29
July 23	Robert Follansbee	.82	116

Daily gage height, in feet, of Tarryall Creek near Jefferson, Colo., for 1913.

[Rose Robbins, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.69	0.65	0.33	0.44	0.30	0.65	0.15	0.10
2	.....	.67	.58	.28	.36	.30	.75	.15	.10
3	1.05	.42	.73	.24	.34	.30	.45	.....	.08
4	.85	.36	.50	.16	.30	.30	.38	.15	.05
5	.75	.34	.52	−.02	.30	.30	.35	.20	.....
6	.69	.34	.52	−.02	.31	.30	.32	.20	.....
7	.49	.35	.65	−.14	.31	.45	.30	.30	.....
8	.35	.35	2.30	−.21	.30	.85	.26	.40	.....
9	.45	.30	2.20	−.13	.30	.95	.21	.45	.....
10	.45	.30	2.80	.28	.34	.75	.20	.38	.....
11	.35	.31	2.60	.23	.65	.65	.20	.35	.....
12	.37	.47	2.20	.00	.59	.71	.20	.32	.....
13	.65	.45	1.10	−.10	.45	.45	.20	.30	.....
14	1.30	.35	.90	−.12	.31	.45	.20	.25	.....
15	1.50	.20	.63	−.12	.30	.39	.20	.20	.....
16	1.00	.20	.59	−.14	.30	.34	.20	.20	.....
17	.85	.19	.60	1.45	.30	.30	.20	.20	.....
18	1.10	.20	.72	1.20	.30	.30	.20	.20	.....
19	.80	.20	1.10	1.35	.30	.30	.20	.20	.....
20	.69	.20	1.10	1.50	.51	.30	.20	.20	.....
21	.95	.20	1.10	1.35	.52	.30	.50	.20	.....
22	.80	.20	1.10	1.65	.48	.30	.48	.18	.....
23	.58	.08	1.10	1.00	.52	.30	.30	.15	.....
24	.40	.05	1.15	1.80	.66	.30	.28	.15	.....
25	.29	.05	.95	.80	.49	.30	.25	.12	.....
26	.31	.08	.75	.68	.35	.30	.20	.12	.....
27	.30	.62	.57	.38	.30	.30	.....	.....	.....
28	.54	.70	.50	.35	.30	.30	.20	.10	.....
29	.65	.46	.39	.35	.30	.30	.20	.10	.....
30	.58	.46	.28	.34	.30	.30	.....	.10	.....
31	.....	.52	.....	.30	.30	.....	.18	.....	.....

Daily discharge, in second-feet, of Tarryall Creek near Jefferson, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	90	84	39	53	36	84	24	20
2	.....	86	73	34	43	36	99	24	20
3	146	50	95	31	40	36	54	24	19
4	114	43	61	24	36	36	45	24	17
5	99	40	64	13	36	36	42	27	.....
6	90	40	64	13	37	36	38	27	.....
7	60	42	84	7	37	54	36	36	.....
8	42	42	372	4	36	114	32	47	.....
9	54	36	353	8	36	130	28	54	.....
10	54	36	475	34	40	99	27	45	.....
11	42	37	433	30	84	84	27	42	.....
12	44	57	353	14	75	93	27	38	.....
13	84	54	155	9	54	54	27	36	.....
14	189	42	122	8	37	54	27	31	.....
15	225	27	80	8	36	46	27	27	.....
16	138	27	75	7	36	40	27	27	.....
17	114	26	76	216	36	36	27	27	.....
18	155	27	94	172	36	36	27	27	.....
19	106	27	155	198	36	36	27	27	.....
20	90	27	155	225	63	36	27	27	.....
21	130	27	155	198	64	36	61	27	.....
22	106	27	155	252	58	36	58	26	.....
23	73	19	155	138	64	36	36	24	.....
24	47	17	163	279	85	36	34	24	.....
25	35	17	130	106	60	36	31	21	.....
26	37	19	99	88	42	36	27	21	.....
27	36	79	71	45	36	36	27	20	.....
28	67	91	61	42	36	36	27	20	.....
29	84	55	46	42	36	36	27	20	.....
30	73	55	34	40	36	36	26	20	.....
31	.....	64	.....	36	36	.....	26	.....	.....

NOTE.—Discharge computed from a rating curve well defined below 315 second-feet but somewhat uncertain above that point. Impossible to measure considerable flow prior to Apr. 3 because of the severe effect of ice.

Monthly discharge of Tarryall Creek near Jefferson, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 3-30	225	35	90.5	5,030	B.
May	91	17	42.8	2,630	B.
June	475	34	150	8,930	B.
July	279	4	76.2	4,690	B.
August	85	36	46.4	2,850	B.
September	130	36	49.6	2,950	B.
October	99	26	36.6	2,250	B.
November	54	20	28.8	1,710	B.
The period	.....	.....	.....	31,000	

NORTH FORK OF SOUTH PLATTE RIVER AT GRANT, COLO.

Location.—At Grant post office, in sec. 9, T. 7 S., R. 74 W., in the Pike National Forest, 250 feet above the mouth of Geneva Creek.

Records available.—July 18, 1910, to December 31, 1913.

Drainage area.—51 square miles (measured from Forest atlas).

Gage.—Vertical staff whose datum has remained unchanged.

Control.—Permanent during 1913. No backwater from Geneva Creek.

Discharge measurements.—Made from footbridge and by wading.

Winter flow.—Ice causes backwater during the winter months; measurements made to determine flow.

Diversions.—There are court decrees for diversions of 5.5 second-feet from the North Fork above the station and diversions of 24 second-feet from tributaries entering above.

Accuracy.—Owing to the high altitude of this station, considerable diurnal fluctuations at certain seasons of the year are likely to be caused by alternate melting and freezing, and the mean daily gage height based on one gage reading prior to October 1, 1913, may be considerably in error. This fact, together with the scattering gage heights, makes estimates at this station only fair during high-water period. Beginning October 1 the gage was read morning and evening and records for the last part of the year are good.

Cooperation.—Station maintained in cooperation with United States Forest Service and State engineer.

Discharge measurements of North Fork of South Platte River at Grant, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 15	Robert Follansbee	1.94	50	Sept. 28	Robert Follansbee	1.60	20
May 22	R. H. Fletcher	2.11	69	Dec. 4	R. H. Fletcher	[a] 1.94	8.96
June 17	do	2.24	85	30	do	[a] 1.82	5.82
Aug. 8	do	1.64	23				

[a] Discharge relation affected by ice.

Daily gage height, in feet, of North Fork of South Platte River at Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				2.07		1.57	1.72	1.60	1.86
2					1.77	1.62	1.89	1.60	1.94
3		1.90					1.89	1.53	2.07
4			2.12		1.67		1.62	1.62	1.91
5		1.85	2.12		1.64		1.65	1.70	2.07
6						1.62	1.66	1.62	2.48
7			2.17				1.59	1.53	2.41
8			2.17	1.82		1.70	1.59	1.66	2.20
9				1.87	1.64	1.70	1.62	1.60	2.07
10		1.85		1.87		1.67	1.60	1.62	1.98
11			2.22		1.72		1.64	1.63	1.77
12			2.22		1.72	1.67	1.60	1.56	1.74
13		2.15	2.17				1.71	1.56	1.77
14					1.64		1.62	1.53	
15	1.95		2.17			1.64	1.61	1.62	
16		1.90		1.92		1.64	1.65	1.72	
17		1.95	2.22	1.92			1.53	1.78	
18	1.60					1.62	1.62	1.52	
19		2.00		1.92	1.67		1.62	1.53	
20					1.64		1.59	1.56	
21	1.70	1.95	2.22		1.64	1.59	1.59	1.54	
22		2.05		1.87		1.59	1.67	1.62	
23		2.10	2.12			1.57	1.59	1.76	
24				1.87		1.57	1.65	2.00	
25	1.70		2.07		1.62		1.63	2.12	
26	1.60			1.87			1.77	2.12	
27			2.07			1.57	1.71	1.96	
28	1.70			1.82	1.62	1.61	1.57	1.92	
29		2.22			1.57		1.74	1.88	
30	1.90		2.07	1.82			1.67	1.92	
31		2.22					1.62		

NOTE.—Ice present Nov. 22 to Dec. 31.

Daily discharge, in second-feet, of North Fork of South Platte River at Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	50	82	65	34	18	28	20	11
2	.....	45	79	60	32	21	44	20	11
3	.....	45	75	55	28	21	44	16	10
4	.....	42	72	50	24	21	21	21	9
5	.....	40	72	45	22	21	23	26	10
6	.....	35	75	40	22	21	24	21	11
7	.....	50	78	50	22	24	20	16	10
8	.....	60	78	37	22	26	20	24	9
9	.....	50	80	42	22	26	21	20	8
10	.....	40	82	42	25	24	20	21	7
11	.....	52	85	42	28	24	22	22	6
12	.....	64	85	43	28	24	20	18	6
13	.....	75	78	44	25	20	27	18	6
14	.....	65	78	45	22	19	21	16	5
15	51	55	78	46	22	22	21	21	5
16	40	45	82	47	23	22	23	28	5
17	30	51	85	47	23	22	17	33	6
18	20	54	90	47	24	21	21	16	6
19	22	57	95	47	24	21	21	16	6
20	24	54	90	46	22	20	20	18	6
21	26	51	85	44	22	20	20	17	6
22	26	63	85	42	22	20	24	16	6
23	26	69	72	42	22	18	20	16	6
24	26	65	68	42	21	18	23	16	6
25	26	60	65	42	21	18	22	14	6
26	20	80	65	42	21	18	32	13	6
27	23	75	65	40	21	18	27	13	6
28	26	70	65	37	21	20	18	12	6
29	36	85	65	37	18	22	30	12	6
30	45	85	65	37	18	25	24	11	6
31	.....	85	.....	36	18	.....	21	.....	6

NOTE.—Discharge computed from a rating curve well defined throughout. Discharge for days for which gage heights are missing estimated by comparison with flow of Geneva Creek. Discharge for ice periods computed from discharge measurements and temperature records.

Monthly discharge of North Fork of South Platte River at Grant, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 15–30	51	20	29.2	927	C.
May	85	35	58.6	3,600	C.
June	95	65	77.3	4,600	C.
July	65	36	44.5	2,740	C.
August	34	18	23.2	1,430	C.
September	26	18	21.2	1,260	C.
October	44	17	23.8	1,460	B.
November	28	11	18.4	1,090	B.
December	11	5	7.06	434	C.
The period	.....	.....	.....	17,500	

NORTH FORK OF SOUTH PLATTE RIVER AT CASSELLS, COLO.

Location.—At Cassells, in sec. 11, T. 7 S., R. 74 W., in Pike National Forest. The nearest tributary is a small stream entering from the south a short distance below.

Records available.—July 4, 1908, to November 30, 1913.

Drainage area.—128 square miles (measured from Forest atlas).

Gage.—Chain gage, which replaced a vertical staff reading to same datum. On May 23, 1913, the gage was moved 185 feet downstream and set to read the same as at the original site. Although the gage itself is below the headgates of the Cassell ditch in the present location, the measurements were all made above and, therefore, the flow represents that above the ditch, as the diversion is too small to have any appreciable effect on the gage heights.

Control.—Permanent at new site.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes backwater during winter months.

Diversions.—There are no court decrees for diversions between this station and that at Grant, except for 2 second-feet from tributaries.

Accuracy.—Owing to the high altitude of this station, considerable diurnal fluctuations are likely to be caused at certain seasons of the year by alternate melting and freezing, and the mean daily gage height based on night and morning readings may be somewhat in error. For this reason the estimates can not be considered better than good. Rating curve excellent.

Cooperation.—Gage heights furnished by State engineer.

Discharge measurements of North Fork of South Platte River at Cassells, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	Robert Follansbee	1.40	69	Sept. 28	Robert Follansbee	1.19	74
May 24	R. H. Fletcher	2.01	242	Dec. 4	R. H. Fletcher	.92	27
June 17	do	2.10	285	31	do	1.20	29
Aug. 8	do	1.28	88				

Daily gage height, in feet, of North Fork of South Platte River at Cassells, Colo., for 1913.

[Miss Lulu Cassell, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.70	2.00	1.60	1.60	1.18	1.38	0.92
2	.....	1.55	1.90	1.60	1.55	1.26	1.26	.96
3	.....	1.55	1.90	1.55	1.42	1.21	1.26	1.00
4	.....	1.70	1.85	1.55	1.40	1.38	1.22	.98
5	.....	1.65	1.80	1.50	1.35	1.28	1.19	.98
6	.....	1.80	1.90	1.50	1.35	1.26	1.15	.99
7	.....	1.85	1.80	1.49	1.30	1.30	1.12	1.02
8	.....	1.80	2.05	1.55	1.22	1.50	1.10	1.04
9	.....	1.70	1.95	1.55	1.25	1.42	1.11	.98
10	.....	1.85	2.00	1.48	1.30	1.26	1.15	.90
11	.....	1.90	2.05	1.38	1.35	1.36	1.15	.98
12	.....	1.90	2.00	1.32	1.38	1.36	1.16	.98
13	.....	1.90	1.85	1.32	1.32	1.32	1.10	.95
14	.....	1.75	1.90	1.45	1.32	1.28	1.05	.95
15	.....	1.65	1.95	1.48	1.30	1.38	1.09	.82
16	1.50	1.70	1.95	1.80	1.28	1.32	1.08	.92
17	1.40	1.75	2.05	1.65	1.25	1.28	.99	.95
18	1.46	1.90	1.95	1.80	1.20	1.20	.98	.88
19	1.39	1.80	2.00	1.90	1.20	1.16	.98	.88
20	1.39	1.80	1.90	1.90	1.20	1.14	1.04	.85
21	1.45	1.80	1.95	1.80	1.20	1.18	1.08	.85
22	1.33	1.80	1.90	1.70	1.19	1.24	1.02	.68
23	1.40	1.90	1.85	1.70	1.16	1.20	1.05	.80
24	1.34	2.00	1.80	1.65	1.28	1.19	1.05	.72
25	1.29	1.95	1.80	1.60	1.19	1.21	1.08	.95
26	1.35	2.00	1.80	1.65	1.16	1.22	1.06	.85
27	1.39	2.00	1.70	1.65	1.19	1.23	.99	.88
28	1.55	1.95	1.80	1.60	1.20	1.17	.95	.84
29	1.65	2.00	1.80	1.60	1.18	1.14	.98	.70
30	1.75	2.00	1.70	.....	1.18	1.19	.92	.90
31	.....	2.00	.....	.....	1.16	.....	.88	.....

