DEPARTMENT OF THE INTERIOR
HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 512

SURFACE WATER SUPPLY OF THE UNITED STATES

1919 AND 1920

PART XII. NORTH PACIFIC SLOPE DRAINAGE BASINS

A. PACIFIC BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

NATHAN C. GROVER, Chief Hydraulic Engineer
G. L. PARKER and W. A. LAMB, District Engineers

Prepared in cooperation with the States of
WASHINGTON, MONTANA, AND IDAHO

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ILLUSTRATIONS.

SURFACE WATER SUPPLY OF PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN, 1919 AND 1920.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 14 reports presenting results of measurements of streams in the United States during the years ending September 30, 1919 and 1920.

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 resouces.

Annual appropriations for the fiscal years ending June 30, 1895–1920.

1895	$12,500.00
1896	20,000.00
1897 to 1900, inclusive	50,000.00
1901 to 1902, inclusive	100,000.00
1903 to 1906, inclusive	200,000.00
1907	150,000.00
1908 to 1910, inclusive	100,000.00
1911 to 1917, inclusive	150,000.00
1918	175,000.00
1919	148,244.10
1920	175,000.00

In this work many private and State organizations have cooperated, either by furnishing records or by assisting in their collection. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected; cooperation of the second kind is acknowledged on pages 5 and 6.

Measurements of stream flow have been made at about 5,000 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1920, 1,350 gaging stations were being maintained by the Survey and the cooperating organizations. Many miscellaneous discharge measurements were made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the water-supply papers from time to time.

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 work of a certain class. These terms may be divided into two groups—(1) those that 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 that represent the actual quantity of water, as run-off in inches, acre-feet, and millions of cubic feet. The principal terms used in this series of reports are second-feet, second-feet per square mile, run-off in inches, and acre-feet. They may be defined as follows:

"Second-feet" is an abbreviation for "cubic feet per second." 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.

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

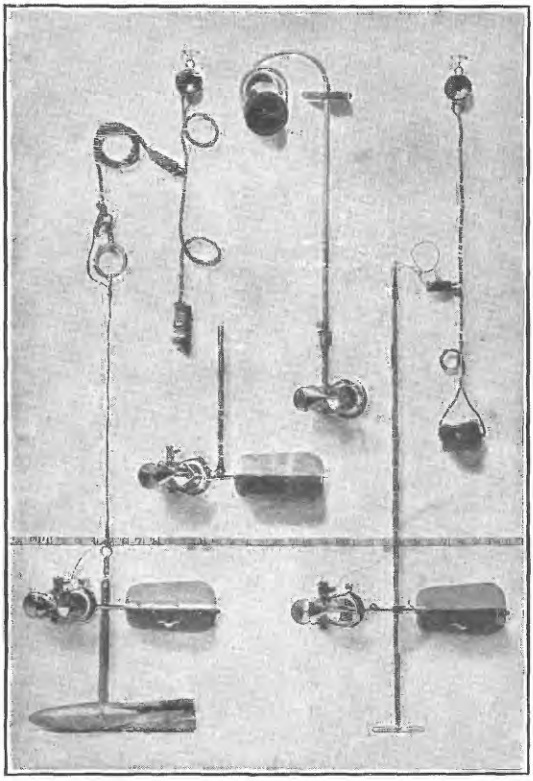
"Run-off in inches" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot," equivalent to 43,560 cubic feet, 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.

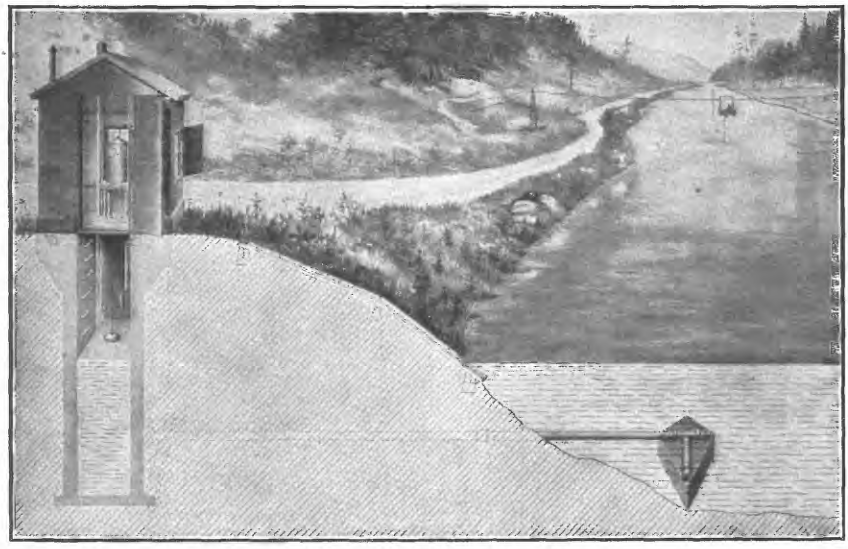
The following terms not in common use are here defined:

"Stage-discharge relation," an abbreviation for the term "relation of gage height to discharge."

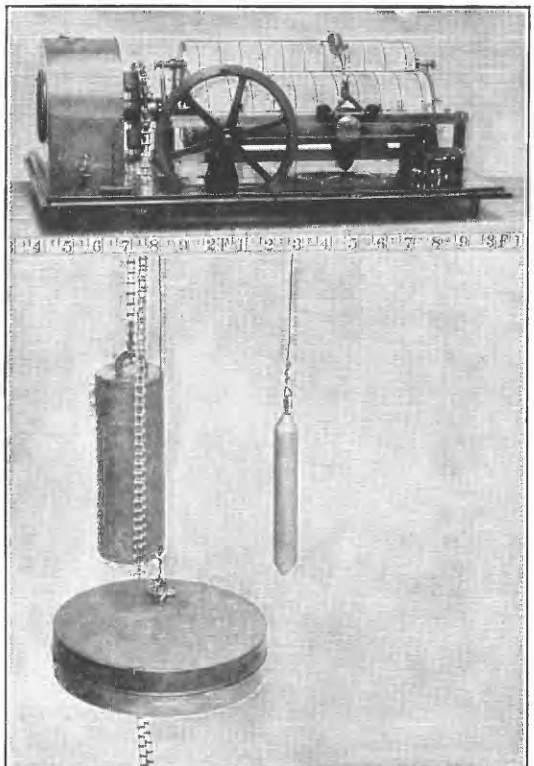
"Control," a term used to designate the section or sections of the stream below the gage which determine the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.



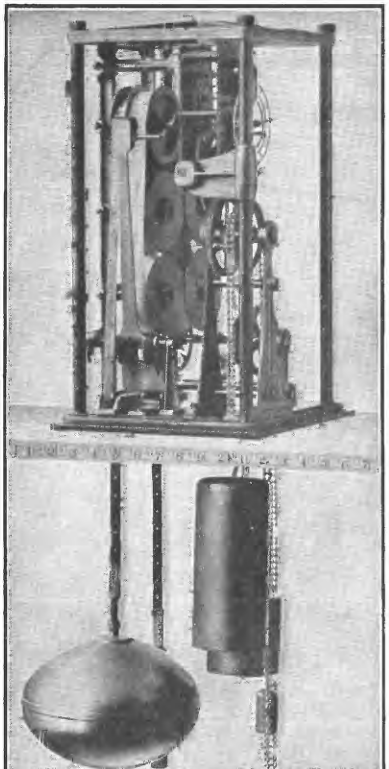
A. PRICE CURRENT METERS.



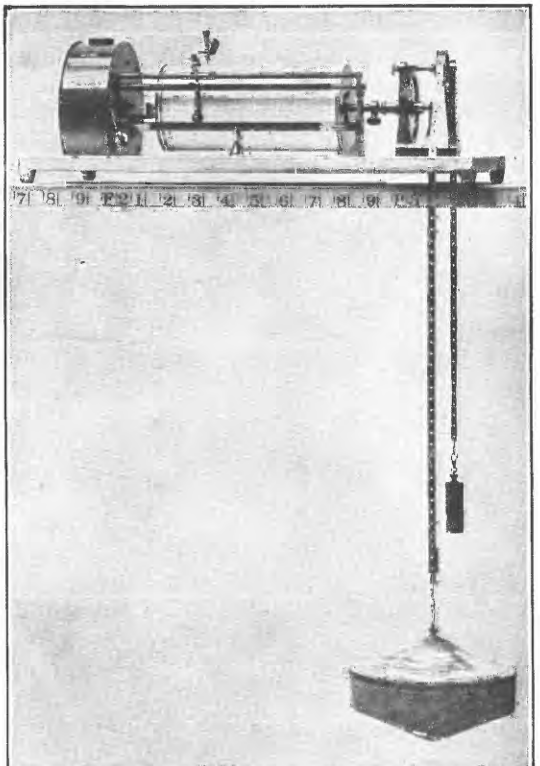
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

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 stream would fall if there were no flow.

EXPLANATION OF DATA.

The data presented in this report cover the years ending September 30, 1919 and 1920. At the first of January, in most parts of the United States much of the precipitation in the preceding three months is stored as ground water, in the form of snow or ice, or in ponds, lakes, and swamps, and this stored water passes off in the streams during the spring break-up. At the end of September, on the other hand, the only stored water available for run-off is possibly a small quantity in the ground; therefore, the run-off for the year beginning October 1 is practically all derived from precipitation within that year.

The base data collected at gaging stations consist of records of stage, measurements of discharge, and general information used to supplement the gage heights and discharge measurements in determining the daily flow. The records of stage are obtained either from direct readings on a staff gage or from a water-stage recorder that gives a continuous record of the fluctuations. Measurements of discharge are made with a current meter by the general methods outlined in standard textbooks on the measurement of river discharge. (See Pls. I and II.)

From the discharge measurements rating tables are prepared that give the discharge for any stage. The application of the daily gage heights to these rating tables gives the daily discharge from which the monthly and yearly mean discharge are computed.

The data presented for each gaging station in the area covered by this report comprise a description of the station, a table giving results of discharge measurements, a table showing the daily discharge, and a table of monthly and yearly discharge and run-off.

If the base data are insufficient to determine the daily discharge, tables giving daily gage heights and results of discharge measurements are published.

The description of the station gives, in addition to statements regarding location and equipment, information in regard to any conditions that may affect the permanence of the stage-discharge relation, covering such subjects as the occurrence of ice, the use of the stream for log driving, shifting of channel, and the cause and effect of backwater. It gives also information as to diversions that decrease the flow at the gage, artificial regulation, maximum and minimum recorded stages and the accuracy of the records.

The table of daily discharge gives the discharge in second-feet corresponding to the mean of the gage heights read each day. At

stations on streams subject to sudden or rapid diurnal fluctuation the discharge obtained from the rating table and the mean daily gage heights may not be the true mean discharge for the day. If such stations are equipped with water-stage recorders, the mean daily discharge may be obtained by weighting discharge for parts of the day or by use of the discharge integrator, an instrument operating on the principle of the planimeter and containing as an essential element the rating curve of the station.

In the table of monthly discharge the column headed "Maximum" gives the mean flow 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 that given in the column. Likewise, in the column headed "Minimum," the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" gives the average flow in cubic feet for each second during the month. On this average flow computations recorded in the remaining columns, which are defined on pages 2 and 3, are based.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends, primarily, (1) on the permanence of the stage-discharge relation and (2) on the accuracy of observations of stage, measurements of flow, and interpretation of records.

A paragraph in the description of the station or footnotes added to the tables gives information regarding the (1) permanence of the stage-discharge relation, (2) precision with which the discharge rating curve is defined, (3) refinement of gage readings, (4) frequency of gage readings, and (5) methods of applying daily gage heights to the rating table to obtain the daily discharge.

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," 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 monthly means for any station may represent with high accuracy the quantity of water flowing past the gage, but the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors caused by including large noncontributing districts in the measured drainage area, by lack of information concerning water diverted for irrigation or other use, or by inability to interpret the effect of artificial regulation of the flow of the river above the station. "Second-feet per square mile" and "run-off in inches" are therefore not computed if such errors appear

probable, and are also omitted for stations on streams draining areas in which the annual rainfall is less than 20 inches. All figures representing "second-feet per square mile" and "run-off in inches" previously published by the Survey should be used with caution because of possible inherent sources of error not known to the Survey.

Many gaging stations on streams in the irrigated sections of the United States are located above most of the diversions from those streams, and the discharge recorded does not show the water supply available for further development, as prior appropriations below the stations must first be satisfied. To give an idea of the amount of prior appropriations, a paragraph on diversions is presented in each station description. The figures given can not be considered exact but represent the best information available.

The table of monthly discharge gives only a general idea of the flow at the station and should not be used for other than preliminary estimates. The tables of daily discharge allow more detailed studies of the variation in flow. It should be borne in mind, however, that the observations in each succeeding year may be expected to throw new light on records previously published.

COOPERATION.

The work in Washington, Montana, and Idaho was carried on under cooperative agreements between the United States Geological Survey and the respective States.