NOTE.—Gage heights May 23 to Nov. 30 refer to gage established on earlier date.

Daily discharge, in second-feet, of North Fork of South Platte River at Cassells, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	115	243	139	139	73	100	47
2	.....	88	211	139	130	83	84	50
3	.....	88	211	130	106	76	84	54
4	.....	115	198	130	103	100	78	52
5	.....	105	184	120	96	85	74	52
6	.....	135	211	120	96	83	70	53
7	.....	148	184	118	88	88	66	56
8	.....	135	262	130	78	120	64	58
9	.....	115	227	130	82	106	65	52
10	.....	148	243	117	88	83	70	45
11	.....	160	262	100	96	97	70	52
12	.....	160	243	91	100	97	71	52
13	.....	160	198	91	91	87	64	50
14	.....	125	211	112	91	85	59	50
15	.....	105	227	117	88	100	63	39
16	80	115	227	184	85	91	62	47
17	67	125	262	150	82	85	53	50
18	75	160	227	184	75	75	52	43
19	66	135	243	211	75	71	52	43
20	66	135	211	211	75	68	58	41
21	74	135	227	184	75	73	62	41
22	59	135	211	160	74	80	56	29
23	67	211	198	160	71	75	59	37
24	60	243	184	150	85	74	59	31
25	54	227	184	139	74	76	62	50
26	61	243	184	150	71	78	60	41
27	66	243	160	150	74	79	53	43
28	88	227	184	139	75	72	50	40
29	105	243	184	139	73	68	52	30
30	125	243	160	139	73	74	47	45
31	.....	243	.....	139	71	.....	43	.....

NOTE.—Discharge computed from two well-defined rating curves, one used Apr. 15 to May 22, and the other May 23 to Nov. 30.

Monthly discharge of North Fork of South Platte River at Cassells, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 16-30	125	54	74.2	2,210	B.
May	243	88	160	9,840	B.
June	262	160	212	12,600	B.
July	211	91	141	8,670	B.
August	139	71	86.5	5,320	B.
September	120	68	86.3	5,140	B.
October	100	43	63.3	3,890	A.
November	58	30	45.8	2,730	A.
The period	.....	.....	.....	50,400	

NORTH FORK OF SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.

Location.—One-third mile above South Platte. No tributary between station and mouth.

Records available.—January 4, 1909, to September 30, 1910; April 1 to December 31, 1913.

Drainage area.—449 square miles (measured from Hayden atlas).

Gage.—Inclined staff.

Control.—Somewhat shifting.

Discharge measurements.—Made from car and cable during high and medium stages and by wading at low stages.

Winter flow.—Ice causes backwater; discharge measurements made to determine winter flow.

Diversions.—There are court decrees for diversions of 20 second-feet from North Fork between Cassells and South Platte and 60 second-feet from intervening tributaries. There are also a number of small ice and fish ponds which divert small amounts of water at various times.

Accuracy.—Mean daily gage heights based on one observation and may be somewhat in error; estimates therefore can not be considered better than good.

Cooperation.—Gage heights furnished by State engineer.

Discharge measurements of North Fork of South Platte River at South Platte, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 13	R. H. Fletcher	.....	36	Aug. 8	R. H. Fletcher	2.10	137
Feb. 25	do	.....	37	Sept. 29	Robert Follansbee	2.25	126
Apr. 1	do	1.80	76	Nov. 1	do	1.98	90
May 15	Raymond Richards	2.73	275	Dec. 29	R. H. Fletcher	[a]3.70	67
June 16	R. H. Fletcher	3.00	380				

[a] Discharge relation affected by ice.

Daily gage height, in feet, of North Fork of South Platte River at South Platte, Colo., for 1913.

[Miss A. Vermillion, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	2.9	3.1	2.7	2.3	2.2	2.5	2.0	1.6
2	1.9	2.9	2.9	2.7	2.3	2.2	2.7	2.0	1.8
3	1.7	2.7	2.9	2.6	2.2	2.3	2.5	2.1	1.8
4	1.5	2.5	2.9	2.6	2.2	2.3	2.5	2.0	.....
5	1.7	2.8	2.8	2.5	2.3	2.4	2.3	2.0	.....
6	1.8	2.9	2.8	2.5	2.2	2.4	2.3	2.1	.....
7	1.8	3.0	2.9	2.4	2.2	2.3	2.3	2.1	.....
8	1.7	2.9	3.1	2.5	2.1	2.5	2.2	2.1	5.0
9	1.7	2.7	3.3	2.5	2.0	2.6	2.2	2.1	5.0
10	1.6	3.0	3.3	2.4	2.2	2.4	2.2	2.0	5.0
11	1.8	3.1	3.5	2.4	2.5	2.3	2.2	2.0	4.9
12	1.8	3.1	3.2	2.3	2.4	2.7	2.2	2.0	4.9
13	1.9	3.6	3.1	2.2	2.4	2.4	2.2	2.0	4.9
14	2.0	3.0	3.0	2.2	2.4	2.2	2.15	2.0	4.8
15	2.3	2.7	3.1	2.4	2.3	2.4	2.1	2.0	4.8
16	2.3	2.6	3.0	2.4	2.2	2.5	2.1	2.0	4.6
17	2.4	2.7	3.0	3.1	2.2	2.4	2.1	2.0	4.5
18	2.4	3.0	3.1	2.7	2.3	2.4	2.1	2.0	4.4
19	2.2	3.0	3.1	3.0	2.3	2.3	2.1	2.0	4.4
20	2.4	2.9	3.1	2.8	2.3	2.3	2.0	2.0	4.2
21	2.5	2.8	3.1	3.0	2.3	2.2	2.2	2.0	4.0
22	2.4	2.9	3.0	2.8	2.2	2.2	2.2	1.8	4.0
23	2.3	2.9	3.0	3.0	2.2	2.2	2.1	1.6	4.0
24	2.0	3.0	3.0	2.9	2.2	2.3	2.1	1.6	3.9
25	2.3	3.1	2.9	2.6	2.4	2.3	2.1	2.0	3.8
26	2.2	3.2	2.9	2.5	2.3	2.3	2.1	1.9	3.7
27	2.3	3.3	2.8	2.5	2.3	2.3	2.1	2.0	3.7
28	2.6	3.2	2.8	2.4	2.2	2.25	2.2	2.0	3.7
29	2.9	3.2	2.9	2.4	2.2	2.25	1.8	2.0	3.7
30	2.9	3.3	2.8	2.3	2.2	2.25	2.1	1.6	3.7
31	.....	3.2	.....	2.3	2.3	.....	2.0	.....	3.7

NOTE.—Ice present Jan. 1 to Mar. 31 and Dec. 8 to 31.

Daily discharge, in second-feet, of North Fork of South Platte River at South Platte Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	76	343	424	274	171	150	180	90	46
2	93	343	343	274	171	150	230	90	54
3	61	274	343	244	150	171	188	107	54
4	35	217	343	244	150	171	188	90	54
5	61	307	307	217	171	193	146	90	93
6	76	343	307	217	150	193	146	107	130
7	76	382	343	193	150	171	146	107	130
8	61	343	424	217	130	217	126	107	93
9	61	274	517	217	111	244	126	107	76
10	47	382	517	193	150	193	126	90	68
11	76	424	620	193	217	171	126	90	54
12	76	424	469	171	193	274	126	90	54
13	93	675	424	150	193	193	126	90	54
14	111	382	382	150	193	150	116	90	68
15	171	274	424	193	171	191	107	90	68
16	171	244	382	193	150	212	107	90	68
17	193	274	382	424	150	186	107	90	68
18	193	382	424	274	171	184	107	90	54
19	150	382	424	382	171	160	107	90	68
20	193	343	424	307	171	158	90	90	54
21	217	307	424	382	171	136	126	90	54
22	193	343	382	307	150	134	126	59	54
23	171	343	382	382	150	132	107	36	54
24	111	382	382	343	150	150	107	36	68
25	171	424	343	244	193	148	107	90	84
26	150	469	343	217	171	146	107	74	84
27	171	517	307	217	171	144	107	90	76
28	244	469	307	193	150	130	126	90	68
29	343	469	343	193	150	125	59	90	68
30	343	517	307	171	150	125	107	36	68
31	.....	469	.....	171	171	.....	90	.....	76

NOTE.—Discharge determined as follows: Apr. 1 to Sept. 14, from a well-defined curve; Apr. 15 to Oct. 1, by indirect method for shifting channel; Oct. 1 to Nov. 30, from curve based on one measurement; Dec. 1–31, estimated because of effect of ice on discharge relation.

Monthly discharge of North Fork of South Platte River at South Platte, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	343	35	140	8,330	B.
May	675	217	378	23,200	B.
June	620	307	391	23,300	B.
July	424	150	243	14,900	B.
August	217	111	163	10,000	B.
September	274	125	170	10,100	B.
October	230	59	125	7,690	B.
November	107	36	85.9	5,110	C.
December	120	46	69.8	4,290	D.
The period	.....	.....	.....	107,000	

GENEVA CREEK AT GRANT, COLO.

Location.—In the Pike National Forest, at highway bridge, in sec. 9, T. 7 S., R. 74 W., at Grant post office, 300 feet above the mouth of creek.

Records available.—November 3, 1911, to December 31, 1913. From July 5, 1908, to November 3, 1911, a station was maintained at Sullivan's ranch, 3 miles above Grant. Except during the spring run-off, the flow at the two points is practically the same.

Drainage area.—74 square miles (measured from Forest atlas).

Gage.—Vertical staff.

Channel.—Practically permanent during 1913.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater during the winter months; discharge measurements made to determine approximate flow.

Diversions.—There is a court decree for a diversion of 1 second-foot from Geneva Creek above the station, and a temporary reservoir decree for 1,480 acre-feet from Geneva and Kerby creeks.

Accuracy.—Owing to the high altitude of this station considerable diurnal fluctuations are likely to be caused at certain seasons of the year by alternate melting and freezing; and the mean daily gage height based on morning and evening readings, together with the maximum gage height for the 24 hours, may be somewhat in error. For this reason the estimates can not be considered better than good.

Cooperation.—Gage heights furnished by the State engineer.

Discharge measurements of Geneva Creek at Grant, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	Robert Follansbee	1.15	28.3	Sept. 27	Robert Follansbee	1.39	56.2
May 22	R. H. Fletcher	1.71	123	28	do	1.30	48.1
June 17	do	1.80	143	Dec. 4[a]	R. H. Fletcher	1.22	18.3
Aug. 8	do	1.40	62	30[a]	do	.90	15.8

[a] Discharge relation affected by snow and slush ice.

Daily gage height, in feet, of Geneva Creek at Grant, Colo., for 1913.

[Mrs. M. McFarland, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.63	1.95	1.72	1.57	1.36	1.48	1.12	1.05
2	0.99	1.65	1.87	1.67	1.57	1.40	1.53	1.11	1.25
3	.....	1.43	1.87	1.67	1.53	1.50	1.43	1.15	1.20
4	.90	1.41	1.80	1.66	1.53	1.43	1.39	1.14	1.22
5	.....	1.59	1.82	1.65	1.53	1.47	1.40	1.14	1.38
6	.....	1.67	1.90	1.60	1.50	1.49	1.37	1.08	1.65
7	.....	1.72	1.95	1.60	1.47	1.47	1.25	1.12	1.88
8	.....	1.80	2.03	1.65	1.42	1.55	1.24	1.15	1.82
9	.95	1.76	2.02	1.77	1.41	1.51	1.26	1.11	1.92
10	.....	1.80	2.07	1.63	1.50	1.54	1.27	1.14	1.85
11	.95	1.78	2.03	1.57	1.60	1.54	1.28	1.10	1.85
12	.....	1.95	1.82	1.55	1.59	1.53	1.25	1.08	1.85
13	.....	2.10	1.92	1.50	1.49	1.46	1.33	1.08	1.85
14	.....	1.77	1.77	1.47	1.45	1.41	1.30	1.05	.....
15	.....	1.71	1.93	1.62	1.45	1.52	1.28	1.14	1.84
16	1.30	1.63	1.93	1.78	1.45	1.57	1.23	1.24	1.84
17	1.24	1.87	1.93	1.78	1.45	1.42	1.17	1.12	1.81
18	1.13	1.87	2.02	1.83	1.45	1.42	1.20	1.06	1.80
19	1.15	1.77	1.90	1.88	1.40	1.38	1.24	1.08	1.80
20	1.22	1.70	1.90	1.85	1.43	1.32	1.25	1.08	1.78
21	1.23	1.70	1.93	1.85	1.43	1.31	1.22	1.09	1.45
22	1.30	1.78	1.95	1.85	1.37	1.32	1.27	1.11	1.46
23	1.10	2.02	1.87	1.89	1.37	1.32	1.21	1.22	1.40
24	1.05	1.90	1.87	1.85	1.38	1.38	1.23	1.22	1.30
25	1.05	1.90	1.83	1.80	1.33	1.35	1.26	1.18	1.30
26	1.15	2.10	1.85	1.77	1.32	1.32	1.22	1.16	1.45
27	1.30	2.00	1.80	1.75	1.38	1.35	1.27	1.18	1.40
28	1.43	1.95	1.85	1.62	1.37	1.39	1.18	1.11	1.30
29	1.50	2.10	1.80	1.58	1.37	1.39	1.15	1.10	1.30
30	1.62	1.95	1.70	1.57	1.38	1.38	1.21	1.20	1.20
31	.....	2.03	.....	1.56	1.38	.....	1.15	.....	1.20

NOTE.—Discharge relation affected by ice during December.

Daily discharge, in second-feet, of Geneva Creek, Grant, at Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	18	105	188	125	92	54	75	28	22
2	18	109	165	113	92	61	84	27	22
3	16	66	165	113	84	78	66	30	19
4	14	63	145	111	84	66	60	30	18
5	14	96	151	109	84	73	61	30	20
6	15	113	173	98	78	76	56	25	20
7	15	125	188	98	73	73	40	28	19
8	16	145	214	109	64	88	39	30	18
9	16	135	210	138	63	80	42	27	17
10	16	145	229	105	78	86	43	30	17
11	16	140	214	92	98	86	44	26	16
12	22	188	151	88	96	84	40	25	16
13	28	240	179	78	76	71	50	25	14
14	34	138	138	73	70	63	46	22	12
15	40	122	182	102	70	82	44	30	12
16	46	105	182	140	70	92	38	39	14
17	39	165	182	140	70	64	32	28	14
18	29	165	210	153	70	64	35	23	16
19	30	138	173	167	61	58	39	25	16
20	37	120	173	159	66	49	40	25	16
21	38	120	182	159	66	48	37	25	16
22	46	140	188	159	56	49	43	27	16
23	26	210	165	170	56	49	36	37	16
24	22	173	165	159	58	58	38	37	16
25	22	173	153	145	50	54	42	33	16
26	30	240	159	138	49	49	37	31	15
27	46	203	145	132	58	54	43	33	15
28	66	188	159	102	56	60	33	27	15
29	78	240	145	94	56	60	30	26	15
30	102	188	120	92	58	58	36	35	15
31	.....	214	.....	90	58	.....	30	.....	15

NOTE.—Discharge, except for December, determined from a rating curve that is well defined above 40 second-feet and fairly well defined below. Discharge for December estimated from two discharge measurements and the daily gage heights.

Monthly discharge of Geneva Creek at Grant, Colo., for 1913.

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	102	14	31.8	0.430	0.48	1,890	C.
May	240	63	152	2.05	2.36	9,350	B.
June	229	120	173	2.34	2.61	10,300	B.
July	170	73	121	1.64	1.89	7,440	B.
August	98	49	69.7	.942	1.09	4,290	B.
September	92	48	66.2	.895	1.00	3,940	B.
October	84	30	44.5	.601	.69	2,740	B.
November	39	22	28.8	.389	.43	1,710	C.
December	22	12	16.4	.222	.26	1,010	C.
The period	.....	.....	.....	.....	.....	42,700	

NOTE.—Accuracy reduced because of probable error in mean daily gage heights. See station description.

SCOTT GOMER CREEK [1] NEAR GRANT, COLO.

Location.—Near Sullivan's ranch, in sec. 19, T. 6 S., R. 74 W., in Pike National Forest, about 5 miles above Grant, one-fourth mile above mouth of creek. No tributary enters between mouth and station.

Records available.—Fragmentary records August 16, 1909, to November 28, 1913.

[1] Also called East Geneva Creek.

Drainage area.—21 square miles (measured from topographic sheet).

Gage.—Vertical staff; moved to its present position 2¾ miles below original site September 4, 1909. Datum unchanged in new location, but has no determined relation to datum of original gage.

Control.—Permanent during 1913.

Discharge measurements.—Made by wading.

Winter flow.—Ice causes backwater during the winter months.

Diversions.—There are no court decrees for diversions above this station and therefore the records probably represent the natural run-off.

Accuracy.—Owing to the high altitude of this station, considerable diurnal fluctuations are likely to be caused at certain seasons of the year by alternate melting and freezing, and the mean daily gage height based on one gage height may be considerably in error. As there are so few gage heights, estimates have been made only for the days when the gage was read and can be considered only fair.

Cooperation.—Station maintained in cooperation with United States Forest Service

Discharge measurements of Scott Gomer Creek near Grant, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 17	R. H. Fletcher	1.28	26
Aug. 7	do	1.03	17
Sept. 27	Robert Follansbee	1.29	28

Daily gage height, in feet, of Scott Gomer Creek near Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1						1.0		0.85
2								
3							1.2	
4			1.35					
5					1.0			
6								
7			1.25					
8			1.55		1.05		1.05	1.0
9								
10		1.35		1.2				
11	0.35		1.5					
12						1.45		.65
13		1.6						
14					1.15			
15								
16	.4							
17			1.32				1.05	
18						1.25		
19				1.55				
20					1.05			
21	.45				1.0			.70
22		1.7				1.25		
23			1.1					
24				1.5				
25								
26								
27						1.25		
28	.6			1.5				1.0
29					1.0			
30			1.35					
31		2.05						

NOTE.—Ice present Nov. 28 to Dec. 31.

Daily discharge, in second-feet, of Scott Gomer Creek near Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1						16		12
2								
3							23	
4			30					
5					16			
6								
7			25					
8			42		18		18	16
9								
10		30		23				
11	3.0		39					
12						36		7.2
13		46						
14					21			
15								
16	3.5							
17			28				18	
18						25		
19				42				
20					18			
21	4.2				16			8.0
22		54				25		
23			19					
24				39				
25								
26								
27						25		
28	6.5			39				
29					16			
30			30					
31		95						

CLEAR CREEK NEAR GOLDEN, COLO.

Location.—About 2 miles above Golden, in sec. 6, T. 4 S., R. 70 W., and a short distance below the headgate of the Golden ditch. The only important tributary between the station and the mouth is Ralston Creek, which enters about 12 miles below.

Records available.—December 4, 1908, to December 31, 1909; June 8 to September 24, 1911; January 1, 1912, to December 31, 1913.

Drainage area.—Approximately 380 square miles.

Gage.—Automatic recording gage.

Control.—Slightly shifting.

Discharge measurements.—Made from car and cable located near gage.

Winter flow.—Ice causes backwater during the winter months.

Diversions.—There is a court decree for a diversion of 53 second-feet from the headwaters of Fraser River to the West Fork of Clear Creek. During 1913, 1,120 acre-feet were diverted. Above the Golden station there is a court decree for a diversion of 26 second-feet by the Golden ditch. Below there are decrees for diversions of 1,642 second-feet.

Accuracy.—Conditions favorable for accurate results; records should be reliable.

Cooperation.—Station maintained in cooperation with the Farmers' Reservoir Irrigation Co.

Control.—Character not known, as only computed records are received.
Discharge measurements.—Made from car and cable.
Winter flow.—Ice causes backwater during a portion of the winter months.
Diversions.—There are court decrees for the diversion of 166 second-feet from the St. Vrain and tributaries above station. Below there are court decrees for 1,632 second-feet from St. Vrain Creek and flood-water diversions of 190,000 acre-feet.
Cooperation.—Records from 1887 to 1890 and from July 1 1904, to 1913, furnished by the State engineer.

Daily gage height, in feet, of St. Vrain Creek at Lyons, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.7	3.5	2.95	2.5	2.3	2.3	1.85
2	.....	2.7	3.5	2.9	2.5	2.3	2.3	1.8
3	.....	2.7	3.55	2.85	2.6	2.4	2.25	1.8
4	.....	2.7	3.55	2.9	2.6	2.4	2.35	1.7
5	.....	2.65	3.5	2.9	2.6	2.5	2.4	1.7
6	.....	2.7	3.5	3.0	2.6	2.5	2.3	1.8
7	.....	2.8	3.4	3.0	2.6	2.5	2.3	1.8
8	.....	2.8	3.5	3.0	2.5	2.75	2.3	1.8
9	2.1	3.5	3.15	2.85	2.5	2.6	2.2	1.8
10	2.1	3.3	3.25	3.1	2.5	2.4	2.1	1.7
11	2.1	3.35	3.6	2.95	2.5	2.4	2.0	1.7
12	2.2	3.35	3.4	2.8	2.5	2.4	2.2	1.7
13	2.35	3.3	3.2	2.7	2.45	2.3	2.3	1.7
14	2.5	3.5	3.15	2.65	2.45	2.2	2.25	1.7
15	2.5	3.25	3.3	3.1	2.4	2.2	2.25	1.7
16	2.5	3.05	3.4	2.95	2.4	2.3	2.2	1.7
17	2.55	3.0	3.3	2.95	2.4	2.15	2.2	1.65
18	2.65	3.05	3.4	3.05	2.4	2.1	2.2	1.6
19	2.75	3.0	3.4	3.15	2.4	2.1	2.2	1.7
20	2.9	2.9	3.35	2.9	2.4	2.1	2.1	1.6
21	2.95	2.8	3.3	3.05	2.4	2.1	2.0	1.6
22	2.9	2.7	3.2	3.2	2.35	2.05	2.0	1.55
23	2.8	3.0	3.2	3.2	2.35	2.05	1.9	1.55
24	2.75	3.05	3.15	3.3	2.35	2.1	1.8	1.55
25	2.7	3.2	3.15	3.0	2.4	2.1	1.8	1.7
26	2.7	3.2	3.1	2.8	2.3	2.1	1.7	1.7
27	2.65	3.45	3.1	2.65	2.3	2.1	1.7	1.6
28	2.65	3.45	3.1	2.6	2.3	2.05	1.7	1.55
29	2.65	3.45	3.1	2.6	2.3	2.0	1.7	1.5
30	2.7	3.45	3.0	2.6	2.2	2.0	1.7	1.5
31	.....	3.5	.....	2.5	2.3	.....	1.8	.....

Daily discharge, in second-feet, of St. Vrain Creek at Lyons, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Day.	Apr.	May.	June.	July.	Aug.
1	.....	138	382	197	98	16	98	224	342	197	82
2	.....	138	382	184	98	17	108	210	306	197	82
3	.....	138	404	172	118	18	128	224	342	224	82
4	.....	138	404	184	118	19	149	210	342	254	82
5	.....	128	382	184	118	20	184	184	324	184	82
6	.....	138	382	210	118	21	197	160	306	224	82
7	.....	160	342	210	118	22	184	138	270	270	74
8	.....	160	382	210	98	23	160	210	270	270	74
9	38	382	254	172	98	24	149	224	254	306	74
10	38	306	288	238	98	25	138	270	254	210	82
11	38	324	426	197	98	26	138	270	238	160	66
12	52	324	342	160	98	27	128	362	238	128	66
13	74	306	270	138	90	28	128	362	238	118	66
14	98	382	254	128	90	29	128	362	238	118	66
15	98	288	306	238	82	30	138	362	210	118	52
						31	.....	382	.....	98	66

Monthly discharge of St. Vrain Creek near Lyons, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 9–30	197	38	118	5,150
May	382	128	245	15,100
June	426	210	312	18,600
July	306	98	190	11,700
August	118	52	87.6	5,390

BOULDER CREEK AT ORODELL, COLO.

Location.—At Orodell station, in sec. 27, T. 1 N., R. 71 W., just below mouth of Fourmile Creek.

Records available.—March 18, 1907, to December 31, 1913. From May 14, 1895, to December 20, 1909, a station was maintained about 1 mile below present site chiefly by the State engineer. The records at the two points are not directly comparable, as some water is diverted for irrigation between. From 1902 to 1906 the records for lower station were published only in reports of the State engineer.

Drainage area.—108 square miles (State engineer's report).

Gage.—Automatic recording gage owned by Colorado Power Co.

Control.—Character not known, as only computed records are furnished.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes backwater during the winter months; discharge measurements made to determine flow.

Diversions.—There are no diversions from Boulder Creek above the station, but there are court decrees for diversions of 165 second-feet from tributaries entering above. Below the station there are decrees for diversions of 2,871 second-feet from Boulder Creek.

Cooperation.—Station maintained by the State engineer in cooperation with the Colorado Power Co., by which records are furnished.

Discharge measurements of Boulder Creek at Orodell, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Jan. 30	M. E. Bunger	2.05	40	May 13	M. E. Bunger	2.28	61
Feb. 27	do	1.80	17	July 8	do	2.82	153
Mar. 19	do	1.88	22	Oct. 22	D. L. Bundy		115

Daily gage height, in feet, of Boulder Creek at Orodell, Colo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	1.9	.....	1.9	2.15	3.3	2.8	2.6	2.05	.....	2.05	2.1
2	2.1	.....	1.75	1.9	2.15	3.25	2.75	.....	2.2	.....	.....	2.1
3	1.65	.....	1.9	.....	2.15	3.25	2.75	.....	2.15	.....	2.0	2.15
4	.....	.....	1.95	.....	2.1	3.25	2.75	.....	2.4	.....	2.1	2.1
5	.....	.....	1.95	2.2	2.2	3.25	2.75	.....	2.45	2.15	2.15	2.0
6	.....	.....	1.9	2.2	2.25	3.2	2.8	.....	2.45	2.4	2.15	2.05
7	.....	.....	1.95	2.25	2.3	3.05	2.85	.....	2.4	2.2	2.15	.....
8	.....	.....	1.85	2.3	2.35	3.05	2.8	.....	2.6	2.25	.....	.....
9	.....	.....	.....	2.25	2.35	3.0	2.7	.....	2.55	2.2	1.9	2.05
10	.....	.....	1.7	2.25	2.3	3.05	2.7	2.35	2.55	2.15	2.05	2.15
11	.....	2.05	2.0	2.3	2.3	3.15	2.75	2.4	.....	2.0	2.1	2.25
12	.....	2.0	1.95	2.35	2.3	3.15	2.55	2.25	.....	2.1	2.05	2.3
13	.....	2.05	1.95	2.25	2.3	3.15	2.55	2.25	2.5	2.2	.....	2.3
14	.....	2.05	2.1	2.4	2.25	3.1	2.55	2.3	2.3	2.05	.....	.....
15	.....	2.05	1.95	2.4	2.2	3.0	2.7	2.25	.....	.....	.....	2.25
16	.....	1.8	.....	2.3	2.15	3.05	2.6	2.25	.....	.....	.....	2.3
17	.....	1.95	1.9	2.2	2.2	2.95	2.65	2.15	2.15	.....	.....	2.25
18	2.0	1.95	2.0	2.2	2.25	3.0	2.7	2.25	2.15	.....	.....	2.2
19	.....	2.05	1.7	2.1	2.25	3.05	2.7	2.15	2.1	2.05	.....	2.2
20	1.75	2.05	1.75	2.15	2.25	3.05	2.75	2.15	2.05	2.25	.....	2.1
21	1.95	1.95	.....	2.25	2.25	3.05	2.85	2.35	2.25	2.25	2.0	2.25
22	1.95	.....	.....	2.2	2.3	3.1	2.9	2.05	2.15	2.2	.....	2.3
23	1.95	.....	1.65	2.15	2.3	3.15	2.85	2.15	2.15	.....	.....	2.3
24	2.0	1.8	1.75	.....	2,35	3.1	2.8	.....	2.1	.....	.....	2.3
25	1.8	2.1	1.55	.....	2.35	3.05	2.8	2.15	2.05	.....	2.0	2.25
26	.....	2.0	.....	.....	2.45	2.95	2.75	2.3	2.25	2.05	.....	2.25
27	1.9	1.95	2.15	2.15	2.7	2,95	2.7	2.2	2.15	2.2	.....	2.1
28	2.0	2.05	2.05	2.15	2.8	2.95	2.8	2.25	.....	2.15	1.95	.....
29	2.0	.....	1.9	2.15	3.0	2.85	2.65	2.1	.....	.....	1.95	.....
30	2.0	.....	1.95	2.15	2.85	2.85	2.65	2.0	.....	.....	1.85	.....
31	2.0	.....	1.95	.....	3.0	.....	2.65	2.0	.....	.....	.....	.....