Cooperation with the States is effected under contracts which are made between the Director of the United States Geological Survey and the State engineers or other officials and are authorized by legislative acts appropriating money.

The work in Washington was carried on in cooperation with the Board of Geological Survey, composed of Louis F. Hart, governor and chairman, of board; W. W. Sherman, State treasurer and secretary of board; Henry Suzzallo, president of the University of Washington; and E. O. Holland, president of the State College. The board was efficiently represented in the cooperative investigations by Henry Landes, State geologist.

Acknowledgments are due to A. W. Mahon, State engineer of Montana, and to J. H. Smith, State engineer, and W. G. Swendsen, commissioner of reclamation, Idaho, for the efficient manner in which they represented their States in the cooperative investigations.

Acknowledgments are also due to the United States Reclamation Service, the United States Forest Service, and the United States Office of Indian Affairs for assistance, suggestions, and the freest use of data gathered exclusively for them and paid for by them. The

United States Weather Bureau furnished hydrographic and climatologic data used in discharge computation for a number of streams.

The Straits Power Co. cooperated in maintaining the station on Soleduck River near Fairholm and Lyre River at Piedmont, Wash., and the city of Tacoma cooperated in maintaining the stations on North Fork of Skokomish River near Hoodport, Nisqually River near La Grande, East Creek near Elbe, and Tacoma power conduit near La Grande, Wash.

Acknowledgment is made in the description of gaging stations for gage-height records and discharge measurements furnished by cooperating parties.

DIVISION OF WORK.

Data for stations in Washington and Idaho were collected and prepared for publication under the direction of G. L. Parker, district engineer, assisted by Lasley Lee, D. J. Calkins, T. G. Bedford, R. B. Kilgore, John McCombs, and L. D. Carson.

Data for stations in Montana were collected and prepared for publication under the direction of W. A. Lamb, district engineer, assisted by A. H. Tuttle.

Data for stations in the Yakima River basin, exclusive of those in the Yakima Indian Reservation, were collected and results computed by Paul Taylor, engineer in charge of hydrometric work, United States Reclamation Service, assisted by F. E. Moxley and D. E. Ball.

The manuscript was assembled and reviewed by B. J. Peterson.

GAGING-STATION RECORDS.

QUINAULT RIVER BASIN.

QUINAULT RIVER AT QUINAULT LAKE, WASH.

LOCATION.—In sec. 25, T. 23 N., R. 10 W., at outlet of Quinault Lake, 4 miles southwest of Quinault and 33 miles north of Hoquiam, Grays Harbor County.

DRAINAGE AREA.—264 square miles (measured on Pl. I, U. S. Geol. Survey Prof. Paper 7).

RECORDS AVAILABLE.—October 29, 1911, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank 350 feet below Olympic Highway crossing at outlet of Quinault Lake; installed September 27, 1916, at different datum from previous gage; inspected by Fred Halbert. Previous gages as follows: Prior to January 1, 1913, staff gage on south shore of lake 3 miles northeast of present site; January 1, 1913, to September 30, 1916, staff-gage in long pool at mouth of Canoe Creek, 4 miles northeast of present site at datum 1.05 feet higher than datum of original gage. All readings prior to October 1, 1916, have been referred to datum of gage at mouth of Canoe Creek.

DISCHARGE MEASUREMENTS.—Made from cable 700 feet above gage.

CHANNEL AND CONTROL.—Bed composed of boulders. Well-defined control 600 feet below gage. Left bank high and wooded; not subject to overflow; right bank high, wooded, and subject to overflow at about gage height 20 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 12.1 feet at 4 a. m. December 14 (discharge, 23,800 second-feet); minimum stage from recorder, 0.90 foot October 2 (discharge, 425 second-feet.)

Maximum stage during year ending September 30, 1920, from water-stage recorder, 11.3 feet at 7 p. m. November 15 (discharge, 21,300 second-feet); minimum stage from recorder, 0.91 foot at 7 p. m. October 27 (discharge, 428 second-feet).

1911–1920: Maximum stage recorded, 16.3 feet at 8 a. m. January 6, 1914 (discharge, 32,500 second-feet); minimum stage recorded, 0.4 foot at 7 a. m. October 1, 1915 (discharge, 395 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSION.—None.

REGULATION.—Flow regulated by natural storage in the lake.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except as noted in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table the daily mean gage height obtained by inspecting gage-height graph or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent except for periods when recorder was not operating, for which they are poor.

Discharge measurements of Quinault River at Quinault Lake, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 1	D. J. F. Calkins.....	3.60	2,900	Apr. 20	R. B. Kilgore.....	2.28	1,310
2	.....do.....	3.49	2,780	21	.....do.....	2.24	1,260
Aug. 31	.....do.....	1.65	813	June 15	.....do.....	4.66	4,560
				16	.....do.....	4.39	4,120
				Aug. 19	H. W. Newton.....	1.18	522
				Sept. 22	R. B. Kilgore.....	5.67	6,540

Daily discharge, in second-feet, of Quinault River at Quinault Lake, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	432	3,660	1,810	2,310	3,100	2,710	2,990	3,060	4,890	2,500	1,750	766
2	425	3,360	3,120	2,050		3,970	2,850	2,990	3,130	2,500	1,690	745
3	428	3,660	7,610	1,930		4,130	2,820	2,850	3,060	2,370	1,580	721
4	439	3,730	20,800	1,750	2,500	3,660	3,730	2,640	3,060	2,780	1,580	721
5	626	3,280	15,200	1,640	2,310	3,280	4,050	2,440	3,200	2,920	1,470	739
6	895	2,850	9,750	1,580	2,120	2,990	3,660	2,240	3,280	2,990	1,470	727
7	920	2,500	7,190	1,470	1,990	2,780	3,200	2,240	3,130	2,850	1,470	715
8	855	2,240	5,610	1,420	2,500	2,570	2,780	2,310	2,920	2,710	1,470	691
9	780	2,310	4,720	1,360	8,300	2,310	2,640	2,310	2,920	2,710	1,470	680
10	831	6,430	4,210	1,360	9,360	2,240	3,580	2,310	2,850	2,920	1,420	663
11	2,860	7,150	4,130	1,340	7,360	2,650	4,050	2,310	2,710	2,920	1,250	652
12	4,890	5,610	4,210	1,360	5,610	2,640	3,730	2,380	2,570	2,920	1,240	727
13	3,660	5,610	13,600	1,470	4,550	2,440	3,280	2,310	2,570	2,710	1,160	745
14	2,710	6,950	21,400		3,970	2,240	2,900	2,180	2,710	2,710	1,070	721
15	2,120	6,750	13,900		3,730	2,120	2,570	2,570	2,710	2,990	1,030	709
16	1,750	6,170	8,800	8,000	3,890	2,050	2,380	3,130	2,640	3,200	1,030	685
17	1,470	5,070	6,360		4,150	3,280	3,100	3,280	2,500	3,170	1,070	680
18	1,260	4,210	5,070		3,730	5,250	5,170	3,060	2,440	2,920	1,090	658
19	1,140	3,580	4,130		3,280	4,590	6,170	3,130	2,570	2,710	1,070	636
20	1,040	3,130	3,730		2,920	3,660	6,750	3,130	2,920	2,640	1,040	625
21	980	2,790	3,360		2,570	3,060	5,980	3,200	2,920	2,710	1,020	600
22	946	2,380	3,060	10,500	2,380	2,640	4,890	3,430	2,990	2,710	1,010	580
23	1,020	2,240	2,720		2,240	2,380	4,130	3,430	3,360	2,640	972	571
24	1,140	2,050	2,440		2,120	2,180	3,730	3,200	3,430	2,500	938	558
25	1,220	1,930	2,240		2,380	1,990	3,500	3,920	3,360	2,380	904	544
26	1,630	1,870	2,240		2,640	1,870	3,280	6,360	3,280	2,180	895	535
27	8,640	1,810	2,120		2,640	1,750	3,200	7,360	3,280	2,050	887	523
28	12,900	1,750	2,640	5,200	2,640	1,690	3,200	6,750	3,060	1,930	855	511
29	8,580	1,750	3,060		.....	1,810	3,130	5,430	2,850	1,930	831	495
30	5,900	1,750	2,850		.....	2,120	3,060	4,550	2,640	1,930	808	511
31	4,380	.....	2,570		.....	2,920	.....	3,810	.....	1,870	780	.....
1919-20.												
1	636	691	1,810	4,210	5,980	871	1,690	1,470	1,930	1,930	680	739
2	697	1,260	1,690	3,660	4,720	831	1,580	1,420	1,870	1,930	668	691
3	691	1,310	1,580	3,280	3,890	831	1,520	1,360	1,870	1,870	646	652
4	652	1,520	1,470	2,920	3,360	904	1,520	1,310		1,810	636	625
5	610	1,580	1,420	2,640	2,990	904	1,870	1,310		1,690	625	600
6	575	1,580	1,310	2,310	3,360	887	1,990	1,260	3,000	1,640	620	576
7	558	1,580	1,250	2,180	4,210	871	1,910	1,360		1,520	620	558
8	540	1,520	1,190	2,050	3,810	920	1,830	1,580		1,470	615	540
9	527	1,360	1,140	1,870	3,280	1,200	1,750	1,750	4,890	1,420	615	544
10	515	1,310	1,070	1,750	2,920	1,360	1,680	1,750	4,130	1,420	605	652
11	507	1,220	998	1,690	2,640	1,520	1,600	1,640	3,660	1,360	600	2,700
12	495	1,150	946	1,640	2,380	1,940	1,520	1,580	3,200	1,310	595	6,750
13	492	1,310	895	1,520	2,180	6,010	1,580	1,470	2,920	1,260	590	7,150
14	484	2,340	871	1,640	1,990	7,360	1,520	1,470	3,660	1,210	580	8,900
15	478	15,700	855	1,930	1,870	5,610	1,420	1,420	4,720	1,140	576	8,000
16	470	19,600	929	2,440	1,750	4,130	1,420	1,420	4,210	1,120	562	6,550
17	456	14,000	3,230	5,370	1,640	3,200	1,360	1,810	3,810	1,110	548	5,070
18	453	8,800	5,070	13,100	1,520	2,640	1,310	2,050	3,500	1,080	535	4,050
19	446	7,360	5,790	13,000	1,470	2,310	1,310	1,930	3,130	1,030	527	3,430
20	439	5,610	8,260	8,350	1,420	2,120	1,360	1,810	2,850	998	523	4,240
21	432	5,250	11,300	5,900	1,310	2,180	1,310	1,750	2,640	946	511	6,170
22	439	4,720	9,970	4,380	1,260	2,240	1,260	1,690	2,570	904	507	6,550
23	439	4,050	13,700	3,500	1,180	2,310	1,230	1,750	2,380	863	507	5,790
24	453	3,580	16,400	3,130	1,120	2,180	1,170	1,750	2,180	839	507	4,890
25	456	3,130	13,100	3,360	1,050	2,180	1,150	1,690	2,050	808	511	4,050
26	450	2,710	9,020	3,504	980	2,050	1,160	1,580	1,930	780	499	3,500
27	436	2,380	7,570	3,880	946	1,930	1,310	1,640	1,870	752	531	3,810
28	453	2,240	6,170	10,600	912	1,750	1,470	1,690	1,870	733	652	3,580
29	460	2,050	5,070	9,840	895	1,690	1,520	1,930	1,870	727	766	3,130
30	460	1,930	5,070	8,670	.....	1,690	1,520	2,050	1,870	721	847	2,710
31	481	.....	4,720	7,580	.....	1,750	.....	1,990	.....	691	808	.....

NOTE.—Water-stage recorder did not operate satisfactorily during following periods: Jan. 14 to Feb. 3, 1919, discharge estimated from comparison with records of North Fork of Skokomish River; Feb. 27, 1919, and Apr. 7–11, 1920, discharge interpolated; and June 4–8, 1920, discharge estimated from range of stage shown by recorder and inspection of records of discharge of near-by streams. Braced figures show mean discharge for periods included.

Monthly discharge of Quinault River at Quinault Lake, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 264 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	12,900	425	2,480	9.39	10.83	152,000
November	7,150	1,750	3,620	13.7	15.29	215,000
December	21,400	1,810	6,280	23.8	27.44	386,000
January	.....	1,340	5,270	20.0	23.06	324,000
February	9,360	1,990	3,610	13.7	14.27	200,000
March	5,250	1,690	2,770	10.5	12.11	170,000
April	6,750	2,380	3,680	13.9	15.51	219,000
May	7,360	2,180	3,360	12.7	14.64	207,000
June	4,890	2,440	3,000	11.4	12.72	179,000
July	3,200	1,870	2,620	9.92	11.44	161,000
August	1,750	780	1,170	4.43	5.11	71,900
September	766	495	648	2.45	2.73	38,600
The year	21,400	425	3,210	12.2	165.15	2,320,000
1919–20.						
October	697	432	506	1.92	2.21	31,100
November	19,600	691	4,090	15.5	17.29	243,000
December	16,400	855	4,640	17.6	20.29	285,000
January	13,100	1,520	4,580	17.3	19.94	282,000
February	5,980	895	2,310	8.75	9.44	133,000
March	7,360	831	2,210	8.37	9.65	136,000
April	1,990	1,150	1,490	5.64	6.29	88,700
May	2,050	1,260	1,630	6.17	7.11	100,000
June	.....	1,870	2,890	10.9	12.16	172,000
July	1,930	691	1,200	4.55	5.25	73,800
August	847	499	600	2.27	2.62	36,900
September	8,900	540	3,570	13.5	15.06	212,000
The year	19,600	432	2,470	9.36	127.31	1,790,000

SOLEDUCK RIVER BASIN.