Daily discharge, in second-feet, of Boulder Creek at Orodell, Colo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	20	27	.....	27	51	328	157	117	40	51	40	45
2	45	28	17	27	51	308	147	112	57	51	38	45
3	12	29	27	37	51	308	147	107	51	51	36	51
4	.....	30	32	47	45	308	147	102	84	51	45	45
5	.....	31	32	57	57	308	147	97	92	51	51	36
6	.....	33	27	57	64	287	157	92	92	84	51	40
7	.....	34	32	64	70	231	170	87	84	57	51	40
8	.....	36	24	70	77	231	157	82	117	64	39	40
9	.....	38	19	64	77	214	137	77	108	57	27	40
10	.....	40	14	64	70	231	137	77	108	51	40	51
11	.....	40	36	70	70	268	147	84	106	36	45	64
12	.....	36	32	77	70	268	108	64	103	45	40	70
13	.....	40	32	64	70	268	108	64	100	57	40	70
14	.....	40	45	84	64	248	108	70	70	40	40	67
15	.....	40	32	84	57	214	137	64	64	40	40	64
16	.....	20	30	70	51	231	117	64	57	40	39	70
17	.....	32	27	57	57	199	127	51	51	40	39	64
18	36	32	36	57	64	214	137	64	51	40	39	57
19	.....	40	14	45	64	231	137	51	45	40	38	57
20	17	40	17	51	64	231	147	51	40	64	38	45
21	32	32	15	64	64	231	170	77	64	64	36	64
22	32	29	14	57	70	248	184	40	51	57	36	70
23	32	26	12	51	70	268	170	51	51	53	36	70
24	36	20	17	51	77	248	157	51	45	49	36	70
25	20	45	8	51	77	231	157	51	40	44	36	64
26	24	36	.....	51	92	199	147	70	64	40	35	64
27	27	32	51	51	137	199	137	57	51	57	33	45
28	36	40	40	51	157	199	157	64	51	51	32	42
29	36	.....	27	51	214	170	127	45	51	48	32	40
30	36	.....	32	51	170	170	127	36	51	45	24	38
31	36	.....	32	.....	214	.....	127	36	.....	42	.....	36

NOTE—Discharge for days for which gage heights are missing interpolated except Jan. 4–17, 19, and Mar. 1 and 26, when the flow was largely controlled by the power plant.

Monthly discharge of Boulder Creek at Orodell, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January (16 days)	45	12	29.8	946
February	45	20	33.8	1,880
March (29 days)	51	8	26.7	1,540
April	84	27	56.7	3,370
May	214	45	83.4	5,130
June	328	170	243	14,500
July	184	108	143	8,790
August	117	36	69.5	4,270
September	117	40	68.0	4,050
October	84	40	50.3	3,090
November	51	24	38.4	2,280
December	70	36	53.7	3,300

SOUTH BOULDER CREEK NEAR ROLLINSVILLE, COLO.

Location.—At highway bridge in sec. 35, T. 1 S., R. 73 W., 1 mile west of Rollinsville in Pike National Forest. The nearest important tributary, Jennie Creek, enters 4 miles above.

Records available.—September 10, 1910, to December 31, 1913.

Drainage area.—39 square miles (measured from topographic sheets).

Gage.—Vertical staff.

Control.—Fairly permanent.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater.

Diversions.—No court decrees for diversions above station; records probably represent the natural run-off.

Accuracy.—Owing to the high altitude of the station, considerable diurnal fluctuation is likely to be caused at certain seasons by alternate melting and freezing, and the mean daily gage height based on one reading may be considerably in error. For this reason the estimates can not be considered better than fair.

Cooperation.—Station maintained in cooperation with United States Forest Service.

Discharge measurements of South Boulder Creek near Rollinsville, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 15	R. H. Fletcher	1.90	145
July 4	do	1.60	65

Daily gage height, in feet, of South Boulder Creek near Rollinsville, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.72		1.9			1.3		
2				1.9					
3		1.72	2.45	1.7		1.3		1.2	
4			2.4		1.3				
5			2.4	1.8		1.4			
6		1.87		1.7	1.3		1.4	1.3	
7				1.7	1.28		1.5		
8		1.77			1.2	1.7			
9		1.92			1.2	1.5			
10			2.2	1.6	1.2	1.45			
11		1.87	2.4	1.5		1.4	1.4		2.7
12		2.05	2.3	1.5				1.3	
13		2.07	2.2		1.3		1.45		
14					1.2	1.25		1.25	
15		1.88			1.15	1.25		1.3	
16		1.9			1.2		1.25		
17				1.7			1.2		
18			2.3		1.2	1.2	1.1	1.15	
19		2.1		1.7				1.15	
20		1.9							
21			2.2	1.4	1.1		1.3		
22									
23			2.1			1.3	1.3		1.6
24		2.1	2.05	1.7			1.3		
25		2.1		1.55	1.1		1.3		
26		2.5						1.15	.8
27		2.6	1.95			1.3			
28	1.7		1.95		1.1		1.3		
29		2.6	2.0		1.1	1.3		1.1	
30				1.35	1.05			1.5	
31		2.6		1.35	1.08		1.25		

NOTE.—Ice present Nov. 30 to Dec. 31.

Daily discharge, in second-feet, of South Boulder Creek near Rollinsville, Colo. for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		113	283	115	38	24	35	30
2		113	271	115	37	29	37	28
3		113	260	85	36	35	39	27
4		122	248	92	35	40	41	30
5		131	248	100	35	45	43	32
6		140	239	85	35	58	45	35
7		131	231	85	33	71	57	35
8		122	222	80	27	85	54	35
9		149	214	75	27	57	51	35
10		144	205	70	27	51	48	35
11		140	248	57	30	45	45	35
12		175	226	57	32	40	48	35
13		179	205	63	35	35	51	33
14		160	202	68	27	31	44	31
15		141	199	74	24	31	38	35
16		145	196	79	27	29	31	31
17		158	193	85	27	28	27	28
18		172	190	85	27	27	20	24
19		185	183	85	24	29	25	24
20		145	177	65	22	30	30	24
21		155	170	45	20	32	35	24
22		165	160	58	20	33	35	24
23		175	150	71	20	35	35	24
24		185	140	85	20	35	35	24
25		185	134	64	20	35	35	24
26		271	128	59	20	35	35	24
27		295	122	54	20	35	35	23
28		110	295	122	50	20	35	35	21
29			295	130	45	20	35	34	20
30			295	122	40	17	35	32	20
31			295		40	19		31	

NOTE.—Discharge determined from two fairly well-defined rating curves applicable Apr. 28 to June 13 and June 18 to Nov. 29. Discharge estimated for Nov. 30 and interpolated for days of no gage height.

Monthly discharge of South Boulder Creek near Rollinsville, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May	295	113	177	10,900	B.
June	283	122	194	11,500	C.
July	115	40	72.0	4,430	B.
August	38	17	26.5	1,630	C.
September	85	24	38.8	2,310	C.
October	57	20	38.3	2,360	C.
November	35	20	28.3	1,680	C.
The period				34,800	

SOUTH BOULDER CREEK AT ELDORADO SPRINGS, COLO.[1]

Location.—At mouth of canyon at Eldorado Springs, in sec. 30, T. 1 S., R. 70 W., 3 miles southwest of Marshall. No important tributaries within several miles.

Records available.—May 15, 1895, to September 30, 1901; July 1, 1904, to December 13, 1913.

Drainage area.—125 square miles (measured from topographic sheet).

Gage.—Vertical staff; datum unchanged.

Control.—Character not known; only completed estimates received.

Discharge measurements.—Made by wading.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—There are court decrees for diversions of 137 second-feet above the station and 1,658 second-feet blow. There are also a number of flood-water decrees.

Cooperation.—Station maintained since 1904 by State engineer, who furnishes the records. The records for 1904 to 1908 were published only in reports of the State engineer.

Discharge measurements of South Boulder Creek at Eldorado Springs, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 14	M. E. Bunger	1.75	75
July 8	....do	1.75	77.4
Oct. 24	D. L. Bundy	1.40	21.3

[1] Called South Boulder Creek near Marshall in 1910 report.

Daily gage height, in feet, of South Boulder Creek at Eldorado Springs, Colo., for 1913.

[B. E. Chesebro, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.5	2.0	2.45	1.9	1.4	1.3	1.6	0.90	0.80
2	1.5	2.0	2.4	1.85	1.4	1.2	1.6	.85	.80
3	1.3	1.95	2.4	1.8	1.4	1.35	1.5	.90	.80
4	1.3	1.9	2.4	1.8	1.45	1.25	1.6	.85	.80
5	1.3	1.7	2.3	1.8	1.5	1.25	1.55	.85	.80
6	1.4	1.4	2.3	1.8	1.5	1.2	1.5	.80	.70
7	1.4	1.3	2.2	1.75	1.4	1.2	1.4	.95	.60
8	1.3	1.6	2.2	1.75	1.35	1.5	1.45	.90	.60
9	1.25	1.75	2.25	1.7	1.3	1.7	1.5	1.15	.60
10	1.2	1.3	2.3	1.7	1.4	1.6	1.4	.80	.95
11	1.4	1.6	2.4	1.7	1.4	1.5	1.35	.70	1.4
12	1.4	1.7	2.35	1.6	1.4	1.4	1.5	.85	1.4
13	1.5	1.9	2.25	1.6	1.35	1.3	1.5	.80	1.4
14	1.6	1.8	2.1	1.6	1.35	1.4	1.5	.70	.....
15	1.7	1.55	2.15	1.7	1.3	1.45	1.45	.95	.....
16	1.7	1.5	2.15	1.7	1.3	1.45	1.4	.95	.....
17	1.75	1.7	2.15	1.8	1.3	1.5	1.4	.80	.....
18	1.7	1.6	2.2	1.8	1.3	1.4	1.4	.80	.....
19	1.7	1.7	2.2	1.7	1.3	1.4	1.4	.80	.....
20	1.8	2.05	2.2	1.7	1.25	1.4	1.45	.80	.....
21	1.8	1.9	2.2	1.8	1.25	1.35	1.45	.85	.....
22	1.85	1.9	2.15	1.7	1.25	1.3	1.5	1.0	.....
23	1.8	2.0	2.15	1.8	1.2	1.35	1.25	.90	.....
24	1.75	2.1	2.15	1.8	1.2	1.4	1.3	1.2	.....
25	1.7	2.15	2.05	1.7	1.25	1.4	1.0	1.3	.....
26	1.7	2.25	2.0	1.7	1.2	1.4	.60	1.3	.....
27	1.75	2.4	2.0	1.7	1.2	1.4	.70	1.25	.....
28	1.8	2.4	2.0	1.6	1.2	1.35	.80	1.3	.....
29	1.9	2.5	2.0	1.6	1.2	1.4	.90	.70	.....
30	1.9	2.5	1.9	1.5	1.2	1.4	.90	.80	.....
31	.....	2.45	.....	1.5	1.2	.....	.90	.....	.....

Daily discharge, in second-feet, of South Boulder Creek at Eldorado Springs, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	43	125	254	105	33	25	55	5.0	3.0
2	43	125	237	95	33	19	55	4.0	3.0
3	25	116	237	85	33	29	43	5.0	3.0
4	25	105	237	85	38	22	55	4.0	3.0
5	25	69	207	85	43	22	49	4.0	3.0
6	33	33	207	85	43	19	43	3.0	1.5
7	33	25	179	77	33	19	33	7.0	1.0
8	25	55	179	77	29	43	38	5.0	1.0
9	22	77	193	69	25	69	43	16.0	1.0
10	19	25	207	69	33	55	33	3.0	5.0
11	33	55	237	69	33	43	29	1.5	.....
12	33	69	222	55	33	33	43	4.0	.....
13	43	105	193	55	29	25	43	3.0	.....
14	55	85	152	55	29	33	43	1.5	.....
15	69	49	166	69	25	38	38	7.0	.....
16	69	43	166	69	25	38	33	7.0	.....
17	77	69	166	85	25	43	33	3.0	.....
18	69	55	179	85	25	33	33	3.0	.....
19	69	69	179	69	25	33	33	3.0	.....
20	85	140	179	69	22	33	38	3.0	.....
21	85	105	179	85	22	29	38	4.0	.....
22	95	105	166	69	22	25	43	9.0	.....
23	85	127	166	85	19	29	22	5.0	.....
24	77	152	166	85	19	33	25	19	.....
25	69	166	140	69	22	33	9.0	25	.....
26	69	193	125	69	19	33	1.0	25	.....
27	77	237	125	69	19	33	1.5	22	.....
28	85	237	125	55	19	29	3.0	25	.....
29	105	270	125	55	19	33	5.0	1.5	.....
30	105	270	105	43	19	33	5.0	3.0	.....
31	.....	254	.....	43	19	.....	5.0	.....	.....

Monthly discharge of South Boulder Creek at Eldorado Springs, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	105	19	58.2	3,460
May	270	25	116	7,130
June	254	105	180	10,700
July	105	43	72.2	4,440
August	43	19	26.8	1,650
September	69	19	32.8	1,950
October	55	1.0	31.3	1,920
November	25	1.5	7.68	457
December 1-10	5.0	1.0	2.45	48.6
The period				31,800

CACHE LA POUDRE RIVER AT MOUTH OF CANYON, NEAR FORT COLLINS, COLO.

Location.—In sec. 15, T. 8 N., R. 70 W., 3 miles below intake of Fort Collins waterworks, and 12 miles above Fort Collins, half a mile above mouth of Lewstone Creek.

Records available.—March 15, 1884, to October 15, 1901; February 3, 1910, to November 26, 1913.

Drainage area.—1,060 square miles.

Gage.—An automatic recording gage installed November 30, 1909. No information available concerning gage used from 1884 to 1901.

Control.—Character not known; only completed records furnished.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes backwater during winter months and measurements are made to determine flow.

Diversions.—There is a court decree for a diversion of 57 second-feet from Cache la Poudre River above station and decrees for diversions of 526 second-feet from tributaries entering above, including Wyoming diversions. Below station there are decrees for diversions of 3,105 second-feet from the river. In addition there are a number of decrees for flood-water diversions. There are also decrees for diversions of 688 second-feet from Laramie River and 121 second-feet from headwaters of North Platte River to headwaters of Cache la Poudre through Chambers Lake. During 1913 a total of 15,220 acre-feet were diverted from the Laramie and 3,750 acre-feet from the North Platte. From North Fork of Grand River there are decrees for a diversion of 525 second feet to headwaters of Cache la Poudre River. During 1913, 12,200 acre-feet were diverted.

Cooperation.—From 1884 to 1901 the records were collected by Prof. L. G. Carpenter, of the Colorado State Agricultural College. Since 1910 records have been furnished by the State engineer, by whom the station is maintained.

Discharge measurements of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec.-ft.*
Jan. 29	M. E. Bunger	1.60	38	June 12	M. E. Bunger	3.20	1,350
Feb. 26	do	1.45	54	July 11	do	2.24	608
Mar. 18	do	1.05	57	Oct. 13	D. L. Bundy	1.48	205
May 12	do	2.72	940				

Daily gage height, in feet, of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.4	3.6	2.3	1.7	1.55	1.25	1.3
2	.....	1.4	3.35	2.2	1.7	1.55	1.35	1.3
3	.....	1.35	3.25	2.2	1.75	1.6	1.5	1.3
4	.....	1.3	3.25	2.2	1.3	1.45	1.6	1.3
5	.....	1.45	3.2	2.2	1.85	1.45	1.6	1.3
6	.....	1.6	3.05	2.2	1.9	1.5	1.55	1.4
7	.....	1.8	2.9	2.1	1.85	1.4	1.45	1.2
8	.....	1.9	2.9	2.05	1.85	1.95	1.35	1.05
9	.....	1.95	2.95	2.05	1.8	1.85	1.45	1.1
10	.....	2.05	2.95	2.15	1.8	1.75	1.35	1.3
11	.....	2.35	3.35	2.25	1.75	1.7	1.35	1.45
12	1.05	2.6	3.15	2.1	1.85	1.65	1.5	1.2
13	1.1	2.75	2.95	2.0	1.9	1.5	1.5	1.0
14	1.25	2.65	2.8	2.0	1.95	1.5	1.5	1.0
15	1.3	2.4	2.8	2.1	1.9	1.4	1.5	1.0
16	1.3	2.3	2.9	2.15	1.75	1.25	1.5	1.0
17	1.25	2.3	2.8	2.15	1.45	1.35	1.4	1.0
18	1.25	2.4	2.85	2.2	1.45	1.5	1.35	1.0
19	1.25	2.65	2.9	2.4	1.4	1.5	1.3	1.0
20	1.2	2.6	2.85	2.15	1.25	1.45	1.45	1.05
21	1.35	2.5	2.8	2.05	1.35	1.45	1.5	.95
22	1.25	2.35	2.8	1.95	1.35	1.45	1.35	.85
23	1.3	2.55	2.7	2.15	1.25	1.2	1.4	.75
24	1.1	2.95	2.65	2.35	1.35	1.1	1.4	.85
25	1.1	3.1	2.75	2.2	1.25	1.1	1.4	1.05
26	1.1	3.45	2.65	2.1	1.4	1.1	1.35	1.1
27	1.1	3.65	2.75	2.0	1.35	1.15	1.45	.....
28	1.25	3.6	2.8	1.9	1.35	1.35	1.35	.....
29	1.35	3.6	2.6	1.85	1.6	1.35	1.3	.....
30	1.35	3.65	2.4	1.75	1.5	1.3	1.2	.....
31	.....	3.75	.....	1.7	1.55	.....	1.2	.....

Daily discharge, in second-feet, of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	180	2,060	660	300	235	130	145
2	.....	180	1,725	590	300	235	162	145
3	.....	162	1,598	590	325	255	215	145
4	.....	145	1,598	590	145	198	255	145
5	.....	198	1,535	590	375	198	255	145
6	.....	255	1,358	590	400	215	235	180
7	.....	350	1,190	520	375	180	198	115
8	.....	400	1,190	490	375	430	162	80
9	.....	430	1,245	490	350	375	198	90
10	.....	490	1,245	555	350	325	162	145
11	.....	695	1,725	625	325	300	162	198
12	80	900	1,475	520	375	278	215	115
13	90	1,040	1,245	460	400	215	215	70
14	130	945	1,090	460	430	215	215	70
15	145	730	1,090	520	400	180	215	70
16	145	660	1,190	555	325	130	215	70
17	130	660	1,090	555	198	162	180	70
18	130	730	1,140	590	198	215	162	70
19	130	945	1,190	730	180	215	145	70
20	115	900	1,140	555	130	198	198	80
21	162	810	1,090	490	162	198	215	62
22	130	695	1,090	430	162	198	162	50
23	145	855	990	555	130	115	180	30
24	90	1,245	945	695	162	90	180	50
25	90	1,415	1,040	590	130	90	180	80
26	90	1,855	945	520	180	90	162	90
27	90	2,130	1,040	460	162	102	198	.....
28	130	2,060	1,090	400	162	162	162	.....
29	162	2,060	900	375	255	162	145	.....
30	162	2,130	730	325	215	145	115	.....
31	.....	2,270	.....	300	235	.....	115	.....

Monthly discharge of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 12–30	162	80	123	4,640
May	2,270	145	920	56,600
June	2,060	730	1,230	73,200
July	730	300	528	32,500
August	430	130	265	16,300
September	430	90	204	12,100
October	255	115	184	11,300
November 1–26	198	40	99.6	5,140
The period				212,000

LOUP RIVER AT COLUMBUS, NEBR.

Location.—At railroad bridge in sec. 23, T. 17 N., R. 1 W., at Columbus. No tributaries between station and mouth of the river, 3 miles below.

Records available.—October 13, 1894, to December 31, 1913.

Drainage area.—13,500 square miles.

Gage.—Vertical staff gage established at Union Pacific Railway bridge November 23, 1913. The original gage was a vertical staff situated a short distance above railroad bridge and was used from October 13, 1894, to June 24, 1904. On that date a chain gage was established on highway bridge, 1½ miles downstream. The chain gage was set to read the same as original staff gage, but owing to the slope of the river the datum of the chain gage was 8.56 feet lower. The chain gage was used until November 21, 1913.

Control.—Extremely shifting.

Discharge measurements.—Made from highway bridge and later from railroad bridge.

Winter flow.—Ice causes backwater during winter months; observations discontinued.

Diversions.—Prior to September 1, 1912, there were approved diversions of 1,764 second-feet for irrigation and 4,700 second-feet for power from Loup River above station. There were also approved diversions of 2,046 second-feet for irrigation and 3,130 second-feet for power from tributaries entering above.

Accuracy.—Though the channel is extremely shifting, sufficient measurements have been made to insure fair estimates of discharge.

Cooperation.—Field data for 1913 furnished by the State engineer.

Discharge measurements of Loup River near Columbus, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	D. P. Weeks, jr.	4.70	4,620	July 28	D. P. Weeks, jr.	4.45	2,230
Apr. 6	do	4.65	3,420	Aug. 5	do	4.10	1,570
13	do	4.60	3,900	12	do	4.60	2,250
20	do	4.50	3,490	20	do	4.30	1,650
27	do	4.45	3,760	27	do	4.30	1,610
May 4	do	4.40	4,720	Sept. 3	do	4.30	1,690
11	do	4.60	4,730	9	do	4.30	1,720
18	do	4.60	3,570	18	Weeks and Follansbee	4.44	2,060
25	do	4.50	3,000	28	D. P. Weeks, jr.	4.54	2,070
June 8	do	4.50	2,600	Oct. 4	do	4.52	2,210
18	do	4.80	2,870	Nov. 9	do	4.65	2,500
25	do	4.50	2,080	23	do	a 3.70	4,560
July 2	do	4.55	2,180	29	W. M. Jefferys	a 3.60	2,370
10	do	4.85	3,250	Dec. 12	do	a 3.20	3,750
16	do	4.10	1,640				

a New gage established Nov. 23, 1913.

Daily gage height, in feet, of Loup River at Columbus, Nebr., for 1913.

[W. D. Benson, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.65	.....	4.7	.....	4.3	4.3	4.5	4.55	3.75
2	.....	4.75	.....	5.0	4.6	4.2	4.35	4.3	4.55	3.78
3	.....	4.65	5.5	5.05	4.55	4.0	4.35	4.4	4.45	3.75
4	.....	4.95	4.95	4.8	4.4	4.1	4.4	4.45	4.65	3.85
5	.....	4.8	4.4	5.0	4.4	4.1	4.35	4.5	4.75	3.88
6	.....	4.7	.....	4.75	5.35	4.1	4.35	4.5	4.6	4.2
7	.....	4.65	4.45	4.85	4.65	4.2	4.4	4.5	4.55	4.5
8	.....	4.5	4.4	4.5	4.55	4.25	4.4	4.55	4.55	4.1
9	5.75	4.9	4.45	4.5	4.45	.....	4.35	4.45	4.55	3.7
10	5.7	4.95	4.55	4.45	4.75	4.65	4.4	4.5	4.55	3.55
11	5.5	4.55	4.6	4.3	4.4	4.6	4.4	4.5	4.45	3.5
12	4.75	4.5	4.55	4.3	4.2	4.65	5.15	4.55	4.45	3.2
13	4.75	4.55	4.45	4.25	4.2	4.55	4.65	4.6	4.5	3.35
14	.....	4.5	4.7	4.25	4.3	4.6	4.35	4.7	4.5	3.42
15	.....	4.65	4.95	4.3	4.25	4.9	4.35	4.55	4.65	3.48
16	3.8	4.7	4.75	4.55	4.15	4.6	4.35	.....	4.55	3.5
17	3.95	4.75	4.65	4.85	4.05	4.6	4.4	4.6	4.55	3.5
18	4.45	4.8	4.6	4.8	4.1	4.55	.....	4.55	4.4	3.5
19	4.95	4.8	.....	4.45	4.25	4.4	4.4	4.6	4.7	3.32
20	.....	4.65	4.65	.....	4.95	4.35	4.45	4.5	4.75	3.5
21	3.6	4.65	4.7	4.6	4.75	4.35	4.55	4.65	4.75	3.55
22	3.7	4.5	4.45	4.45	4.45	4.35	4.55	4.6	.....	.....
23	4.0	.....	4.5	4.7	4.35	4.4	4.45	4.5	.....	2.75
24	5.1	5.05	4.25	4.65	.....	4.45	4.35	4.55	3.85	2.8
25	4.8	4.7	4.55	4.55	4.3	4.4	.....	4.55	3.72	.....
26	4.1	4.65	4.55	4.55	4.3	4.4	4.45	4.55	3.68	.....
27	4.55	4.5	4.5	.....	4.35	4.3	4.55	4.75	3.6	3.55
28	4.45	4.4	4.45	4.3	4.5	4.3	4.5	.....	3.75	3.7
29	4.5	4.4	4.3	.....	4.35	4.2	4.6	4.5	3.65	3.68
30	4.65	4.35	4.3	4.25	4.3	4.2	4.55	.....	3.75	.....
31	4.65	.....	4.35	.....	4.3	4.2	.....	4.4	.....	4.15

NOTE.—Gage heights Nov. 23 to Dec. 31 refer to gage established Nov. 23, 1913. Ice present Dec. 20 to 31.

Daily discharge, in second-feet, of Loup River at Columbus, Nebr., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3,560	6,160	4,040	1,980	1,870	1,680	2,080	2,220
2	.....	4,080	8,580	5,780	2,350	1,700	1,760	1,680	2,220
3	.....	3,460	11,000	6,020	2,220	1,530	1,760	1,850	1,960
4	.....	5,300	8,500	4,460	1,850	1,600	1,850	1,960	2,510
5	.....	4,210	4,560	5,600	1,850	1,600	1,760	2,080	2,860
6	.....	3,720	4,520	4,040	5,750	1,600	1,760	2,080	2,350
7	.....	3,560	4,490	4,580	2,510	1,700	1,850	2,080	2,220
8	.....	2,900	3,980	2,600	2,210	1,780	1,850	2,220	2,220
9	.....	5,440	4,100	2,550	1,960	2,270	1,760	1,960	2,220
10	.....	5,930	4,560	2,270	2,860	2,760	1,850	2,080	2,220
11	.....	3,460	4,750	1,780	1,900	2,480	1,850	2,080	1,960
12	.....	3,300	4,230	1,740	1,610	2,510	4,750	2,220	1,960
13	.....	3,680	3,450	1,590	1,640	2,220	2,510	2,350	2,080
14	.....	3,400	4,820	1,550	1,820	2,350	1,760	2,670	2,080
15	.....	4,280	6,420	1,600	1,760	3,500	1,760	2,220	2,510
16	.....	4,600	4,750	2,240	1,650	2,350	1,760	2,280	2,220
17	.....	4,950	3,920	3,500	1,560	2,350	1,850	2,350	2,220
18	.....	5,300	3,550	3,050	1,600	2,220	2,060	2,220	1,850
19	6,380	5,300	3,680	1,960	1,780	1,850	1,850	2,350	2,670
20	5,260	4,280	3,820	2,160	4,380	1,760	1,960	2,080	2,860
21	1,120	4,280	4,100	2,350	3,380	1,760	2,220	2,510	2,860
22	1,180	3,400	2,780	1,960	2,240	1,760	2,220	2,350	3,710
23	1,570	5,380	3,000	2,670	1,980	1,850	1,960	2,080	4,560
24	7,200	7,350	1,950	2,510	1,920	1,960	1,760	2,220	4,190
25	4,950	5,020	3,280	2,220	1,870	1,850	1,860	2,220	3,820
26	1,710	4,880	3,280	2,220	1,870	1,850	1,960	2,220	3,460
27	3,300	4,100	3,000	1,950	1,980	1,680	2,220	2,860	3,100
28	2,770	3,680	2,780	1,680	2,370	1,680	2,080	2,470	2,740
29	2,950	3,860	2,150	1,650	1,980	1,570	2,350	2,080	2,370
30	3,680	3,740	2,150	1,620	1,870	1,570	2,220	1,960	2,500
31	3,620	.....	2,350	.....	1,870	1,570	.....	1,850	.....

NOTE.—Discharge determined from a series of parallel curves and by indirect method for shifting channels.

Monthly discharge of Loup River at Columbus, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 19-31	7,200	1,120	3,510	90,500	C.
April	7,350	2,900	4,350	259,000	C.
May	11,000	1,950	4,340	267,000	C.
June	6,020	1,550	2,800	167,300	C.
July	5,750	1,560	2,210	136,000	B.
August	3,500	1,530	1,970	121,000	B.
September	4,750	1,680	2,030	121,000	B.
October	2,860	1,680	2,180	134,000	B.
November	4,560	1,850	2,620	156,900	B.
The period				1,450,000	

ELKHORN RIVER NEAR ARLINGTON, NEBR.

Location.—At highway bridge in sec. 15, T. 17 N., R. 9 E., one-half mile from Arlington. Nearest tributary, Bell Creek, enters 2 miles below.

Records available.—July 11 to December 31, 1913. From April 28, 1899, to November 21, 1903, a station was maintained at the old bridge, situated just above the present one.