SOLEDUCK RIVER NEAR FAIRHOLM, WASH.

LOCATION.—In lot 4, sec. 35, T. 30 N., R. 10 W., 300 feet below South Fork and 7 miles southwest of Fairholm (on Lake Crescent), Clallam County.

DRAINAGE AREA.—79 square miles (measured on Pl. I, U. S. Geol. Survey Prof. Paper 7).

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by T. F. Rixon and William Stewart.

DISCHARGE MEASUREMENTS.—Made from cable 600 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of bedrock and boulders; not likely to shift. One channel at all stages. Banks high and wooded.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 10.4 feet at 2 a. m. December 4 (discharge, 15,300 second-feet); minimum stage, from reqorder, 0.48 foot October 2–3 (discharge, 58 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 8.8 feet at 10 a. m. November 15 (discharge, 11,400 second-feet); minimum stage, from recorder, 0.40 foot from 1 to 3 p. m. October 20 (discharge, 72 second-feet).

1918–1920: Maximum stage, from recorder, 11.7 feet at 6 a. m. December 18, 1917 (discharge, 18,600 second-feet); minimum discharge, 58 second-feet, September 29 and October 2–3, 1918.

ICE.—None.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation for low water changed on December 4, 1918. Rating curves well defined below 8,000 second-feet. Operation of water-stage recorder satisfactory except as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table the daily mean gage height determined by inspection of recorder graph, or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records fair during periods recorder was not operating; otherwise excellent.

Discharge measurements of Soleduck River near Fairholm, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Dec. 5	Rixon and Ahlvers	4.00	2,050	June 24	R. B. Kilgore	1.60	345
17	R. B. Kilgore	2.90	994	25	do	1.59	346
1919.				Sept. 27	do	2.42	746
May 19	L. D. Carson	2.46	736	27	do	2.34	705
20	do	2.41	731				
Sept. 5	D. J. F. Calkins	.86	141				
28	Rixon and Ahlvers	.55	87.3				

Daily discharge, in second-feet, of Soleduck River near Fairholm, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	59	753	680	516	717	514	622	767	622	548	334	145
2	58	732	1,900	485	693	971	622	717	646	576	326	139
3	58	759	6,590	463	599	717	767	622	646	622	334	139
4	60	655	8,310	441	576	622	1,220	553	693	669	326	143
5	90	537	2,180	415	521	553	906	512	717	693	326	139
6	91	466	1,440	390	481	530	717	498	646	717	330	141
7	92	420	1,070	373	450	498	622	539	576	622	326	136
8	92	410	936	365	1,850	450	539	599	599	599	307	126
9	81	803	848	353	4,040	411	600	599	622	693	279	120
10	95	3,850	848	382	1,980	480	1,260	558	571	717	275	118
11	97	1,360	848	365	1,260	669	936	622	553	693	289	147
12	98	899	1,120	365	968	516		622	558	567	282	210
13	100	1,920	8,910	398	820	450		539	622	576	259	145
14	101	2,000	5,020	503	767	407	560	571	669	622	243	130
15	101	1,240	2,000	622	767	386		820	622	742	243	125
16	101	967	1,300	2,050	1,200	365		820	622	693	246	119
17	101	814	1,000	4,860	1,070	1,030		693	567	584	259	116
18	103	706	936	4,740	820	1,080	1,440	669	599	512	249	114
19	104	706	820	1,860	767	742		772	717	516	232	114
20	106	580	767	1,140	622	622		717	742	548	219	111
21	111	522	693	1,140	571	539		767	646	553	211	111
22	132	475	646	4,380	539	498		848	732	530	200	104
23	196	438	599	5,050	494	481	960	717	1,040	498	182	102
24	377	420	567	1,980	459	459		669	876	472	173	99
25	258	379	530	1,810	535	428		1,330	767	441	178	99
6	1,520	429	508	1,660	503	394		1,470	742	390	173	99
7	6,100	401	576	1,220	459	382	750	1,440	717	378	166	92
8	2,540	452	912	1,440	445	402		1,000	646	402	160	94
9	1,050	420	717	1,220	.....	476		820	571	420	151	90
0	732	630	599	936	.....	659	742	742	553	394	147	114
1	680	.....	553	820	.....	742	.....	669	.....	361	147	.....

Daily discharge, in second-feet, of Soleduck River near Fairholm, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	153	500	314	646	887	190		326	373	390	120	111
2	125	356	282	599	742	185		307	402	353	116	102
3	105	228	262	548	669	185		296	463	338	113	93
4	96	538	252	512	622	192		289	526	330	109	93
5	92	260	234	472	576	185		272	517	282	108	89
6	88	214	225	441	921	175	300	296	718	275	107	87
7	84	190	211	407	820	178		398	717	296	105	86
8	83	155	192	386	669	214		490	848	286	99	84
9	83	143	178	357	576	275		432	717	286	98	86
10	83	162	173	341	544	231	282	345	622	269	98	119
11	82	158		322	508	219	275	296	622	246	96	2,010
12	83	141		311	472	612	357	266	526	237	95	1,140
13	84	407		293	445	2,400	390	266	503	228	92	1,350
14	82	1,150	150	467	415	1,030	334	259	693	222	91	1,520
15	81	6,960		535	394	669	314	259	742	216	89	1,070
16	81	3,240		799	365	535	300	301	576	214	88	906
17	81	1,570	2,220	3,290	349		272	854	544	203	88	669
18	79	968	921	4,040	334		266	499	517	187	88	646
19	76	1,000	959	1,860	318		330	365	463	170	87	526
20	75	742	2,300	1,040	307	500	311	345	441	164	86	846
21	81	1,000	1,730	794	286		286	390	459	155	86	1,180
22	88	717	1,260	669	269		275	353	441	149	84	1,020
23	91	669	3,980	599	252		259	402	373	149	84	794
24	84	646	4,100	622	237		252	365	349	147	86	669
25	82	535	1,820	782	228		256	326	357	143	87	571
26	79	463	1,440	622	219		296	314	326	136	86	521
27	79	420	1,400	1,510	206	400	394	353	349	132	187	717
28	93	407	968	3,430	197		428	390	377	130	192	530
29	106	369	848	1,620	190		415	411	390	128	310	454
30	91	345	876	1,620	.....		369	415	420	126	184	415
31	117	.....	742	1,140	.....		.....	377	.....	125	128	.....

NOTE.—Only total range in stage recorded Apr. 12-29, 1919; discharge estimated by comparison with record of North Fork of Skokomish River and study of weather records. Gage-height record faulty Dec. 11-16, 1919, and Mar. 17 to Apr. 9, 1920; discharge estimated from range in stage and comparison with records of near-by streams. Braced figures show mean discharge for periods included.

Monthly discharge of Soleduck River near Fairholm, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 79 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	6,100	58	499	6.32	7.29	30,700
November	3,850	379	838	10.6	11.83	49,900
December	8,910	508	1,760	22.3	25.71	108,000
January	5,050	353	1,380	17.5	20.18	84,800
February	4,040	445	890	11.3	11.77	49,400
March	1,080	365	564	7.14	8.23	34,700
April	.....	.....	893	11.3	12.61	53,100
May	1,470	498	751	9.51	10.96	46,200
June	1,040	553	663	8.39	9.36	39,500
July	742	361	560	7.09	8.17	34,400
August	334	147	244	3.09	3.56	15,000
September	210	90	123	1.56	1.74	7,320
The year	8,910	58	764	9.67	131.41	553,000
1919-20.						
October	153	75	89.9	1.14	1.31	5,530
November	6,960	141	822	10.4	11.60	48,900
December	4,100	.....	929	11.8	13.60	57,100
January	4,040	293	1,000	12.7	14.64	61,500
February	921	190	449	5.68	6.13	25,800
March	2,400	175	461	5.84	6.73	28,300
April	428	252	312	3.95	4.41	18,600
May	854	259	363	4.59	5.29	22,300
June	848	326	512	6.48	7.23	30,500
July	390	125	217	2.75	3.17	13,300
August	310	84	112	1.42	1.64	6,890
September	2,010	84	617	7.81	8.71	36,700
The year	6,960	75	490	6.20	84.46	355,000

LYRE RIVER BASIN.

LAKE CRESCENT AT PIEDMONT, WASH.

LOCATION.—In sec. 14, T. 30 N., R. 9 W., on dock at Log Cabin Hotel at Piedmont, Clallam County.

DRAINAGE AREA.—49.1 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 1, 1919, to September 30, 1920.

GAGE.—Vertical staff on dock; read by J. A. Martin.

EXTREMES OF STAGE.—Maximum stage recorded April to September, 1919, 3.18 feet April 21; minimum stage, 1.36 feet September 29.

Maximum stage recorded during year ending September 30, 1920, 3.24 feet January 31; minimum stage recorded, 1.30 feet October 26–29.

ACCURACY.—Gage read once daily to hundredths. Records excellent.

COOPERATION.—Gage-height record furnished by Northwestern Power & Manufacturing Co.

Daily gage height, in feet, of Lake Crescent at Piedmont, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1919.							1919.						
1	2.78	2.96	2.62	2.35	1.96	1.60	16	2.68	2.70	2.44	2.16	1.84	1.52
2	2.75	2.96	2.60	2.30	1.96	1.56	17	2.78	2.68	2.42	2.16	1.84	1.50
3	2.75	2.92	2.58	2.30	1.96	1.52	18	2.92	2.65	2.40	2.15	1.82	1.50
4	2.82	2.90	2.56	2.30	1.96	1.52	19	2.95	2.65	2.38	2.15	1.80	1.48
5	2.84	2.85	2.56	2.30	1.94	1.50	20	3.15	2.62	2.40	2.14	1.80	1.48
6	2.85	2.82	2.52	2.28	1.94	1.50	21	3.18	2.62	2.35	2.14	1.78	1.46
7	2.78	2.78	2.50	2.26	1.94	1.50	22	3.15	2.62	2.40	2.12	1.76	1.46
8	2.76	2.75	2.45	2.26	1.94	1.50	23	3.15	2.58	2.42	2.10	1.74	1.46
9	2.80	2.72	2.46	2.25	1.92	1.50	24	3.12	2.58	2.42	2.06	1.70	1.44
10	2.82	2.70	2.46	2.25	1.90	1.50	25	3.10	2.55	2.42	2.04	1.68	1.42
11	2.82	2.74	2.45	2.25	1.90	1.52	26	3.08	2.60	2.44	2.00	1.68	1.42
12	2.82	2.75	2.45	2.24	1.90	1.56	27	3.05	2.70	2.42	2.00	1.66	1.40
13	2.80	2.72	2.44	2.22	1.90	1.54	28	3.04	2.65	2.42	1.98	1.66	1.38
14	2.75	2.68	2.45	2.20	1.88	1.54	29	2.96	2.65	2.40	1.98	1.64	1.38
15	2.72	2.70	2.45	2.18	1.88	1.52	30	2.96	2.66	2.38	1.98	1.64	1.40
							31	.....	2.60	.....	1.96	1.62	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	1.44	1.40	2.10	2.78	3.22	2.40	2.32	2.00	2.06	2.02	1.92	1.92
2	1.46	1.40	2.08	2.78	3.20	2.36	2.30	2.00	2.04	2.00	1.94	1.90
3	1.46	1.40	2.02	2.78	3.20	2.34	2.28	1.98	2.02	2.00	1.96	1.86
4	1.46	1.42	1.98	2.76	3.18	2.30	2.28	1.98	2.02	1.98	1.96	1.84
5	1.44	1.44	1.94	2.74	3.18	2.28	2.26	1.96	2.00	1.96	1.96	1.80
6	1.44	1.44	1.90	2.72	3.16	2.24	2.26	1.96	2.04	1.94	1.96	1.80
7	1.44	1.46	1.88	2.68	3.20	2.24	2.24	1.96	2.04	1.90	1.96	1.78
8	1.42	1.48	1.86	2.60	3.16	2.26	2.22	1.94	2.06	1.90	1.94	1.78
9	1.42	1.50	1.84	2.56	3.10	2.26	2.22	1.94	2.10	1.90	1.94	1.78
10	1.40	1.50	1.82	2.52	3.06	3.00	2.20	1.94	2.14	1.88	1.92	1.80
11	1.40	1.48	1.80	2.50	3.03	3.06	2.20	1.94	2.14	1.88	1.92	1.82
12	1.38	1.48	1.78	2.48	2.98	3.10	2.18	1.94	2.14	1.88	1.90	2.08
13	1.38	1.46	1.76	2.46	2.94	3.12	2.18	1.92	2.14	1.86	1.90	2.18
14	1.38	1.50	1.74	2.44	2.90	3.14	2.16	1.92	2.16	1.86	1.90	2.28
15	1.38	2.00	1.74	2.46	2.86	3.08	2.14	1.92	2.16	1.86	1.88	2.30
16	1.38	2.05	1.76	2.50	2.84	3.02	2.12	1.92	2.14	1.84	1.84	2.34
17	1.36	2.08	1.98	2.50	2.78	2.56	2.10	1.98	2.12	1.84	1.82	2.34
18	1.36	2.16	2.08	2.84	2.74	2.52	2.10	2.02	2.12	1.84	1.80	2.34
19	1.36	2.18	2.14	3.00	2.70	2.50	2.08	2.04	2.10	1.84	1.78	2.34
20	1.36	2.20	2.20	3.00	2.68	2.48	2.08	2.04	2.10	1.84	1.78	2.36
21	1.36	2.24	2.24	2.98	2.64	2.46	2.08	2.06	2.08	1.84	1.76	2.40
22	1.34	2.24	2.30	2.94	2.60	2.44	2.06	2.08	2.08	1.84	1.76	2.42
23	1.34	2.20	2.50	2.92	2.60	2.44	2.06	2.08	2.08	1.86	1.76	2.42
24	1.32	2.16	2.70	2.90	2.58	2.42	2.06	2.08	2.06	1.88	1.74	2.44
25	1.32	2.12	2.76	2.90	2.58	2.42	2.04	2.04	2.06	1.88	1.74	2.44
26	1.30	2.10	3.00	2.90	2.54	2.40	2.04	2.02	2.04	1.88	1.74	2.44
27	1.30	2.08	3.00	2.90	2.52	2.40	2.02	2.00	2.04	1.88	1.76	2.42
28	1.30	2.08	3.00	3.10	2.50	2.38	2.02	2.02	2.04	1.90	1.80	2.40
29	1.30	2.08	2.98	3.16	2.46	2.36	2.02	2.06	2.02	1.90	1.94	2.40
30	1.34	2.10	2.98	3.20	.....	2.34	2.00	2.08	2.02	1.90	1.94	2.40
31	1.36	.....	2.96	3.24	.....	2.32	.....	2.06	.....	1.90	1.92	.....