Drainage area.—5,980 square miles.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made from single-span bridge.

Diversions.—Prior to September 1, 1912, there were approved diversions from Elkhorn River of 147 second-feet for irrigation and 538 second-feet for power, all above the station. From tributaries entering above there were approved diversions of 174 second-feets for power development.

Accuracy.—Conditions favorable for accurate results; estimates considered reliable.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Elkhorn River near Arlington, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 9	D. P. Weeks, jr	2.00	590	Nov. 16	D. P. Weeks, jr	2.15	453
Aug. 5	do	1.60	300	28	Jefferys and Weeks	2.20	470
Sept. 8	do	1.50	219	Dec. 19	W. M. Jefferys	2.25	843
17	Follansbee and Weeks	1.60	264				

Daily gage height, in feet, and discharge, in second-feet, of Elkhorn River near Arlington, Nebr., for 1913.

[Gerald Berry, observer.]

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	1.65	315	1.5	220	1.9	413	2.1	400	2.3	554
2	.....	.....	1.6	280	1.5	220	1.9	406	2.1	400	2.3	572
3	.....	.....	1.6	280	1.5	220	1.9	399	2.2	480	2.35	640
4	.....	.....	1.6	280	1.45	192	1.85	357	2.2	480	2.3	610
5	.....	.....	1.6	280	1.5	220	2.0	460	2.2	480	2.35	680
6	.....	.....	1.6	280	1.4	165	1.9	378	2.2	480	2.5	850
7	.....	.....	1.6	280	1.4	165	1.9	371	2.2	480	2.5	870
8	.....	.....	1.6	280	1.5	220	1.9	364	2.2	480	2.5	890
9	.....	.....	1.7	350	1.4	165	2.0	428	2.15	440	2.45	860
10	.....	.....	1.7	350	1.4	165	1.95	385	2.1	400	2.45	880
11	2.0	590	1.8	420	1.5	220	1.9	343	2.1	400	2.4	850
12	1.9	500	1.8	420	1.5	220	2.0	406	2.15	440	2.4	870
13	1.8	420	2.0	590	1.5	220	1.9	329	2.2	480	2.4	890
14	1.8	420	2.1	690	1.5	220	1.9	322	2.2	480	2.35	860
15	1.8	420	2.05	640	1.6	280	1.95	350	2.2	480	2.35	880
16	1.8	420	2.05	640	1.6	280	1.9	308	2.2	480	2.3	850
17	1.8	420	2.0	590	1.6	280	1.95	336	2.2	480	2.35	923
18	1.75	385	1.9	500	1.6	280	2.0	364	2.2	480	2.25	840
19	1.7	350	2.0	590	1.6	280	2.0	357	2.2	480	2.25	840
20	1.75	385	1.9	500	1.6	280	2.0	350	2.2	480	2.4	1,000
21	1.8	420	1.85	460	1.65	308	1.9	274	2.2	480	1.8	420
22	1.65	315	1.85	460	1.7	336	2.0	336	2.3	580	2.2	790
23	1.75	385	1.7	350	1.6	262	2.0	329	2.3	580	2.0	590
24	1.7	350	1.65	315	1.6	256	2.0	322	2.25	530	2.0	590
25	1.7	350	1.6	280	1.8	385	2.0	315	2.25	530	2.15	740
26	1.7	350	1.6	280	1.8	378	2.05	350	2.25	530	2.45	.....
27	1.7	350	1.6	280	1.8	371	2.1	400	2.25	530	2.55	.....
28	1.75	385	1.6	280	1.8	364	2.1	400	2.25	530	2.8	.....
29	1.7	350	1.55	250	1.85	392	2.1	400	2.25	530	2.75	.....
30	1.7	350	1.5	220	1.85	385	2.1	400	2.3	580	2.6	.....
31	1.7	350	1.5	220	.....	.....	2.1	400	.....	.....	2.6	.....

NOTE.—Gage heights Dec. 26–31 are probably affected by ice, though observer makes no note. Discharge determined from two well-defined curves.

Monthly discharge of Elkhorn River near Arlington, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
July 11–31	590	350	394	16,400	A.
August	690	220	385	23,700	A.
September	392	165	265	15,800	B.
October	460	274	366	22,500	C.
November	580	400	487	29,000	A.
December 1–25	1,000	420	774	38,400	C.
The period	.....	.....	.....	146,000	

ELKHORN RIVER AT WATERLOO, NEBR.

Location.—At the highway bridge half a mile north of Waterloo, on the line between secs. 3 and 10, T. 15 N., R. 10 E. No tributary within several miles.

Records available.—May 19, 1911, to July 19, 1913.

Drainage area.—Not measured.

Gage.—Reference point on bridge from which distance to water surface is measured.

Control.—Shifting.

Discharge measurements.—Made from the highway bridge.

Winter flow.—No data.

Diversions.—Prior to September 1, 1912, there were no approved diversions from Elkhorn River between Waterloo and Arlington, and none below Waterloo.

Accuracy.—Estimates obtained by indirect method for shifting channels; can be considered good.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Elkhorn River at Waterloo, Nebr., in 1913.

[D. P. Weeks, jr., hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 17	2.75	1,440	May 3	4.70	2,430	June 7	3.25	1,430
Apr. 12	3.52	2,030	May 10	3.90	2,150	June 17	2.50	901
Apr. 19	4.40	3,010	May 17	6.00	5,070	June 28	2.60	1,060
Apr. 27	4.97	3,200	May 24	4.35	2,890	July 3	2.06	735

Daily gage height, in feet, and discharge, in second-feet, of Elkhorn River at Waterloo, Nebr., for 1913.

[John Todd, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	3.07	1,640	3.90	1,760	3.88	2,080	2.23	815
2	.....	.....	3.00	1,590	4.05	1,830	3.80	2,000	2.15	780
3	.....	.....	3.14	1,690	4.74	2,480	3.96	2,160	2.08	754
4	.....	.....	3.15	1,700	4.80	2,660	3.77	1,970	1.98	724
5	.....	.....	3.10	1,660	5.57	3,780	3.60	1,800	2.10	760
6	.....	.....	3.16	1,710	5.15	3,280	3.50	1,700	1.95	715
7	.....	.....	3.23	1,760	4.58	2,640	3.23	1,460	2.20	800
8	.....	.....	3.20	1,740	4.15	2,210	3.10	1,350	2.00	730
9	2.55	1,320	3.33	1,850	4.15	2,300	3.27	1,490	1.95	715
10	3.25	1,780	3.50	2,000	3.90	2,100	3.00	1,270	1.90	700
11	3.38	1,890	3.57	2,070	3.70	1,900	2.90	1,200	1.80	670
12	3.78	2,290	3.56	2,060	3.62	1,820	2.85	1,160	1.68	646
13	3.28	1,800	3.45	1,960	3.90	2,100	2.60	1,000	1.66	642
14	3.25	1,780	3.55	2,050	4.58	2,900	2.57	985	1.60	630
15	3.14	1,690	3.90	2,430	5.10	3,600	2.45	925	1.60	630
16	3.00	1,590	4.25	2,850	5.35	3,980	2.43	915	1.59	628
17	2.78	1,440	4.50	3,170	5.83	4,760	2.50	950	1.54	621
18	2.85	1,480	4.60	3,300	6.15	5,340	2.64	1,020	1.53	620
19	3.14	1,690	4.49	3,160	5.36	3,990	2.60	1,000	1.48	612
20	3.25	1,780	4.20	2,790	5.30	3,900	2.50	950	.....	.....
21	3.32	1,840	3.95	2,420	5.40	4,050	2.60	1,000	.....	.....
22	2.70	1,400	3.75	2,120	5.20	3,750	2.37	885	.....	.....
23	2.83	1,470	3.90	2,200	4.85	3,260	2.45	925	.....	.....
24	3.65	2,150	3.75	2,000	4.35	2,620	2.30	850	.....	.....
25	4.14	2,720	4.20	2,410	4.34	2,610	4.63	2,970	.....	.....
26	3.88	2,410	4.90	3,200	4.20	2,440	3.54	1,740	.....	.....
27	3.50	2,000	5.05	3,310	4.04	2,250	3.00	1,270	.....	.....
28	3.18	1,720	4.76	2,860	4.00	2,200	2.53	965	.....	.....
29	3.15	1,700	4.50	2,480	4.00	2,200	2.47	935	.....	.....
30	3.16	1,710	4.15	2,030	3.98	2,180	2.36	880	.....	.....
31	3.20	1,740	.....	.....	3.86	2,060	.....	.....	.....	.....

NOTE.—Discharge determined from two fairly well-defined rating curves and by indirect method for shifting channels.

Monthly discharge of Elkhorn River at Waterloo, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 9–31	2,720	1,320	1,800	82,100	B.
April	3,310	1,590	2,270	135,000	B.
May	5,340	1,760	2,870	176,000	B.
June	2,970	850	1,330	79,100	A.
July 1–19	815	612	694	26,200	B.
The period				498,400	

KANSAS RIVER BASIN.

REPUBLICAN RIVER AT CULBERTSON, NEBR.

Location.—At highway bridge in sec. 20, T. 3 N., R. 31 W., south of Culbertson, Nebr. Nearest tributary, Frenchman River, enters a short distance below.
Records available.—June 15 to December 12, 1913.
Drainage area.—Not measured.
Gage.—Vertical staff.
Control.—Data too meager to determine.
Discharge measurements.—Made from bridge.
Winter flow.—Ice causes backwater during winter months; records discontinued.
Diversions.—There are adjudicated decrees amounting to 165 second-feet from the Republican, in Colorado, and approved diversions of 434 second-feet in Nebraska above the station. Below there are approved diversions of 582 second-feet.
Accuracy.—Station not completely rated; base data only available
Cooperation.—Field data furnished by State engineer.

Discharge measurements of Republican River at Culbertson, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 12	D. P. Weeks, jr		[a] 6.0	Sept. 13	D. P. Weeks, jr		0
July 21	do		0	Nov. 7	do		0
Aug. 14	do		0	Dec. 3	W. M. Jefferys	1.1	132

[a] Discharge estimated.

Daily gage height, in feet, of Republican River at Culbertson, Nebr., for 1913.

Day.	June.	Nov.	Dec.	Day.	June.	Nov.	Dec.	Day.	June.	Nov.	Dec.
1			0.9	11		1.8	0.9	21	0.2	1.2	0.9
2			.9	12		1.8	.9	22	.0	1.1	.9
3			1.1	13		1.9	.9	23	.0		.9
4			1.2	14		1.9	.9	24	.2		.9
5			1.3	15	0.4	1.9	.9	25	.0		.9
6			1.5	16	.3	1.9	.9	26	.0		.9
7			1.6	17	.4	1.9	.9	27	.0		.9
8			1.2	18	.0	1.9	.9	28	.0		
9			.9	19	.0	2.0	.9	29			
10		1.6	.9	20	1.8	1.1	.9	30		.9	

NOTE.—River dry June 29 to Nov. 9.
NOTE.—Ice present Dec. 13 to 31; gage heights to top of ice.

REPUBLICAN RIVER AT BOSTWICK, NEBR.

Location.—At highway bridge about 1 mile southwest of Bostwick, on the line between secs. 22 and 23, in T. 1 N., R. 8 W. Nearest tributary, a small intermittent stream which enters a short distance below.

Records available.—June 6, 1904, to December 31, 1913. From June 20, 1896, to November 30, 1903, a station was maintained at Superior, 10 miles downstream. As there are no important tributaries or diversions between, the records at the two points are very nearly comparable.

Drainage area.—23,300 square miles.

Gage.—Chain gage.

Control.—Shifting at intervals.

Discharge measurements.—Made from bridge.

Winter flow.—Discharge relation affected by ice; observations discontinued.

Diversions.—Prior to September 1, 1912, there were approved diversions of 862 second-feet for irrigation and 150 second-feet for power from Republican River above Bostwick station.

Accuracy.—During 1913 channel did not shift to any great extent; estimates of discharge should be reliable.

Cooperation.—Field data for 1913 furnished by the State engineer.

Discharge measurements of Republican River at Bostwick, Nebr., in 1913.

[Hydrographer, D. P. Weeks, jr.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 5	2.20	700	Aug. 15	0.60	12
May 3	2.90	1,340	Nov. 8	.98	34
June 15	1.50	257	Dec. 4	1.30	132
July 22	1.10	41			

Daily gage height, in feet, of Republican River at Bostwick, Nebr., for 1913.

[J. W. Kelfer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	.....	.....	2.3	2.1	1.7	1.5	0.8	0.40	1.0	0.95	1.55
2	2.4	.....	.....	2.3	2.1	1.7	2.3	.8	.4	.95	.95	1.3
3	2.4	.....	2.5	2.2	3.1	1.7	2.5	.8	.4	.9	.95	1.3
4	2.3	.....	2.6	2.2	2.3	1.7	2.1	.8	.4	.9	.95	1.3
5	2.3	.....	2.8	2.2	3.45	1.8	1.8	.7	.4	.85	.95	1.3
6	.....	.....	2.8	2.1	3.3	1.7	1.6	.7	.4	.85	1.0	2.0
7	.....	.....	3.0	2.1	3.3	1.75	1.5	.7	.4	1.3	1.0	2.1
8	.....	.....	2.7	2.1	3.4	1.7	1.4	.7	.5	1.1	1.0	1.75
9	.....	.....	3.1	2.1	3.4	1.6	1.2	.65	.55	1.1	1.0	1.75
10	.....	.....	2.8	2.1	4.3	1.7	1.2	.65	.55	1.1	.95	1.85
11	.....	.....	2.5	2.2	3.2	1.95	1.2	.6	.5	1.0	.95	2.0
12	.....	.....	2.5	2.2	2.8	1.8	1.75	.6	.68	.95	1.0	2.05
13	.....	.....	2.3	2.3	2.6	1.7	1.5	.6	.9	.95	1.0	2.0
14	.....	.....	2.3	2.3	2.4	1.6	1.3	.55	.9	.9	1.0	1.95
15	.....	.....	2.3	2.2	2.3	1.5	1.2	.55	.8	.9	1.0	1.9
16	.....	.....	2.3	2.3	2.3	1.5	1.1	.5	.8	.9	1.0	1.9
17	.....	2.4	2.5	2.3	2.65	1.4	1.0	.5	.75	.9	1.0	1.8
18	.....	2.4	2.3	2.2	2.6	1.4	1.0	.5	.7	.9	1.0	1.8
19	.....	2.2	2.0	2.2	2.4	1.4	.9	.5	.75	.9	1.0	1.8
20	.....	2.3	2.0	2.2	2.5	1.4	1.0	.45	.7	.9	1.0	2.0
21	.....	2.3	2.4	2.1	3.0	1.4	1.1	.5	.7	.9	1.0	2.3
22	.....	3.3	2.2	2.1	2.25	1.7	1.0	.45	.6	.95	1.0	2.1
23	.....	3.2	2.2	2.1	2.2	1.7	1.0	.45	.65	.95	1.0	2.0
24	.....	3.0	2.3	2.2	2.1	1.7	1.4	.4	.95	.9	1.0	2.1
25	.....	3.0	2.3	2.2	2.0	2.0	1.2	.45	1.0	.9	1.0	2.0
26	.....	3.0	2.5	2.2	2.0	1.8	1.2	.45	.95	.9	1.0	2.0
27	.....	.....	2.3	2.3	1.9	1.7	1.0	.4	.9	.9	1.0	2.0
28	.....	.....	2.5	2.2	1.9	1.8	.9	.4	.9	.9	1.0	2.0
29	.....	.....	2.4	2.2	1.9	1.6	.9	.4	.9	1.0	1.1	2.0
30	.....	.....	2.4	2.2	1.9	1.6	.9	.4	1.0	.95	1.55	2.0
31	.....	.....	2.3	.....	1.8	.....	.8	.4	.....	.9	.....	2.0

NOTE.—Ice present Jan. 6 to Mar. 7 and Dec. 20–31.