LYRE RIVER AT PIEDMONT, WASH.

LOCATION.—In NE. ¼ sec. 15, T. 30 N., R. 9 W., a quarter of a mile below outlet of Crescent Lake and half a mile west of Piedmont, Clallam County.

DRAINAGE AREA.—49.5 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by T. F. Rixon, H. Ahlvers, and E. Brooks.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 1,000 feet above gage.

CHANNEL AND CONTROL.—Channel composed of bedrock and boulders. Banks medium high and wooded. Control formed by series of rapids over bedrock and by contracted channel between railroad bridge abutments; apparently permanent. Stage of zero flow, as determined September 4, 1919, gage height −0.4 foot ±0.25 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 7.0 feet at 11 p. m., December 14 (discharge, 692 second-feet); minimum stage, from recorder, 2.08 feet September 30 at 2 a. m. (discharge, 38 second-feet).

Maximum stage during year ending September 30, 1920, recorder, 4.8 feet from January 30 to February 2 (discharge, 320 second-feet); minimum stage, from recorder, 1.70 feet July 27 at 8.30 p. m. (discharge, 19 second-feet).

1918–1920: Maximum stage, from recorder, 5.91 feet at noon January 4, 1918 (discharge, 1,080 second-feet); minimum stage recorded July 27, 1920.

ICE.—None.

DIVERSIONS.—None.

REGULATION.—Flow is very uniform because of natural regulation in Lake Crescent.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder excellent except as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection. Records excellent.

Discharge measurements of Lyre River at Piedmont, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Dec. 7	Rixon and Ahlvers	5.83	463	May 18	L. D. Carson	4.42	275
16	R. B. Kilgore	6.92	657	21	do	4.35	260
16	do	6.92	643	Aug. 10	Rixon and Ahlvers	2.95	95.5
18	do	6.72	614	Sept. 4	D. J. F. Calkins	2.38	61.5
1919.				4	do	2.39	61.5
Jan. 27	Rixon and Ahlvers	6.84	700	16	Rixon and Ahlvers	2.34	59.3
Feb. 12	R. B. Kilgore	6.42	597	1920.			
15	do	6.24	561	Feb. 11	Lasley Lee	4.55	283
17	do	6.16	544	June 23	R. B. Kilgore	3.30	132
Mar. 26	do	4.85	328	26	do	3.23	125
28	do	4.79	313	Sept. 28	do	3.18	125

Daily discharge, in second-feet, of Lyre River at Piedmont, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	57	207	239	394	580	426	299	320	258	207	124	61
2	66	213	278	386	562	426	292	320	252	201	122	59
3	73	213	349	372	544	410	292	313	252	201	120	59
4	80	207	476	364	527	410	306	306	246	201	117	59
5	103	201	493	356	510	410	306	299	246	201	115	59
6	106	201	493	342	493	402	299	292	239	201	112	59
7	106	195	476	327	476	394	299	292	239	195	109	58
8	103	189	476	320	493	394	292	285	232	195	106	57
9	105	207	476	306	562	379	292	285	232	189	103	55
10	121	265	459	306	598	379	299	278	232	189	100	54
11	150	272	442	292	598	386	306	278	232	189	99	59
12	155	278	442	292	580	379	299	278	226	189	98	62
13	150	285	527	278	580	372	299	278	226	183	95	59
14	144	313	673	278	580	364	292	272	226	177	92	59
15	142	313	692	299	544	364	285	272	226	177	91	58
16	139	313	673	313	544	364	285	272	226	177	89	56
17	135	306	654	364	544	372	292	272	226	172	87	57
18	133	292	635	442	527	386	313	265	220	166	84	57
19	131	292	616	459	510	379	327	265	213	166	83	56
20	130	278	598	459	510	372	349	265	213	166	80	53
21	128	272	580		493	364	349	258	213	160	80	51
22	129	265	562		476	356	349	258	220	155	68	50
23	136	258	527		476	349	349	252	226	155	73	48
24	144	252	510	560	459	342	342	252	226	150	73	46
25	144	246	493		442	334	342	258	226	150	72	47
26	155	246	476		442	327	334	265	226	141	69	45
27	183	246	459	654	426	320	334	265	226	137	68	41
28	201	239	459	654	426	320	327	265	220	135	67	40
29	201	232	442	635	.....	306	327	265	213	133	66	39
30	201	239	426	616	.....	306	320	265	207	130	65	43
31	201	.....	410	598	.....	299	.....	265	.....	126	64	.....
1919-20.												
1	50	36	136	278	320	183	186	128	134	75	37	66
2	51	37	131	272	320	183	184	126	133	75	38	63
3	50	38	128	265	313	177	182	124	132	95	37	63
4	48	44	122	258	306	177	179	124	132	121	43	62
5	48	44	118	252	299	172	177	121	133	118	55	60
6	47	46	115	246	306	166	175	119	141	116	54	59
7	46	47	110	239	313	166	172	118	144	113	54	58
8	44	46	106	232	306	166	170	118	155	112	53	57
9	40	47	100	226	299	172	168	118	155	109	53	58
10	41	45	96	220	292	172	166	117	150	103	53	57
11	41	44	93	213	285	166	160	115	155	99	52	70
12	38	43	90	213	278	177	166	113	150	100	52	84
13	37	47	87	207	272	207	160	113	150	91	60	96
14	37	57	84	207	265	220	160	111	150	80	64	107
15	37	113	83	207	265	220	160	110	155	75	62	111
16	36	142	89	213	258	213	155	112	150	54	61	114
17	35	155	121	226	252	213	155	130	150	42	56	114
18	34	160	133	272	246	213	150	130	150	42	53	117
19	33	166	139	285	239	207	155	128	144	40	52	117
20	33	166	160	285	232	207	155	129	144	40	52	120
21	34	172	172	278	232	207	150	135	140	38	52	121
22	32	166	177	278	226	201	150	133	136	34	52	123
23	30	166	220	272	226	201	144	137	133	30	52	124
24	28	166	265	272	220	201	141	137	132	27	52	126
25	28	160	278	278	213	201	137	135	129	26	51	123
26	29	150	285	272	207	201	134	132	118	24	51	122
27	30	144	292	278	201	198	133	133	112	22	56	123
28	30	144	285	299	189	196	134	141	98	21	58	122
29	30	141	285	313	189	193	132	143	82	21	68	122
30	32	138	285	320	.....	191	130	141	76	21	68	120
31	30	.....	278	320	.....	189	.....	135	.....	24	67	.....

NOTE.—No gage-height record Jan. 21–26, 1919; discharge estimated from precipitation record and range of stage. Gage-height record incomplete Aug. 6–10, 1919, and Mar. 27 to Apr. 9, 1920; discharge interpolated. Bra ed figures show mean discharge for periods included.

Monthly discharge of Lyre River at Piedmont, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 49.5 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	201	57	134	2.71	3.12	8,240
November	313	189	251	5.07	5.66	14,900
December	692	239	500	10.1	11.64	30,700
January	.....	278	434	8.77	10.11	26,700
February	598	426	518	10.5	10.93	28,800
March	426	299	367	7.41	8.54	22,600
April	349	285	313	6.32	7.05	18,600
May	320	252	277	5.60	6.46	17,000
June	258	207	229	4.63	5.17	13,600
July	207	126	171	3.45	3.98	10,500
August	124	64	90.0	1.82	2.10	5,530
September	62	39	53.5	1.08	1.20	3,180
The year	692	39	277	5.60	75.96	200,000
1919-20.						
October	51	28	37.4	.756	.87	2,300
November	172	36	102	2.06	2.30	6,070
December	292	83	163	3.29	3.79	10,000
January	320	207	258	5.21	6.01	15,900
February	320	189	261	5.27	5.68	15,000
March	220	166	192	3.88	4.47	11,800
April	186	130	157	3.17	3.54	9,340
May	143	110	126	2.55	2.94	7,750
June	155	76	135	2.73	3.05	8,080
July	121	21	64.1	1.29	1.49	3,940
August	68	37	53.8	1.09	1.26	3,310
September	126	57	96.0	1.94	2.16	5,710
The year	320	21	137	2.77	37.56	99,200

ELWHA RIVER BASIN.

ELWHA RIVER AT McDONALD BRIDGE, NEAR PORT ANGELES, WASH.

LOCATION.—In NE. ¼ NW. ¼ sec. 33, T. 30 N., R. 7 W., at McDonald Bridge, 6½ miles above mouth and 8 miles southwest of Port Angeles, Clallam County.

DRAINAGE AREA.—262 square miles (measured on Plate I, U. S. Geol. Survey Prof. Paper 7).

RECORDS AVAILABLE.—October 8, 1897, to December 31, 1901; October 1, 1918, to September 30, 1920.

GAGE.—Since October 17, 1918, Stevens continuous water-stage recorder on left bank; inspected by A. L. Lofstrand, Roy Clark, and A. C. Wingo. Gage datum 206.29 feet above mean sea level. A wire gage on bridge at same site, but different datum, was used 1897–1901.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Bed composed of gravel, shifting; banks high.

EXTREMES OF DISCHARGE.—Maximum discharge during year ending September 30, 1919, 11,000 second-feet on December 13, 1918, by percentage comparison with Soleduck River and hydrographic comparison with other streams in vicinity and may be considerably in error; minimum stage from water-stage recorder, 0.61 foot midnight September 29 (discharge, 440 second-feet).

Maximum stage during year ending September 30, 1920, from water-stage recorder, 6.7 feet November 15 (discharge, 6,500 second-feet); minimum mean daily discharge estimated at 250 second-feet on December 16 during period in which water-stage recorder was not operating.

1897–1901; 1918–1920: Maximum stage recorded, 10.6 feet November 27, 1901, referred to datum of wire gage (discharge, 23,800 second-feet); minimum stage recorded, 0.80 foot October 18, 1897 (discharge, 170 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water on January 23 and May 26, 1919, and January 18, 1920. Rating curves well defined up to 5,000 second-feet. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspection of recorder graph, or for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter periods. Discharge during periods when recorder was not operating estimated by comparison with records of flow of near-by streams or by interpolation. Records good except those estimated by hydrographic comparison, which are poor.

COOPERATION.—Gage-height record and some discharge measurements furnished by Northwestern Power & Manufacturing Co.

Discharge measurements of Elwha River at McDonald Bridge, near Port Angeles, Wash., during the period July 31, 1918, to Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
July 31	Parker and Reineking	1.11	832	July 14	A. L. Lofstrand	2.92	2,560
Aug. 12	V. H. Reineking	.92	650	Sept. 3	Calkins and Clark	1.18	785
27	Parker and Reineking	.77	526	7	do	1.11	709
Sept. 16	Reineking and McNamara	.65	477	29	Clark and Brandt	.60	429
23	do	.48	346	Oct. 18	do	.30	344
24	do	.45	328	Dec. 29	Clark and Wingo	2.42	1,950
30	Kilgore and Reineking	.60	475	1920.			
Dec. 14	do	5.03	6,660	Jan. 26	A. L. Lofstrand	1.56	1,280
19	R. B. Kilgore	2.22	2,050	Feb. 10	Lee and Lofstrand	1.70	1,370
1919.				Mar. 7	Lofstrand and Clark	.70	621
Feb. 11	do	3.05	2,910	Apr. 11	A. L. Lofstrand	.70	650
Mar. 25	do	1.15	891	June 9	do	1.91	1,680
Apr. 7	A. L. Lofstrand	1.58	1,210	22	R. B. Kilgore	1.92	1,600
May 7	do	1.96	1,580	26	do	1.44	1,150
17	Carson and Clark	2.10	1,710	Aug. 22	A. L. Lofstrand	.72	651
21	L. D. Carson	2.56	2,230	Sept. 26	R. B. Kilgore	1.34	1,100

Daily discharge, in second-feet, of Elwha River at McDonald Bridge, near Port Angeles, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1				870	1,780	1,040	1,230	2,100	2,050	2,230	1,600	871
2				800	1,670	1,280	1,230	2,050	2,170	2,290		810
3				748	1,570	1,100	1,320	1,880	2,230	2,420	1,600	773
4				707	1,520	1,040	1,940	1,780	2,290		1,590	788
5			5,600	674	1,370	988	1,670	1,670	2,500	2,600	1,580	766
6				626	1,320	973	1,420	1,620	2,360		1,570	745
7				594	1,230	931	1,240	1,670	2,150	2,360	1,560	717
8				578	2,440	903	1,140	1,830	2,170	2,360	1,550	
9				555	5,430	861	1,180	1,780	2,230	2,550	1,500	
10			1,600	602	3,850	889	1,720	1,720	2,050	2,820	1,450	
												750
11			1,480	563	2,940	1,000	1,470	1,720	1,990	2,820	1,550	
12			1,600	548	2,460	889	1,320	1,570		2,550	1,500	
13			11,000	570	2,160	861	1,230	1,470		2,550		
14			6,660	706	2,000	819	1,100	1,570		2,620		684
15			5,740	998	1,780	805	1,050	2,000	2,100			704
16	1,300	1,600	4,820	1,740	2,000	784	1,060	1,940			1,300	685
17			3,890	4,260	1,880	1,480	1,830	1,720				666
18			2,970	5,880	1,670	1,040	2,810	1,720				647
19			2,050	3,560	1,570	1,230	2,880	2,000		2,400		628
20			1,900	2,690	1,470	1,100	2,880	2,100	2,300			609
21			1,600	2,480	1,370	1,000	2,340	2,260				591
22			1,430	4,940	1,280	959	2,050	2,600				572
23			1,290	6,070	1,180	938	1,940	2,400	2,820		1,100	553
24			1,160	4,040	1,140	910	1,940	2,220	2,750			534
25			1,070	3,440	1,180	875	1,940	3,100	2,680			515
26			1,010	3,250	1,140	861	1,880	3,550	2,750			497
27			1,110	2,740	1,060	847	2,100	2,820	2,820	1,800	1,020	478
28			1,580	2,600	1,040	861	2,220	3,100	2,620		999	459
29			1,280	2,400	.....	917	2,160	2,680	2,420		978	440
30			1,050	2,160	.....	1,180	2,100	2,360	2,230		956	476
31		.....	934	1,940	.....	1,320	.....	2,170	.....		935	.....
1919–20.												
1	558		542	1,450	2,340	667	705	777	809	1,880	789	587
2	485		519	1,300	2,040	651	705	770	885	1,760	783	591
3	453		496	1,190	1,880	641	683	757	1,020	1,710	777	587
4	446		473	1,090	1,760	651	667	757	1,350	1,660	739	591
5	439		450	1,010	1,660	636	663	751	1,400	1,450	764	587
6	433	450	427	919	2,160	632	660	815	1,660	1,400	777	567
7	426		404	848	1,930	632	656	1,000	1,880	1,450	783	552
8	419		380	788	1,660	651	652	1,350	2,040	1,550	770	548
9	412		357	745	1,500	683	648	1,300	1,710	1,550	789	548
10	406		384	690	1,440	646	645	1,080	1,550	1,500	815	618
11	399	321	311	671	1,350	641	641	960	1,550	1,400	796	2,860
12	392	319	288	639	1,260	795	699	900	1,400	1,350	764	2,040
13	385	321		621	1,160	2,540	699	930	1,400	1,300	770	2,340
14	378			832	1,120	1,660	677	922	2,120	1,210	764	2,920
15	372			855	1,080	1,210	667	945	2,230	1,260	734	2,220
16	365		1,000	1,000	1,020	1,030	651	1,040	1,710	1,350	693	1,930
17	358			2,510	992	930	632	1,910	1,660	1,300	657	1,450
18	344			3,920	959	864	632	1,300	1,660	1,210	609	1,300
19	344	2,400		2,920	926	822	677	1,080	1,500	1,120	600	1,080
20	344			2,100	892	908	667	1,040	1,550	1,040	609	1,960
21	344			1,760	859	1,030	641	1,030	1,660	992	636	2,220
22	344			1,550	826	945	632	938	1,660	968	662	1,820
23	344		3,200	1,350	793	871	627	908	1,400	885	667	1,550
24	326	903		1,350	759	841	623	857	1,300	815	641	1,350
25	326	724		1,550	726	811	636	815	1,210	777	604	1,210
26	330	658		1,350	693	782	683	796	1,160	809	591	1,080
27	321	635	2,820	2,020	688	752	836	809	1,350	829	939	1,530
28	342	612	2,000	5,660	672	722	922	836	1,600	871	783	1,160
29	335	589	1,930	3,670	672	693	908	836	1,710	915	770	1,080
30	323	566	1,880	3,290	.....	739	836	809	1,980	850	636	1,040
31	325	.....	1,660	2,840	.....	710	.....	789	.....	796	595	.....

NOTE.—Discharge Oct. 1 to Dec. 9 and Dec. 13, 1918, June 5, 7, 12–22, July 4–6, 15–31, Aug. 1, 2, 13–26, Sept. 8–13, Oct. 31, Nov. 1–10, 14–23, Dec. 13–26, and 28, 1919, estimated by hydrographic comparison with records of flow of near-by streams and may be subject to considerable error. Discharge Dec. 14 and 19, 1918, are results of current-meter measurements. Discharge obtained by interpolation Dec. 15–18, 1918, June 29, Aug. 4–7, 9, 28–30, Sept. 16–28, Oct. 4–16 and 19–22, 1919, Feb. 18–25, Mar. 24–27, and Apr. 5–10, 1920. Braced figures show mean discharge for periods included.

Monthly discharge of Elwha River at McDonald Bridge, near Port Angeles, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 262 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches	Acre-feet.
1918–1919.						
October	.....	.....	1,300	4.96	5.72	79,900
November	.....	.....	1,600	6.11	6.82	95,200
December	11,000	.....	3,470	13.2	15.22	213,000
January	6,070	548	2,080	7.94	9.15	128,000
February	5,430	1,040	1,840	7.02	7.31	102,000
March	1,480	784	990	3.78	4.36	60,900
April	2,880	1,050	1,750	6.68	7.45	104,000
May	3,550	1,470	2,100	8.02	9.25	129,000
June	2,820	.....	2,310	8.82	9.84	137,000
July	.....	.....	2,300	8.78	10.12	141,000
August	.....	935	1,300	4.96	5.72	79,000
September	871	440	657	2.51	2.80	39,100
The year	11,000	440	1,810	6.91	93.76	1,310,000
1919–20.						
October	558	321	381	1.45	1.67	23,400
November	[a] 6,500	319	1,140	4.35	4.85	67,800
December	[a] 4,200	[b] 250	1,440	5.50	6.34	88,500
January	5,660	621	1,690	6.45	7.44	104,000
February	2,340	672	1,230	4.69	5.06	70,800
March	2,540	632	864	3.30	3.80	53,100
April	922	623	689	2.63	2.93	41,000
May	1,910	751	962	3.67	4.23	59,200
June	2,230	809	1,340	5.88	6.56	91,600
July	1,880	777	1,220	4.66	5.37	75,000
August	939	591	720	2.75	3.17	44,300
September	2,920	548	1,330	5.08	5.67	79,100
The year	[a] 6,500	[b] 250	1,100	4.20	57.09	798,000

[a] Crest discharge determined from stage indicated by water-stage recorder, although clock had stopped. Mean discharge for day on which peak occurred determined by comparison of mean discharge to peak discharge on same day of Soleduck River near Fairholm and North Fork of Skokomish River near Hoodsport.

[b] Estimated by hydrographic comparison with records of flow of Soleduck River near Fairholm and North Fork of Skokomish River near Hoodsport, study of weather records, and observer's gage reading four days previous during same period of extremely cold weather.

PUGET SOUND BASINS.

SKOKOMISH RIVER BASIN.

NORTH FORK OF SKOKOMISH RIVER NEAR HOODSPORT, WASH.

LOCATION.—In SW. ¼ sec. 5, T. 22 N., R. 4 W., at footbridge on Forest Service trail to South Fork of Skokomish River, 4 miles below Lake Cushman and 4 miles northwest of Hoodsport, Mason County.

DRAINAGE AREA.—91 square miles (measured on Plate 1, U. S. Geol. Survey Prof. Paper 7 and township plats).

RECORDS AVAILABLE.—August 17, 1910, to September 22, 1911; February 1, 1913, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank just below trail bridge; inspected by Phillip Abbey. Fragmentary records, 1910–11, obtained from vertical staff 25 feet below bridge.

DISCHARGE MEASUREMENTS.—Made from cable about a mile above gage or by wading.

CHANNEL AND CONTROL.—Channel curved above gage, straight below gage for 200 feet. Banks high, not subject to overflow. Control composed of rock and gravel, slightly shifting at extremely high stages.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 12.8 feet at 11 a. m., December 4 (discharge, 7,530 second-feet); minimum stage, from recorder, 0.78 foot October 3 (discharge, 90 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 11.7 feet at noon December 24 (discharge, 6,380 second-feet); minimum stage, from recorder, 0.75 foot for several hours October 21 and 22 (discharge, 110 second-feet).

1913–1920: Maximum stage estimated at 23.5 feet January 6, 1914, during part of day when recorder was not operating (discharge, about 14,000 second-feet); minimum stage recorded 0.77 foot September 28, 1918 (discharge, 89 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—Flow regulated by natural storage at Lake Cushman.

ACCURACY.—Stage-discharge relation affected by backwater resulting from drift October 1–11, 1918. Rating curve for this period poorly defined. Rating curve used October 12, 1918, to September 30, 1920, well defined. Operation of water-stage recorder excellent except as noted in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table the mean daily gage height determined from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records for October 1–11, 1918, fair, for remainder of the two-year period excellent.

Discharge measurements of North Fork of Skokomish River near Hoodsport, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Dis. charge.	Date.	Made by—	Gage height.	Dis. charge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 3	N. L. Taylor	0.78	89.9	June 1	Parker and Evans	2.02	361
1919.				15	do	4.66	1,250
Apr. 27	G. L. Parker	4.03	998	Aug. 16	H. W. Newton	.98	142
May 16	L. D. Carson	4.10	1,050	Sept. 24	R. B. Kilgore	3.54	837
23	do	4.05	997				
July 6	Lee and Carson	3.55	870				
Sept. 2	D. J. F. Calkins	1.26	193				
8	do	1.22	178				