Daily discharge, in second-feet, of Republican River at Bostwick, Nebr., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	780	620	350	195	18	6	30	31	228
2	.....	780	620	350	692	18	6	26	31	130
3	.....	700	1,550	350	852	18	6	22	31	130
4	.....	700	780	350	529	18	6	22	31	130
5	.....	700	1,940	415	328	15	6	20	31	130
6	.....	620	1,770	350	218	15	6	20	40	480
7	.....	620	1,770	382	168	15	6	130	40	550
8	1,140	620	1,880	350	129	15	9	66	40	328
9	1,550	620	1,880	295	68	14	10	66	40	328
10	1,240	620	2,960	350	65	14	10	66	31	385
11	960	700	1,660	515	62	12	9	40	31	480
12	960	700	1,240	415	262	12	14	31	40	515
13	780	780	1,050	350	144	12	22	31	40	480
14	780	780	870	295	80	10	22	22	40	448
15	780	700	780	240	60	10	18	22	40	415
16	780	780	780	240	45	9	18	22	40	415
17	960	780	1,100	195	30	9	16	22	40	355
18	780	700	1,050	195	30	9	15	22	40	355
19	550	700	870	195	22	9	16	22	40	355
20	550	700	960	195	30	8	15	22	40	.....
21	620	620	1,440	195	45	9	15	22	40	.....
22	700	620	740	344	30	8	12	31	40	.....
23	700	620	700	339	30	8	14	31	40	.....
24	780	700	620	334	120	6	26	22	40	.....
25	780	700	550	522	65	8	30	22	40	.....
26	960	700	550	382	65	8	26	22	40	.....
27	780	780	480	317	30	6	22	22	40	.....
28	960	700	480	370	22	6	22	22	40	.....
29	870	700	480	251	22	6	22	40	66	.....
30	870	700	480	246	22	6	30	31	228	.....
31	780	.....	415	.....	18	6	.....	22	.....	.....

NOTE.—Discharge determined from 3 fairly well defined curves and by indirect method. Discharge interpolated Mar. 21.

Monthly discharge of Republican River at Bostwick, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 8-31	1,550	550	859	40,900	C.
April	780	620	697	41,500	A.
May	2,960	415	1,070	65,800	A.
June	522	195	323	19,200	B.
July	852	18	144	8,850	B.
August	18	6	10.9	670	B.
September	30	6	15.2	904	B.
October	130	20	32.6	2,000	B.
November	228	31	45.0	2,680	B.
December 1-19	550	130	349	13,200	C.
The period	.....	.....	.....	196,000	

FRENCHMAN RIVER AT CULBERTSON, NEBR.

Location.—At highway bridge in sec. 17, T. 3 N., R. 31 W., at Culbertson. No tributary between the station and the mouth.

Records available.—June 15 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Shifting.

Discharge measurements.—Made from pile-bent bridge.

Winter flow.—Ice causes backwater during the winter months.

Diversions.—Prior to September 1, 1912, there were approved diversions from Frenchman River of 288 second-feet for power and 1,385 second-feet for irrigation, all above station. There were also approved diversions of 51 second-feet from Stinking Water River, which enters above.

Accuracy.—Station not completely rated; base data only available.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Frenchman River at Culbertson, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 12	Weeks and McNamara.	1.1	17.4	Sept. 13	D. P. Weeks.....	[a] 1.3	14.3
July 18	D. P. Weeks.....	1.4	29.3	Nov. 7	.....do.....	1.45	33.2
Aug. 14	.....do.....	1.3	17.4	Dec. 3	W. M. Jefferys.....	1.5	17.0

[a] Observer's gage height.

Daily gage height, in feet, of Frenchman River at Culbertson, Nebr., for 1913.

[La Vaughn Crowell, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	1.2	1.1	1.3	1.2	1.3
2	.....	1.2	1.2	1.1	1.2	1.2	1.3
3	.....	1.3	1.1	1.1	1.3	1.1	1.5
4	.....	1.3	1.1	1.1	.....	.....	1.5
5	.....	1.2	1.1	1.1	.....	.....	1.6
6	.....	1.2	1.1	1.1	.....	.....	1.9
7	.....	1.2	1.1	1.1	.....	1.4	2.3
8	.....	1.2	1.1	1.1	.....	1.5	2.3
9	.....	1.2	1.1	1.1	.....	1.5	2.2
10	.....	1.2	1.2	1.3	.....	1.5	2.3
11	.....	1.1	1.2	1.3	.....	1.5	2.3
12	.....	1.1	1.2	1.3	.....	1.5	2.3
13	.....	1.1	1.2	1.3	.....	1.5	2.3
14	.....	1.2	1.2	1.3	.....	1.3	2.2
15	1.4	1.3	1.2	1.3	.....	1.3	2.1
16	1.3	1.3	1.3	1.3	1.1	1.3	2.1
17	1.4	1.2	1.3	1.3	1.2	1.3	2.1
18	1.2	1.5	1.3	1.3	1.2	1.3	2.1
19	1.3	1.2	1.3	1.3	1.2	1.3	2.2
20	2.1	1.1	1.3	1.3	1.2	1.3	2.2
21	1.8	1.1	1.5	1.3	1.2	1.3	2.1
22	1.4	1.2	1.3	.....	1.2	1.3	2.4
23	1.3	1.2	1.3	.....	1.2	.....	2.1
24	1.8	1.2	1.3	.....	1.2	.....	2.1
25	1.4	1.2	1.3	.....	1.2	.....	2.1
26	1.3	1.2	1.3	.....	1.2	.....	2.1
27	1.3	1.2	1.2	.....	1.2	.....	2.1
28	1.3	1.3	1.1	.....	1.2	.....	.....
29	1.3	1.2	1.1	.....	1.2	.....	.....
30	1.4	1.2	1.1	.....	1.2	1.3	.....
31	.....	1.2	1.1	.....	1.2	.....	.....

NOTE.—Water below gage Sept., 22–30; Oct 5–15; Nov. 4–6. Channel shifted between Oct. 5 and Oct. 15.

BIG BLUE RIVER AT BEATRICE, NEBR.

Location.—At Sixth Street Bridge at Beatrice, Nebr. Nearest tributary a small stream entering from the north a mile or more below.

Records available.—October 15, 1910, to December 31, 1913. Records of gage heights kept by United States Weather Bureau from January 1 to July 31 each year since June 1, 1905.

Drainage area.—3,363 square miles (United States Weather Bureau).

Gage.—Chain gage, which is owned by United States Weather Bureau.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes some backwater during a portion of the winter months.

Flood discharge.—The highest recorded stage was 25.6 feet above present gage datum and occurred May 29, 1903.

Diversions.—Prior to September 1, 1912, there were approved diversions of 841 second-feet for power from the Big Blue above Beatrice. Below the station the approved diversions amount to 500 second-feet for power.

Accuracy.—Estimates obtained by indirect method for shifting channel; considered only approximate or possibly fair.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Big Blue River at Beatrice, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar 22	D P Weeks, jr	2.80	373	Aug 15	D P Weeks, jr	2.15	149
Apr 19	do	2.50	279	Sept 16	do	2.00	105
May 21	do	10.70	6,000	Nov 12	do	2.30	253
June 23	do	2.15	176	Dec 5	W M Jefferys	2.55	334
July 22	do	2.20	177				

Daily gage height, in feet, of Big Blue River at Beatrice, Nebr., for 1913.

[Herbert E. Palmer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	3.4	2.8	2.6	2.5	2.7	2.6	2.4	1.9	2.4	2.2	2.7
2	2.5	2.8	2.7	2.7	2.5	2.6	2.5	2.2	1.3	2.2	1.9	2.7
3	2.4	.....	2.6	2.8	2.4	2.5	2.6	2.1	1.1	2.3	2.5	2.7
4	2.7	.....	2.6	2.5	4.0	2.6	2.4	2.2	2.0	2.2	2.1	2.6
5	2.6	.....	2.6	2.8	4.8	2.6	2.3	2.2	1.4	2.1	2.5	2.8
6	.....	.....	3.0	2.4	3.8	2.8	2.4	2.3	1.7	2.0	2.3	3.3
7	.....	2.7	2.7	2.4	3.3	4.0	2.3	2.4	1.5	2.4	2.5	3.6
8	.....	2.9	2.9	2.6	3.3	3.0	2.4	2.4	1.8	1.9	2.6	3.8
9	.....	3.0	3.0	2.5	3.2	2.6	2.5	2.2	1.4	2.1	2.3	3.3
10	.....	2.7	3.4	2.5	3.2	2.7	2.6	2.2	1.8	2.0	2.5	3.0
11	.....	2.6	3.3	2.7	3.8	2.5	2.5	2.3	1.9	2.1	2.4	2.9
12	.....	2.6	3.3	2.7	3.8	2.7	2.3	2.0	1.4	1.7	2.5	2.8
13	.....	2.7	3.1	2.5	3.4	2.6	2.2	1.9	2.1	1.9	2.4	2.8
14	.....	2.8	3.1	2.5	3.2	2.6	2.4	1.7	1.9	2.3	2.5	2.6
15	.....	2.4	3.0	2.6	3.2	2.5	2.2	2.0	1.8	2.0	2.5	2.7
16	.....	2.4	2.9	2.8	3.0	2.5	2.2	2.0	2.1	1.7	2.5	2.6
17	.....	2.5	3.0	2.7	3.2	2.6	2.4	1.9	1.9	2.2	2.5	2.6
18	.....	2.4	2.8	2.7	2.8	2.5	2.5	1.7	1.5	2.2	2.5	2.5
19	.....	2.5	2.8	2.8	2.7	2.5	2.5	2.3	1.9	2.0	2.5	2.6
20	.....	2.6	2.7	2.7	8.5	2.6	2.3	2.3	2.1	1.9	2.4	2.5
21	.....	2.6	2.9	2.6	12.9	2.6	2.2	1.7	2.0	2.0	2.5	2.2
22	.....	2.5	3.0	2.5	5.6	2.4	2.3	1.2	2.2	2.3	2.4	2.7
23	.....	2.6	2.8	2.6	4.6	2.4	2.4	2.2	2.1	2.0	2.4	2.4
24	.....	2.5	2.8	2.7	4.5	2.5	2.3	1.5	2.1	2.5	2.4	2.6
25	.....	2.8	3.0	2.7	4.8	2.7	2.0	1.8	2.3	2.4	2.4	2.5
26	2.5	2.7	2.7	2.6	3.3	4.1	2.2	2.0	2.5	2.5	2.6	2.7
27	2.6	2.4	2.6	2.5	3.1	2.6	2.2	2.1	2.6	2.2	2.5	2.4
28	2.5	2.9	2.5	2.4	3.1	2.6	2.4	2.0	2.4	2.1	2.5	2.6
29	2.5	.....	2.7	2.2	2.8	2.6	2.3	2.3	2.4	2.3	2.4	2.8
30	2.7	.....	2.4	2.5	2.8	2.6	2.0	2.2	2.2	2.3	2.5	2.8
31	.....	.....	2.5	.....	2.6	.....	2.2	2.0	.....	2.3	.....	2.6

NOTE.—Ice present Jan. 6 to Feb. 6. Low stage, Aug. 22, caused by filling of mill pond.

Daily discharge, in second-feet, of Big Blue River at Beatrice, Nebr., for 1913.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	356	302	278	295	270	220	97	185	143	355
2	.....	328	328	278	270	245	180	20	143	89	360
3	.....	302	356	255	245	270	160	5	163	230	375
4	.....	302	278	750	270	220	180	105	143	165	350
5	.....	302	356	1,080	270	200	180	29	123	280	410
6	.....	416	255	680	320	220	200	62	105	250	570
7	328	328	255	510	710	200	220	39	185	297	675
8	386	386	302	510	375	220	220	75	89	322	755
9	416	416	278	478	270	245	175	29	123	250	570
10	328	542	278	478	295	270	172	75	105	297	470
11	302	510	328	680	245	245	190	89	123	273	440
12	302	510	328	680	295	200	130	29	62	297	410
13	328	446	278	542	270	180	110	123	89	273	410
14	356	446	278	478	270	220	75	89	163	297	353
15	255	416	302	478	245	180	119	75	105	297	380
16	255	386	356	416	245	180	119	123	62	297	353
17	278	416	328	478	270	220	102	89	143	297	353
18	255	356	328	356	245	245	73	39	143	297	326
19	278	356	356	328	245	245	180	89	105	297	353
20	302	328	328	3,590	270	200	180	123	89	273	326
21	302	386	302	8,400	270	180	73	105	105	297	252
22	278	416	278	1,500	220	200	14	143	163	273	380
23	302	356	302	1,000	220	220	158	123	105	273	300
24	278	356	328	975	245	200	46	123	207	273	353
25	356	416	328	1,060	295	144	87	163	185	273	326
26	328	328	302	465	750	180	119	207	207	322	380
27	255	302	278	405	270	180	138	230	143	297	300
28	386	278	255	405	270	220	119	185	123	297	353
29	.....	328	212	320	270	200	180	185	163	273	410
30	.....	255	278	320	270	144	158	143	163	297	410
31	.....	278	.....	270	.....	180	119	.....	163	.....	353

NOTE.—Discharge determined by indirect method for shifting channels.