Daily discharge, in second-feet, of North Fork of Skokomish River near Hoodsport, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	93	568	453	614	946	646	964	1,040	836	679	426	199
2	93	568	915	553	857	782	872	1,000	836	696	399	195
3	92	931	2,410	524	782	800	908	946	872	765	386	192
4	99	983	6,150	495	765	765	1,410	818	946	854	373	186
5	380	765	3,190	481	696	679	1,280	747	1,080	890	360	190
6	444	614	2,280	453	646	630	1,040	696	1,000	836	360	201
7	306	524	1,670	439	598	583	854	730	908	730	360	199
8	225	481	1,320	426	1,230	568	765	800	854	696	360	189
9	187	601	1,200	412	4,850	524	730	818	836	765	345	182
10	199	2,310	1,080	426	3,210	538	1,000	782	800	854	335	177
11	409	1,960	1,040	453	2,020	713	1,080	782	730	872	325	173
12	836	1,200	1,040	481	1,520	679	908	747	696	765	323	190
13	505	1,230	3,570	538	1,200	598	800	662	800	696	311	195
14	348	1,770	5,500	614	1,160	553	696	646	854	730	297	182
15	271	1,870	2,770	890	1,200	534	646	779	800	836	289	175
16	240	1,520	1,820	1,210	1,240	510	614	1,000	730	890	289	168
17	213	1,160	1,370	2,760	1,320	790	918	908	679	818	292	166
18	190	964	1,160	5,080	1,120	1,280	1,920	800	696	679	294	164
19	177	872	1,040	2,970	964	1,000	1,980	782	836	614	285	161
20	169	818	1,040	1,820	854	800	2,040	800	946	630	273	157
21	159	730	946	1,520	765	696	1,620	927	890	662	266	152
22	159	662	872	3,430	713	646	1,240	1,120	902	662	264	149
23	173	614	763	5,410	662	630	1,080	1,000	1,040	614	253	145
24	190	568	696	3,260	614	598	1,080	872	1,000	583	242	142
25	199	524	662	2,280	662	568	1,040	1,210	946	538	236	141
26	248	524	614	2,040	713	538	989	1,920	927	510	234	137
27	2,400	495	598	1,620	679	524	1,000	2,040	946	467	229	136
28	2,850	467	810	1,420	662	538	1,080	1,620	854	467	217	133
29	1,360	439	890	1,370	.....	583	1,080	1,280	765	481	211	130
30	854	453	747	1,240	.....	789	1,040	1,040	696	467	209	134
31	662	.....	679	1,080	.....	1,120	.....	908	.....	439	201	.....
1919-20.												
1	217	156	373	1,000	1,280	273	360	373	373	399	168	213
2	232	251	348	908	1,040	266	350	348	373	386	168	186
3	197	236	330	818	890	264	325	328	386	373	168	173
4	175	234	316	747	800	287	328	311	426	355	162	157
5	161	240	309	679	730	278	373	309	453	340	161	149
6	147	266	297	646	828	266	373	323	604	323	159	144
7	142	264	287	598	1,000	260	386	360	1,120	309	159	139
8	136	240	277	583	872	299	373	481	1,320	301	157	133
9	133	221	267	569	747		355	495	1,080	299	157	133
10	130	207	257	554	662		340	439	854	294	152	159
11	125	203	247	540	614		330	399	730	282	150	926
12	124	203	237	525	568		348	352	630	282	149	1,810
13	121	230	227	510	538		386	335	598	289	147	2,460
14	120	612	217	496	495		360	330	1,240	276	145	3,220
15	118	4,790	217	481	481	800	348	325	1,370	262	145	1,740
16	117	3,860	227	481	453		333	335	964	257	142	1,240
17	116	2,380	908	826	439		311	467	836	253	134	908
18	116	1,470	1,250		412		297	481	747	244	133	730
19	114	1,470	1,770		399		297	412	646	236	131	630
20	114	1,080	3,210		386		301	373	583	225	130	985
21	113	927	3,560	1,500	360	620	289	360	553	221	128	1,370
22	111	818	3,010		352	696	282	342	538	223	127	1,200
23	114	696	4,980		342	614	271	345	495	215	127	1,000
24	116	614	5,500		330	553	249	335	453	205	124	872
25	116	553	3,380	713	318	510	257	316	426	197	124	765
26	114	495	2,040	713	309	467	285	306	412	195	124	679
27	113	453	1,670	984	299	439	360	311	412	190	156	713
28	111	426	1,320	3,190	287	412	439	330	399	186	221	662
29	114	412	1,160	2,160	280	386	426	360	399	184	309	583
30	116	386	1,240	1,920	.....	386	399	373	399	182	325	538
31	121	.....	1,160	1,720	.....	373	.....	373	.....	175	260	.....

NOTE.—No gage-height record Dec. 8–13, 1919, stilling well frozen over; discharge interpolated. Recorder not operating Jan. 8–14, 1920; discharge interpolated. Recorder not operating Jan. 18–24 and Mar. 9–20, 1920; discharge estimated by hydrographic comparison with records of flow of near-by streams. Braced figures show mean discharge for periods included.

Monthly discharge of North Fork of Skokomish River near Hoodsport, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 91 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	2,850	92	475	5.22	6.02	29,200
November	2,310	439	906	9.96	11.11	53,900
December	6,150	453	1,590	17.5	20.18	97,800
January	5,410	412	1,490	16.4	18.91	91,600
February	4,850	598	1,170	12.9	13.43	65,000
March	1,280	510	684	7.52	8.67	42,100
April	2,040	614	1,090	12.0	13.39	64,900
May	2,040	646	975	10.7	12.34	60,000
June	1,080	679	857	9.42	10.51	51,000
July	890	439	683	7.51	8.66	42,000
August	426	201	298	3.27	3.77	18,300
September	201	130	168	1.85	2.06	10,000
The year	6,150	92	864	9.49	129.05	626,000
1919–20.						
October	232	111	133	1.46	1.68	8,180
November	4,790	156	812	8.92	9.95	48,300
December	5,500	217	1,310	14.4	16.60	80,600
January		481	1,060	11.6	13.37	65,200
February	1,280	280	569	6.25	6.74	32,700
March		260	556	6.11	7.04	34,200
April	439	249	338	3.71	4.14	20,100
May	495	306	365	4.01	4.62	22,400
June	1,370	373	661	7.26	8.10	39,300
July	399	175	263	2.89	3.33	16,200
August	325	124	163	1.79	2.06	10,000
September	3,220	133	821	9.02	10.06	48,900
The year	5,500	111	587	6.45	87.69	426,000

NISQUALLY RIVER BASIN.

NISQUALLY RIVER NEAR LA GRANDE, WASH.

LOCATION.—In sec. 9, T. 15 N., R. 4 E., 1,200 feet below diversion dam of city of Tacoma municipal power plant and 2½ miles southeast of La Grande, Pierce County.

DRAINAGE AREA.—287 square miles (measured on topographic map of Rainier National Park, map of Rainier National Forest, edition of 1918, and Plate IV, Water-Supply Paper 313).

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1920; September 5, 1906, to October 31, 1911, fragmentary records showing total flow.

GAGE.—Stevens long-distance recorder on left bank 1,200 feet below dam, inspected by headgate attendants. Previous gages as follows: From September 5, 1906, to September 8, 1910, vertical staff in two sections on right bank near site of present gage; January 1, 1910, to December 31, 1911, vertical staff on right wall of canyon at power-house site.

DISCHARGE MEASUREMENTS.—Made from cable 250 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of bedrock and boulders. Banks high. A considerable amount of glacial silt is deposited during summer, causing control to change temporarily.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1920, occurred December 24 (discharge, 11,000 second-feet, determined from recorded head on dam and coefficient of discharge derived from current-meter measurement made with slightly higher head on dam). Probably no flow at gage for parts of several days from October to March when entire flow was diverted into power conduit.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—City of Tacoma diverts water 1,200 feet above gage for power purposes. Total monthly discharge is computed from determinations of combined flow of river and power conduit.

ACCURACY.—Stage-discharge relation affected by silt deposited in river as result of flushing of the settling basin of conduit from July 4 to September 30. Rating curve for normal control conditions well defined. Rating curves parallel to standard curve used for short periods from July 4 to September 21. Shifting-control method used September 22–30. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by use of discharge integrator except for extremely low water in August and September for which daily discharge was ascertained by applying to rating table mean daily gage height determined from the recorder graph by inspection. Records prior to July, excellent for periods when recorder was operating; fair for remainder of year.

Discharge measurements of Nisqually River near La Grande, Wash., for the period Aug. 25, 1919, to Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Aug. 25	Calkins and Raiter.....	3.60	468	Apr. 6	R. B. Kilgore.....	5.34	1,410
1920.				May 28	.....do.....	2.86	277
Feb. 11	Parker and Evans.....	1.70	73.6	Aug. 7	H. W. Newton.....	2.28	95.1
12	McCombs and Evans...	3.02	315	8	.....do.....	4.17	570
12	.....do.....	2.12	126	9	.....do.....	2.94	224
Mar. 15	.....do.....	5.18	1,320	Sept. 15	.....do.....	5.04	1,110

Daily discharge, in second-feet, of Nisqually River near La Grande, Wash., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1							273			851	194	11
2							300			822	134	12
3					1,450		219		660	776	160	13
4				450			1,200	630		726	154	16
5							2,310			614	201	11
6	100	640	120		1,080	5	1,540		979	434	234	12
7					1,220		1,380		1,000	498	213	17
8					1,110		1,130	1,500	1,250	587	418	15
9							936	1,700	1,040	606	258	10
10				100			742	1,380	848	556	241	6
11					550		732	1,050	792	509	238	218
12						131	650	938	778	304	232	1,050
13				100		2,270	1,100	886	690	295	288	936
14				92		2,780	884	802	1,170	394	276	2,280
15				188		1,410	796	772	1,480	374	272	1,260
16	190	810	270	927		916	628	790	1,140	466	187	760
17				2,640		656	540	1,300	1,100	469	163	468
18				2,550		458		1,540	944	544	17	363
19				2,700		400		1,220	800	386	24	264
20				2,070	50	338		936	892	296	38	178
21				1,550		348	460	872	818	186	86	528
22				1,220		194		634	889	156	280	1,320
23				874		152		790	590	150	100	1,680
24				978		192		525	394	161	30	1,890
25	70	890	3,200	3,780		220		460	280	172	14	1,720
26				5,300	5	138		396	370	94	4	1,680
27						134	710		510	169	7	1,660
28						270			496	234	28	1,410
29				3,000		211		400	604	328	118	1,120
30					.....	350			848	256	46	1,900
31	.....	.....	.....		.....	294	.....	.....	.....	160	10	.....

NOTE.—Water-stage recorder installed Jan. 12. Operation of recorder not satisfactory on days for which daily discharge is not shown. Braced figures show mean discharge for periods included. Mean discharge for periods before recorder was installed and for periods when recorder record is not available estimated from records of combined flow of river and power conduit based on rating of diversion dam and waste gates and record of output of power plant.

Monthly discharge of Nisqually River and Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1920.

[Drainage area, 287 square feet.]

Month.	Discharge in second-feet.						Combined run-off.	
	Combined.		River mean.	Conduit mean.	Combined.		Inches.	Acre-feet.
	Maximum.	Minimum.			Mean.	Per square mile.		
October	.....	.....	118	300	418	1.46	1.68	25,700
November	.....	.....	780	507	1,290	4.49	5.01	76,800
December	.....	.....	1,260	545	1,800	6.27	7.23	111,000
January	.....	598	1,400	550	1,950	6.79	7.83	120,000
February	.....	.....	514	539	1,050	3.66	3.95	60,400
March	3,260	.....	384	520	904	3.15	3.63	55,600
April	2,890	787	761	539	1,300	4.53	5.05	77,400
May	2,280	908	803	554	1,360	4.74	5.46	83,600
June	2,030	734	800	513	1,310	4.56	5.09	78,000
July	1,220	588	406	483	889	3.10	3.57	54,700
August	858	418	150	511	661	2.30	2.65	40,600
September	2,860	420	760	524	1,280	4.46	4.98	76,200
The year	.....	.....	678	507	1,180	4.11	56.13	860,000

NOTE.—Combined results are comparable with results previously published for Nisqually River below Little Nisqually River, near La Grande, Wash., also for Nisqually River near and at La Grande, Wash.

EAST CREEK NEAR ELBE, WASH.

LOCATION.—In NW. ¼ sec. 32, T. 15 N., R. 5 E., at Lutkens ranch 1½ miles above mouth and 1½ miles southwest of Elbe, in Lewis County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 12, 1918, to September 30, 1920.

GAGE.—Vertical staff on left bank about 6 feet above wooden artificial control; read by Charles Lutkens.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Bed composed of clay and gravel; banks fairly high, but may be overflowed at extremely high stages. A control 33 feet long was constructed of logs and fir lumber. Stage of zero flow, according to measurements made September 9, 1919, gage-height 0.01 foot, and August 7, 1920, gage-height 0.17 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 8.2 feet at 3 p. m. January 22 (discharge, 1,430 second-feet); minimum discharge, 1.7 second-feet August 28 and 30.

Maximum stage recorded during year ending September 30, 1920, 5.75 feet at 9 a. m. December 24 (discharge, 949 second-feet); minimum stage recorded, 0.60 foot August 19–26 (discharge, 3.2 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed on December 14, 1918; was uncertain December 14, 1918, to January 23, 1919, because of repairs to artificial control; and changed on December 24, 1919, when gravel was deposited above the artificial control by high water. Rating curves used prior to December 14, 1918, and subsequent to January 23, 1919, well defined. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent except during December, 1918, and January, 1919, for which months they are poor.

Discharge measurements of East Creek near Elbe, Wash, during the period Aug. 12, 1918, to Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Sept. 27	Bedford and Parker	0.36	1.7	June 2	Lee and McCombs	1.25	26.0
27	do	.36	1.6	6	do	1.17	22.8
Oct. 7	T. G. Bedford	.81	8.3	Sept. 9	L. D. Carson	.65	3.8
11	do	.63	4.6	9	do	.65	3.9
Nov. 12	do	1.79	81.6	1920.			
13	do	1.77	75.8	May 29	R. B. Kilgore	1.25	22.0
14	do	2.18	146	29	do	1.28	23.6
15	do	2.75	296	Aug. 5	do	.67	4.2
15	do	3.19	378	5	H. W. Newton	.67	4.8
Dec. 3	Parker and Calkins	2.39	193	7	R. B. Kilgore	.67	4.5
14	Calkins and Carson	4.78	735	8	H. W. Newton	.67	4.3
27	D. J. F. Calkins	1.12	31.2	Sept. 17	do	1.50	40.5
1919.				22	do	1.92	95.9
Mar. 10	R. B. Kilgore	1.65	58.0				
20	do	2.03	113				

Daily discharge, in second-feet, of East Creek near Elbe, Wash., for the period Aug. 12, 1918, to Sept. 30, 1920.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1918.			1918.			1918.		
1		2.0	11		1.8	21	2.8	1.6
2		2.0	12	2.7	1.7	22	3.7	1.6
3		2.0	13	2.5	1.8	23	3.7	1.6
4		2.2	14	2.4	1.8	24	3.1	1.6
5		2.0	15	2.8	1.6	25	2.7	1.6
6		2.0	16	2.8	1.6	26	2.6	1.6
7		2.0	17	2.5	1.6	27	2.4	1.6
8		1.9	18	2.8	1.6	28	2.4	1.6
9		2.0	19	3.2	1.6	29	2.4	1.6
10		2.0	20	3.0	1.6	30	2.4	3.0
						31	2.1	

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	2.6	21	27	32	53	81	86	56	28	9.1	3.3	1.8
2	2.4	22	88	31	49	340	94	50	27	7.9	3.5	1.8
3	2.6	72	194	31	43	137	165	44	26	7.6	3.5	1.8
4	2.7	45	126	30	42	89	504	39	26	7.6	3.7	2.0
5	15	34	95	30	39	82	301	34	23	7.0	3.5	2.0
6	11.2	28	95	26	36	75	105	30	22	7.9	3.3	2.2
7	8.7	22	78	25	32	74	82	31	19.6	7.9	3.0	3.0
8	5.4	20	63	24	78	73	65	34	18.0	6.8	3.2	4.0
9	4.4	57	59	24	697	62	79	36	21	6.3	2.9	3.8
10	5.7	548	49	27	340	59	137	36	22	6.1	2.7	3.5
11	4.6	172	48	30	176	79	143	47	23	5.4	2.6	8.5
12	6.6	85	71	35	102	65	81	44	22	5.6	2.7	6.3
13	5.4	78	438	34	82	60	61	40	25	5.4	2.7	5.6
14	4.8	140	865	31	71	51	51	36	26	6.1	2.7	3.5
15	4.2	344	335	41	62	48	45	56	25	4.9	2.7	3.2
16	11.5	206	223	352	81	51	42	78	21	4.5	2.7	2.7
17	22	121	180	852	89	154	95	68	19.0	4.4	2.6	2.6
18	12	92	153	1,040	68	366	224	54	18.5	4.4	2.5	2.5
19	8.7	75	126	575	61	176	188	51	18.0	4.2	2.5	2.5
20	7.1	64	98	252	53	105	188	45	16.7	3.8	2.5	2.5
21	6.2	53	71	178	47	89	137	46	15.8	3.8	2.5	2.2
22	5.7	45	44	1,190	44	79	97	47	15.8	3.7	2.2	2.2
23	5.7	39	40	1,110	41	75	76	38	14.4	3.7	2.2	2.2
24	7.5	39	38	613	36	69	75	31	12.8	3.5	2.2	2.2
25	7.1	33	38	390	64	59	74	63	12.0	3.3	2.0	2.1
26	6.2	34	34	414	61	53	65	69	12.4	3.3	2.0	2.1
27	77	35	31	200	59	51	63	60	12.4	3.3	1.8	2.2
28	61	30	44	133	67	52	62	51	10.0	3.2	1.7	2.2
29	38	28	37	97		75	61	39	10.0	3.3	1.8	2.2
30	26	30	36	73		121	60	39	9.4	3.0	1.7	2.2
31	21		36	63		114		34		3.3	1.8	

Daily discharge, in second-feet, of East Creek near Elbe, Wash., for the period Aug. 12, 1918, to Sept. 30, 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	19.0	51	26	38	102	11.0	34	45	24	11.3	4.6	7.6
2	25	38	21	32	78	11.0	34	39	24	10.4	4.6	6.0
3	10.4	39	18.5	30	68	11.0	37	34	22	9.3	4.6	5.7
4	7.6	83	18.0	27	57	15.2	78	33	22	8.7	4.6	5.1
5	6.3	59	16.7	25	61	14.5	74	30	24	8.5	4.5	4.6
6	5.2	43	14.9	24	63	14.1	95	28	29	7.6	4.2	4.6
7	4.7	40	14.9	22	54	13.0	82	44	34	7.1	4.0	4.6
8	4.5	29	14.0	18.6	43	13.8	75	48	44	6.6	4.0	4.6
9	3.8	24	11.6	17.4	39	29	72	42	40	6.4	3.8	5.1
10	3.7	23	11.6	16.1	38	27	65	34	35	6.4	3.8	7.8
11	3.7	25	11.6	15.2	32	28	55	31	34	6.4	3.5	26
12	3.7	24		15.2	31	60	54	29	26	8.7	3.5	85
13	3.7	24		14.1	28	570	75	23	28	14.5	3.5	123
14	3.5	29	10	13.4	26	212	75	22	48	14.8	3.5	212
15	3.3	390		13.0	24	105	63	20	45	11.3	3.5	99
16	4.5	143		23	23	79	58	19.5	40	9.0	3.5	61
17	4.9	70	460	39	21	66	52	49	37	8.5	3.5	43
18	4.2	59	121	65	19.5	50	45	31	32	7.6	3.5	32
19	3.7	103	88	62	19.5	42	44	26	29	6.9	3.2	24
20	3.5	64	314	46	18.6	40	44	24	22	6.9	3.2	30
21	3.7	47	212	34	17.8	40	46	25	21	7.8	3.2	47
22	4.7	39	176	28	16.9	38	48	21	19.1	8.0	3.2	95
23	6.8	32	482	26	14.8	32	38	25	18.6	7.6	3.2	125
24	5.4	29	886	31	14.1	33	40	23	18.2	6.9	3.2	133
25	4.7	25	249	327	13.8	37	40	23	15.6	6.2	3.2	102
26	5.2	32	133	236	13.4	34	43	19.5	15.2	6.0	3.2	85
27	4.0	19.0	100	301	12.7	32	52	21	13.4	6.0	5.0	68
28	5.4	19.6	74	482	11.6	32	61	19.5	12.7	5.7	7.8	63
29	20	22	60	188	11.6	35	54	26	11.6	5.0	22	54
30	25	31	52	24	.....	37	51	37	11.6	4.8	13.0	56
31	36	.....	46	55	.....	35	.....	33	.....	4.6	8.7	.....

NOTE.—Stage-discharge relation Dec. 14, 1918, to Jan. 23, 1919, uncertain; discharge for this period may be considerably in error. Ice interference Dec. 12–16, 1919; mean discharge for the period estimated from general information and study of weather records. Braced figures show mean discharge for period included.

Monthly discharge of East Creek near Elbe, Wash., for the period Aug. 12, 1918, to Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918.				
August 12–31	3.7	2.1	2.75	109
September	3.0	1.6	1.81	108
1918–19.				
October	77	2.4	13.2	812
November	548	20	87.1	5,180
December	865	27	125	7,690
January	1,190	24	258	15,900
February	697	32	95.5	5,300
March	366	48	98.8	6,080
April	504	42	117	6,960
May	78	30	46.0	2,830
June	28	9.4	19.1	1,140
July	9.1	3.0	5.17	318
August	3.7	1.7	2.60	160
September	8.5	1.8	2.92	174
The year	1,190	1.7	72.4	52,500
1919–20.				
October	36	3.3	8.06	496
November	390	19.0	54.9	3,270
December	886	.....	119	7,320
January	482	13.0	73.8	4,540
February	102	11.6	33.5	1,930
March	570	11.0	58.0	3,570
April	95	34	56.1	3,340
May	49	19.5	29.8	1,830
June	48	11.6	26.5	1,580
July	14.8	4.6	7.92	487
August	22	3.2	4.93	303
September	212	4.6	54.0	3,210
The year	886	3.2	43.9	31,900

TACOMA POWER CONDUIT NEAR LA GRANDE, WASH.

LOCATION.—In sec. 9, T. 15 N., R. 4 E., 750 feet below headgate at diversion dam of city of Tacoma municipal power plant, 2½ miles southeast of La Grande, Pierce County.

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1920.

GAGE.—Stevens long-distance recorder on right side 750 feet below headgate, inspected by headgate attendants.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage or by wading.

CHANNEL AND CONTROL.—Open concrete-lined canal for 50 feet below gage merging into concrete-lined tunnel 1.9 miles in length.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1920, from water-stage recorder, 10.0 feet for a few minutes at 12.45 p. m., February 16 (discharge, 878 second-feet). No flow when gates are opened wide for cleaning settling basin.

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—Flow regulated at headgate to meet requirements of power plant.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by use of discharge integrator. Records excellent except for periods when recorder was not operating satisfactorily, for which they are fair.

Discharge measurements of Tacoma power conduit near La Grande, Wash., during the period Aug. 25, 1919, to Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Aug. 25	Lee and Taylor	4.73	292	Feb. 12	G. L. Parker	9.24	773
Oct. 20	Carson and Robins	2.94	152	Mar. 7	McCombs and Lee	1.51	54.[illegible]
20	....do	7.50	552	Aug. 6	Kilgore and Newton	7.19	533
1920.				7	R. B. Kilgore	8.32	662
Feb. 10	McCombs and Lanning	9.45	813	8	....do	4.44	235
11	....do	8.90	738	Sept. 22	H. W. Newton	8.10	620
12	G. L. Parker	7.43	566				

Daily discharge, in second-feet, of Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	308	410	578	468		430	569	546	650	370	429	409
2	360	396	570	544		423	557	624	529	390	524	429
3	382	517	572	579	550	417	568	634	522	422	537	468
4	324	496	543	459		454	467	546	538	368	542	501
5	261	528	534	558		456	577	533	534	376	538	469
6	325	548		562	566	435	555	501	444	459	515	459
7	348	556		554	564	404	560	534	567	476	552	435
8	348	549		562	482	416	566	541	555	486	440	481
9	344	432		558	564	524	548	583	545	474	547	
10	253	548		548	580	502	472	636	554	498	544	
11	324	532	550	438	601	474	444	536	558	434	527	520
12		542		530	583	512	577	528	536	544	528	
13		534		515	599	598	566	525	578	538	514	
14		523		506	558	476	581	543	548	524	511	576
15	300	505		552	460	572	560	532	549	518	426	558
16		406	462	542	569	587	564	552	568	522	514	542
17		482	516	593	590	590	556	634	554	511	528	572
18	296	506	562	477	610	574	440	533	552	426	471	566
19	285	525	566	573	584	572	558	536	530	512	440	490
20	275	544	549	570	568	549	564	556	464	530	532	556
21	264	527	472	595	552	437	567	562	520	520	555	534
22	320	527	580	578	468	592	558	548	566	508	454	564
23	334	430	572	642	514	617	540	438	555	514	562	574
24	310	546		639	515		538	542	461	515	592	580
25	263	542		488	490		433	544	454	416	544	578
26	232	554			504	550	530	512	422	504	414	516
27	227	436	540		490		536	534	336	518	462	575
28	244	567		570	446		544	546	402	524	595	544
29	287	560			436	644	534	559	434	511	476	564
30	324	436			.....	554	545	578	385	524	556	572
31	268	.....			.....	562	.....	662	.....	596	470	.....

NOTE.—Water-stage recorder not operating satisfactorily Oct. 12–17, 19, 20, Dec. 6–15, 24–31, Jan. 26 to Feb. 5, Mar. 1–2, 24–28, July 1, and Sept. 9–13. Discharge Oct. 19, 20, and Mar. 1, 2, interpolated; discharge for other periods when recorder was not operating satisfactorily estimated from individual gage readings and records of output at power plant. Braced figures show mean discharge for periods included.

Monthly discharge of Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	382	227	308	18,400
November	567	396	507	30,200
December	.....	.....	545	33,500
January	642	438	550	33,800
February	610	436	539	31,000
March	.....	404	520	32,000
April	581	433	539	32,100
May	662	438	554	34,100
June	650	336	513	30,500
July	544	370	483	29,700
August	595	414	511	31,400
September	580	409	524	31,200
The year	662	227	507	368,000

104341—23—WSP 512——3

PUYALLUP RIVER BASIN.

PUYALLUP RIVER NEAR ELECTRON, WASH.

LOCATION.—In NE. ¼ NW. ¼ sec. 3, T. 16 N., R. 6 E., 1,000 feet above intake of Puget Sound Power & Light Co.'s flume, a quarter of a mile below Mowich River, and 10 miles southeast of Electron, Pierce County.

DRAINAGE AREA.—91 square miles (measured on Plate IV, Water-Supply Paper 313).