Monthly discharge of Big Blue River at Beatrice, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
February 7–28	416	255	312	13,600
March	542	255	373	22,900
April	356	212	302	18,000
May	8,400	255	917	56,400
June	710	220	300	17,900
July	270	144	210	12,900
August	220	14	142	8,730
September	230	5	100	5,950
October	207	62	135	8,300
November	322	89	270	16,100
December	755	252	400	24,600
The period	.....	.....	.....	205,000

LITTLE BLUE RIVER NEAR FAIRBURY, NEBR.

Location.—At highway bridge in sec. 26, T. 2 N., R. 2 E., 1½ miles south of Fairbury. Nearest tributary a small stream entering half a mile above.

Records available.—May 23, 1908, to September 30, 1913.

Drainage area.—Not measured.

Gage.—Chain gage.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes backwater for only a short time during winter months.

Regulation.—The dam of the Fairbury roller mills, 2 miles above, may control the flow to a certain extent during low-water season, causing a daily fluctuation. The gage is read once each day.

Diversions.—Prior to September 1, 1912, there were approved diversions of 180 second-feet from the Little Blue above Fairbury, but none from the intervening tributaries. There was no diversion from Little Blue River below Fairbury.

Accuracy.—Estimates made by indirect method for shifting channels; considered fair or possibly good.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Little Blue River near Fairbury, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 23	D. P. Weeks, jr.	2.90	262	Aug. 16	D. P. Weeks, jr.	2.50	93
Apr. 24	do	2.65	206	30	do	2.00	69
May 21	do	11.35	5,350	Sept. 15	do	2.10	68
June 23	do	3.00	163	Nov. 12	do	2.35	128
July 23	do	2.70	109	Dec. 4	W. M. Jefferys	2.65	174

Daily gage height, in feet, of Little Blue River near Fairbury, Nebr., for 1913.

[Clark Hulbert, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.8	2.7	2.9	2.6	2.6	3.1	3.4	2.5	2.0	2.4	2.5	3.1
2	3.0	2.7	3.9	2.6	2.6	3.0	3.2	2.6	1.9	2.2	2.4	2.6
3	2.4	2.8	2.5	2.6	3.2	3.1	3.0	2.5	2.0	2.3	2.6	3.1
4	2.8	3.0	3.8	2.6	5.4	3.0	3.0	2.5	2.1	2.4	2.5	3.3
5	2.6	.....	2.8	2.6	3.7	3.4	2.9	2.7	2.0	2.3	2.5	4.9
6	2.7	.....	3.6	2.5	4.0	3.4	2.8	2.5	2.2	2.4	2.5	5.6
7	.....	.....	3.1	2.6	3.6	3.4	2.9	2.4	2.0	2.3	2.5	4.4
8	.....	.....	3.3	2.6	3.3	4.5	2.8	2.5	1.9	2.3	2.6	4.1
9	.....	.....	3.5	2.7	3.9	3.8	2.8	2.4	2.1	2.4	2.5	3.6
10	.....	.....	3.4	2.7	4.8	3.4	2.7	2.5	2.1	2.3	2.4	3.3
11	.....	.....	3.2	2.8	3.6	3.3	2.7	2.6	2.0	2.3	2.5	3.0
12	.....	.....	3.1	2.7	3.6	3.5	2.7	2.5	2.1	2.3	2.5	3.0
13	.....	.....	3.0	2.6	4.0	3.4	2.6	2.5	2.0	2.4	2.3	2.9
14	.....	.....	3.2	2.6	3.3	3.3	2.7	2.4	2.1	2.4	2.4	2.7
15	.....	.....	3.8	2.6	3.1	3.3	2.6	2.4	2.0	2.4	2.4	2.8
16	.....	.....	3.0	2.5	3.0	3.2	2.6	2.4	2.3	2.5	2.3	2.8
17	.....	.....	3.0	2.6	2.9	3.2	2.6	2.5	2.2	2.4	2.4	2.7
18	.....	.....	3.0	2.6	3.8	3.1	2.6	2.4	2.1	2.3	2.3	2.7
19	.....	.....	3.3	2.7	3.2	3.0	2.6	2.5	2.2	2.4	2.3	2.8
20	.....	.....	3.1	2.5	7.75	3.1	2.6	2.4	2.3	2.4	2.4	2.9
21	.....	.....	3.0	2.6	11.5	3.0	2.6	2.4	2.1	2.5	2.5	2.6
22	.....	.....	3.1	2.5	8.2	3.0	2.5	2.4	2.1	2.4	2.5	2.9
23	.....	2.6	2.9	2.5	5.4	2.9	2.7	2.4	2.2	2.5	2.4	2.7
24	.....	2.4	2.9	2.7	4.4	3.1	2.6	2.4	2.5	2.5	2.4	2.6
25	.....	2.5	2.9	2.7	4.0	6.3	2.5	2.5	2.4	2.4	2.5	2.9
26	.....	2.7	2.8	2.8	3.7	3.9	2.5	2.5	2.3	2.4	2.4	2.9
27	.....	2.7	2.7	2.7	3.6	3.2	2.6	2.3	2.3	2.4	2.4	2.4
28	.....	2.8	2.7	2.7	3.5	3.1	2.5	2.4	2.3	2.5	2.5	2.9
29	2.8	.....	2.8	2.6	3.3	3.2	2.5	2.3	2.3	2.5	2.6	3.1
30	2.6	.....	2.7	2.7	3.2	7.5	2.5	2.0	2.3	2.4	2.8	3.0
31	2.8	.....	2.6	.....	3.2	.....	2.4	2.0	.....	2.6	.....	2.7

NOTE.—Ice present Jan. 7 to 28 and Feb. 5 to 22.

Daily discharge, in second-feet, of Little Blue River near Fairbury, Nebr., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	240	220	260	200	195	170	220	95	65	92	136	250
2	280	220	505	200	191	155	185	105	63	78	123	162
3	170	240	185	200	300	170	155	95	65	86	154	250
4	240	280	475	200	1,030	155	155	95	70	94	140	295
5	200	.....	240	200	410	220	140	115	65	87	142	780
6	220	.....	425	185	478	220	125	95	75	96	143	1,080
7	.....	.....	300	200	370	220	140	87	65	89	144	595
8	.....	.....	350	200	294	500	125	95	63	89	162	505
9	.....	.....	400	220	410	315	125	87	70	99	148	370
10	.....	.....	375	220	700	220	115	95	70	91	132	295
11	.....	.....	325	240	342	200	115	105	65	92	148	232
12	.....	.....	300	220	335	240	115	95	70	93	148	232
13	.....	.....	280	200	425	220	105	95	65	103	123	214
14	.....	.....	325	200	274	200	115	87	70	104	135	178
15	.....	.....	475	200	208	200	105	87	65	105	135	196
16	.....	.....	280	185	186	185	105	87	80	116	123	196
17	.....	.....	280	200	167	185	105	95	75	107	135	178
18	.....	.....	280	200	388	170	105	87	70	98	123	178
19	.....	.....	350	220	204	155	105	95	75	109	123	196
20	.....	.....	300	185	2,230	170	105	87	80	110	135	214
21	.....	.....	280	200	5,500	155	105	87	70	121	148	162
22	.....	.....	300	185	2,570	155	95	87	70	112	148	214
23	.....	200	260	185	835	140	115	87	75	123	135	178
24	.....	170	260	220	470	170	105	87	95	124	135	162
25	.....	185	260	220	365	1,270	95	95	87	115	148	214
26	.....	220	240	240	290	340	95	87	81	116	135	262
27	.....	220	220	220	265	185	105	80	81	117	135	135
28	.....	240	220	220	240	170	95	87	82	130	148	214
29	240	.....	240	200	200	185	95	80	83	131	162	250
30	200	.....	220	220	185	2,050	95	65	84	120	196	232
31	240	.....	200	.....	185	.....	87	65	.....	149	.....	178

NOTE.—Discharge determined from three parallel curves and by indirect method for shifting channels.

Monthly discharge of Little Blue River near Fairbury, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	505	185	304	18,700	C.
April	240	185	206	12,300	B.
May	5,500	167	651	40,000	C.
June	2,050	140	303	18,000	B.
July	220	87	118	7,260	B.
August	115	65	90.0	5,530	B.
September	95	63	73.1	4,350	B.
October	149	78	106	6,520	C.
November	196	123	141	8,390	B.
December	1,080	135	282	17,300	C.
The period	.....	.....	.....	138,000	

MISCELLANEOUS MEASUREMENTS.

Measurements of stream flow in the Missouri River basin in 1913 at points other than regular gaging stations are listed in the following table:

Miscellaneous measurements in Missouri River drainage basin in 1913.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
June 22	Gibbon River	Madison River	Norris Soldier Station, Wyo	2.89	143
July 24	South Fork of Birch Creek.	Birch Creek	Above flow line of Swift dam reservoir, near Dupuyer, Mont.	2.2	74
Aug. 14	do	do	do	2.3	152
20	do	do	do	2.2	82
27	do	do	do	2.1	60
Sept. 11	do	do	do	1.99	48
Oct. 17	do	do	do		61
Dec. 5	do	do	do	1.92	49
July 10	do	do	150 feet above mouth		121
June 4	South Branch of South Fork of Birch Creek.	South Fork of Birch Creek.	Above flow line of Swift dam reservoir, near Dupuyer, Mont.	1.84	15.9
13	do	do	do	1.68	11.3
24	do	do	do	1.55	7.7
July 9	do	do	do	1.54	6.7
23	do	do	do	1.49	5.3
Aug. 14	do	do	do	1.48	5.7
27	do	do	do	1.42	3.7
Sept. 11	do	do	do	1.41	3.6
Oct. 17	do	do	do	1.44	4.4
Dec. 5	do	do	do	1.43	4.3
June 3	North Fork of Birch Creek.	Birch Creek	do	1.51	280
13	do	do	do	1.32	157
24	do	do	do	1.10	99
July 9	do	do	do	.89	65
23	do	do	do	.72	42
Aug. 13	do	do	do	.70	43
20	do	do	do	.68	41
27	do	do	do	.62	31
Sept. 11	do	do	do	.54	27
Oct. 16	do	do	do	.60	32
Dec. 4	do	do	do	.48	21
June 3	Bear Creek	North Fork of Birch Creek.	do	1.15	32
13	do	do	do	.89	15.8
24	do	do	do	.68	7.2
July 9	do	do	do	.62	4.4
23	do	do	do	.55	3.6
Aug. 13	do	do	do	.50	2.8
20	do	do	do	.50	2.4
27	do	do	do	.46	1.9
Sept. 11	do	do	do	.40	1.2
Oct. 16	do	do	do	.50	2.0
Dec. 4	do	do	do	.40	1.2
May 1	Sheep Creek	Dupuyer Creek	1,000 feet above mouth		18.6
June 27	do	do			43
July 1	do	do			14.5
7	do	do			6.0
15	do	do	Near mouth		5.0
Aug. 8	do	do	¼ mile above mouth		.73
15	do	do	do		4.8
19	do	do	½ mile above mouth		4.0
29	do	do	do		1.2
Sept. 12	do	do	Near mouth		.57
18	do	do	do		.31
Apr. 9	Spring Creek	Teton River	Strabane, Mont		11.5
June 20	Yellowstone	Missouri	Fishing Bridge, Yellowstone National Park, Wyo.	7.86	6,890
Sept. 12	do	do	do	5.11	2,140
13	Trout Creek	Yellowstone	Yellowstone National Park, Wyo		8.5
13	Small creek ¼ mile above Trout Creek.	do	do		4.9
Mar. 21	Boulder River	do	1 mile above falls near Contact, Mont		6.0
Aug. 22	North Platte River		Gaging station at Saratoga, Wyo	3.65	215
Oct. 31	do		do	4.14	479
29	French Creek	North Platte River	Gaging station near French, Wyo	1.50	14

Miscellaneous measurements in Missouri River drainage basin in 1913—Continued.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Oct. 29	Brush Creek	North Platte River	Gaging station near Saratoga, Wyo.	2.06	28
28	Encampment Creek.	do	Gaging station at Encampment, Wyo.	4.23	69
28	Cow Creek	do	Gaging station near Saratoga, Wyo.	2.10	8.9
28	Spring Creek	do	do	.84	16
31	Jack Creek	do	Blydenburgh's ranch near Saratoga, Wyo.	1.28	9.6
18	North Laramie River.	Laramie River	Gaging station near Ura, Wyo.	.88	3.9
Jan. 13	Horse Creek	North Platte River	Gaging station near Lagrange	1.20	34
Oct. 17	Wind River	Bighorn River	Gaging station at Riverton, Wyo.	4.90	587
17	Little Wind River	do	Gaging station above Arapahoe, Wyo	2.65	128
17	do	do	Gaging station below Arapahoe, Wyo	1.82	319
17	Little Popo Agie River.	do	Gaging station at Hudson, Wyo.	2.20	52
Jan. 13	South Fork of South Platte River.	South Platte River	South Platte, Colo		98
Feb. 25	do	do	do		96
Sept. 27	Geneva Creek	North Fork of South Platte River.	¼ mile below Scott Gomer Creek		50
27	do	do	Gaging station at Sullivan's ranch, Colo.	.94	58
Feb. 16	Cache la Poudre River.	South Platte River.	200 feet above Big South Fork and 3½ miles below Chambers Lake, Colo.		3.6
16	do	do	100 feet below Big South Fork, Colo.		8.3
16	do	do	1 mile below Big South Fork, Colo.		11.1
17	do	do	3 miles below Tunnel, Colo.		12.9
17	do	do	1 mile above Home post office, Colo.		15.3
15	do	do	Upper bridge at Fry's ranch, Colo.		19.0
15	do	do	do		19.3
15	do	do	do		20.5
15	do	do	do		19.4
16	do	do	do		19.0
17	do	do	do		21.8
15	do	do	1¼ miles below upper bridge at Fry's ranch, Colo.		21.1
16	Big South Fork	Cache la Poudre River.	500 feet above mouth, Colo.		6.8

Miscellaneous measurements of canals in Missouri River drainage basin in 1913.

Date.	Stream.	Diverts from—	Locality.	Discharge.
May 24	Sevenmile ditch	Sevenmile Creek	Birdseye, Mont	1.6
June 24	Croft & Bird ditch	Teton River	Strabane, Mont	5.2
24	Farmers' Cooperative Canal Co. ditch.	do	do	41
May 24	Wolf Creek ditch	Wolf Creek	Wolf Point, Mont	1.1
July 19	do	do	do	*a* .3
2	Little Bighorn canal	Little Bighorn River	Crow Agency, Mont	22

a Estimated.

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