RECORDS AVAILABLE.—January 1, 1909, to September 30, 1920.

GAGE.—Friez water-stage recorder on left bank at gaging bridge 1,000 feet above intake; inspected by William Chambers. Datum lowered 1.00 foot on March 9, 1918.

DISCHARGE MEASUREMENTS.—Made from gaging bridge at gage.

CHANNEL AND CONTROL.—Channel straight for 150 feet above and below gage. Banks high and wooded. One channel at all stages. Bed composed of boulders and glacial débris; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 6.8 feet January 23 (discharge, 3,610 second-feet); minimum stage, from water-stage recorder, 0.87 foot at 4 a. m. January 16 (discharge, 161 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 4.47 feet at noon December 24 (discharge, 1,890 second-feet); minimum stage, from recorder, 0.72 foot at 7 p. m. October 10 (discharge, 130 second-feet).

1909–1920: Maximum stage estimated from partial gage-height record at 6.4 feet at noon December 18, 1917 (discharge, 4,800 second-feet); minimum discharge estimated at 112 second-feet on December 24, 1914, when stage-discharge relation was affected by ice.

ICE.—Stage-discharge relation slightly affected by ice except during mild winters.

DIVERSIONS.—None above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water on October 27 and December 14, 1918, December 24, 1919, and January 28, 1920; affected by ice December 10–16, 1919. Rating curves well defined up to 1,000 second-feet. Operation of water-stage recorder excellent except as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table the daily mean gage height determined from gage-height graph by inspection, or for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent except during period when stage-discharge relation was affected by ice.

COOPERATION.—Puget Sound Power & Light Co. furnished gage-height record and made most of the discharge measurements.

Discharge measurements of Puyallup River near Electron, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 23	Barber and Chambers..	1.05	232	Oct. 26	Barber and Chambers.	0.87	160
Nov. 9	.....do.....	1.20	237	Nov. 6	.....do.....	1.72	434
22	.....do.....	1.29	265	Dec. 28	.....do.....	1.95	440
Dec. 20	.....do.....	1.75	468	1920.			
31	.....do.....	1.05	207	Jan. 6	William Chambers.....	1.40	230
1919.				Feb. 5	.....do.....	1.81	365
Jan. 14	.....do.....	.88	175	16	.....do.....	1.42	219
Feb. 4	.....do.....	1.40	310	Mar. 3	.....do.....	1.10	147
22	.....do.....	1.25	262	17	.....do.....	1.60	283
Mar. 19	.....do.....	1.23	256	Apr. 1	.....do.....	1.37	203
31	.....do.....	1.67	391	23	.....do.....	1.51	256
Apr. 14	.....do.....	1.46	336	May 2	.....do.....	1.73	313
24	.....do.....	1.87	496	16	.....do.....	2.07	464
May 8	.....do.....	1.65	412	27	Chambers, Knade, and Kilgore.....	1.93	392
June 9	.....do.....	1.95	520	27	R. B. Kilgore.....	1.93	407
29	.....do.....	1.98	529	June 2	William Chambers.....	1.83	373
July 27	.....do.....	1.91	499	25	Chambers and Milsom..	2.05	470
Sept. 19	.....do.....	1.86	475	July 21	William Chambers.....	2.17	503
29	.....do.....	.96	175	31	.....do.....	2.21	518
Oct. 8	.....do.....	1.15	233				

Daily discharge, in second-feet, of Puyallup River near Electron, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	442	357	232	202	376	275	391	560	500	520	540	468
2	450	323	859	197	342	368	413	520	520	581	520	429
3	401	315	1,280	192	322	294	485	456	560	644	492	379
4	330	293	1,020	192	308	262	796	410	623	752	492	304
5	725	258	776	187	301	250	602	376	665	796	520	291
6	458	235	622	182	278	241	496	361	644	644	602	353
7	315	216	496	178	266	238	429	376	581	520	644	253
8	232	207	434	173	395	224	376	410	560	581	560	235
9	222	248	377	173	602	215	383	421	540	730	540	235
10	405	509	338	175	472	213	581	387	492	818	581	266
11	638	397	312	173	410	215	520	394	460	818	644	485
12	725	304	335	173	357	208	448	379	429	686	581	556
13	505	365	1,220	168	314	202	413	353	460	686	492	346
14	357	475	1,990	164	294	190	368	398	476	796	540	339
15	297	558	1,220	173	285	182	336	540	468	933	623	361
16	385	484	828	387	395	178	325	540	433	1,060	708	398
17	350	401	627	1,210	406	217	652	484	425	818	686	368
18	268	365	562	1,840	339	291	752	452	504	644	644	398
19	286	342	505	1,310	314	269	686	540	665	644	665	484
20	272	315	492	841	294	241	623	602	730	686	644	391
21	300	286	401	686	272	232	540	686	708	730	666	325
22	210	268	357	2,480	259	227	464	841	730	730	574	357
23	235	245	326	2,520	250	235	444	730	708	774	560	413
24	312	255	300	1,340	235	232	488	602	644	730	581	464
25	251	228	282	956	262	224	500	810	708	602	623	444
26	238	225	268	818	253	213	476	1,060	774	500	540	350
27	1,080	210	282	686	241	213	500	1,250	752	540	448	266
28	854	216	290	602	235	224	520	996	665	581	444	205
29	580	204	258	540	.....	278	540	796	560	623	484	195
30	442	245	228	484	.....	410	560	644	520	602	623	190
31	438	.....	213	413	.....	417	.....	560	.....	581	686	.....

Daily discharge, in second-feet, of Puyallup River near Electron, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	224	847	368	325	578	154	207	345	353	843	556	369
2	241	698	322	308	501	151	200	323	380	798	578	436
3	173	635	311	288	440	147	192	301	480	820	578	416
4	164	741	304	275	396	154	443	283	620	775	599	440
5	178	538	285	262	365	154	686	272	664	686	664	380
6	208	417	266	244	374	147	476	326	620	686	686	365
7	230	353	262	230	382	147	406	477	708	730	686	365
8	213	311	208	224	330	151	330	642	730	775	730	376
9	153	278	202	215	308	162	297	642	642	775	686	345
10	136	275		205	290	156	279	548	578	730	730	448
11	224	259		210	272	149	266	485	620	620	686	687
12	213	244	190	208	259	386	297	448	599	599	686	890
13	218	276		195	246	838	357	448	588	531	730	708
14	185	357		250	240	600	311	448	908	527	686	990
15	175	1,300		288	234	420	290	448	978	642	642	686
16	168	1,120	540	900	226	334	276	480	798	775	620	599
17	208	872	1,140	1,110	220	286	253	893	752	843	476	599
18	164	730	708	1,030	212	259	240	720	686	752	365	599
19	150	752	602	1,060	207	240	283	578	642	686	384	493
20	150	623	831	752	192	234	293	531	664	599	480	501
21	264	623	730	602	183	269	269	510	730	535	599	620
22	315	602	623	504	176	256	256	444	775	531	642	664
23	241	602	742	438	171	237	249	420	620	506	599	708
24	200	520	1,210	548	176	237	243	388	522	501	514	620
25	170	444	864	929	174	240	253	369	468	480	392	730
26	161	387	665	853	167	220	293	357	448	556	345	686
27	150	353	536	972	162	210	380	376	501	664	448	843
28	309	376	440	1,300	156	226	420	384	578	752	384	730
29	275	412	398	965	154	249	384	357	664	708	642	686
30	218	425	398	798	.....	243	357	380	798	620	400	686
31	281	.....	364	686	.....	212	.....	361	.....	556	349	.....

NOTE.—Water-stage recorder not operating satisfactorily Jan. 22 to Feb. 1 and Dec. 8–16, 1919, April 5–7 and Sept. 23–24, 1920; gage-height record completed by readings from staff gage twice daily. Braced figures show mean discharge for periods included.

Monthly discharge of Puyallup River near Electron, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 91 square miles]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	1,080	210	419	4.60	5.30	25,800
November	558	204	312	3.43	3.83	18,600
December	1,990	213	572	6.29	7.25	35,200
January	2,520	164	639	7.02	8.09	39,300
February	602	235	324	3.56	3.71	18,000
March	417	178	248	2.73	3.15	15,200
April	796	325	504	5.54	6.18	30,000
May	1,250	353	579	6.36	7.33	35,600
June	774	425	583	6.41	7.15	34,700
July	1,000	500	687	7.55	8.70	42,200
August	708	444	579	6.36	7.33	35,600
September	556	190	352	3.87	4.32	20,900
The year	2,520	164	485	5.33	72.34	351,000
1919–20.						
October	315	136	205	2.25	2.59	12,600
November	1,300	244	546	6.00	6.69	32,500
December	1,210	.....	466	5.12	5.90	28,700
January	1,300	195	554	6.09	7.02	34,100
February	578	154	269	2.96	3.19	15,500
March	838	147	254	2.79	3.22	15,600
April	686	192	316	3.47	3.87	18,800
May	893	272	451	4.96	5.72	27,700
June	978	353	637	7.00	7.81	37,900
July	843	480	665	7.31	8.43	40,900
August	730	345	567	6.23	7.18	34,900
September	990	345	589	6.47	7.22	35,000
The year	1,300	136	460	5.05	68.84	334,000

PUYUP RIVER AT ALDERTON, WASH.

LOCATION.—On township line between sec. 25, T. 20 N., R. 4 E., and sec. 30, T. 20 N., R. 5 E., at highway bridge 1 mile north of Alderton, Pierce County, and 1½ miles above Stuck River.

DRAINAGE AREA.—410 square miles (measured on Plate IV, Water-Supply Paper 313).

RECORDS AVAILABLE.—November 20, 1914, to September 30, 1920.

GAGE.—Vertical staff in two sections on downstream side of bridge pier on right bank used to January 15, 1920. Three temporary staff gages just below bridge used during remainder of year while new bridge was being built. Gage read by Mrs. H. D. Foster. Datum of gage lowered 1.00 foot August 5, 1918.

DISCHARGE MEASUREMENTS.—Made from bridge at gage prior to January 15, 1920; from bridge 2½ miles above gage thereafter.

CHANNEL AND CONTROL.—Bed composed of silt and gravel; shifting. Right bank is overflowed at gage height about 9 feet; left bank high and not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 10.0 feet January 23 (discharge, 12,200 second-feet); minimum stage recorded, 1.20 feet September 30 (discharge, 407 second-feet).

Maximum stage recorded during year ending September 30, 1920, 6.75 feet January 28 (discharge, 8,360 second-feet); minimum stage recorded, 1.1 foot October 10 (discharge, 342 second-feet).

1915–1920: Maximum stage recorded, 12.6 feet at 8 p. m. December 18, 1917 (discharge, 19,300 second-feet); minimum stage recorded on October 10, 1919.

ICE.—Stage-discharge relation slightly affected by ice for a few days during severe winters.

DIVERSIONS.—None.

REGULATION.—The operation of the Puget Sound Power & Light Co.'s plant at Electron does not materially affect the natural flow, as the pondage utilized is small.

ACCURACY.—Stage-discharge relation changed frequently from October 1, 1918, to September 8, 1919; fairly permanent September 9 to November 1, 1919; changed November 2, 1919, to April 4, 1920; and was practically permanent April 5 to September 30, 1920. Standard rating curves well defined below and fairly well defined above 4,000 second-feet. Gage read to half-tenths once daily. Slight diurnal fluctuation. Daily discharge ascertained by applying daily gage height to rating table or by shifting-control method. Records fair.

COOPERATION.—Gage-height record furnished by Inter-County River Improvement Commission of King and Pierce counties.

Discharge measurements of Puyallup River at Alderton, Wash., during the years ending Sept. 30, 1919, and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 2	T. G. Bedford	2.53	690	June 17	Lee and Calkins	2.41	1,440
Nov. 20	do	3.03	1,300	June 30	L. D. Carson	2.22	1,190
20	do	3.03	1,250	Sept. 8	do	1.48	602
Dec. 11	Calkins and Carson	2.68	1,190	Nov. 17	McCombs and Carson	3.68	3,040
1919.				1920.			
Jan. 3	Kilgore and Calkins	2.08	638	Jan. 6	do	1.79	829
30	Carson and Calkins	3.20	2,200	Mar. 6	McCombs and Lee	1.28	604
Feb. 19	do	2.52	1,370	Apr. 17	Lee and Kilgore	2.14	1,410
Mar. 5	do	2.47	1,490	June 16	John McCombs	3.10	2,560
20	do	2.49	1,490	July 28	Kilgore and Newton	2.30	1,469
Apr. 10	do	3.00	2,150	Sept. 7	Newton and Lee	1.50	680

Daily discharge, in second-feet, of Puyallup River at Alderton, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	735	1,040	965	705	2,000	1,180	1,520	2,000	1,430	1,180	965	895
2	678	965	1,110	705	2,110	2,000	1,520	1,900	1,430	1,180	965	798
3	735	1,040	7,200	650	1,900	1,900	1,600	1,800	1,520	1,340	895	765
4	625	895	4,410	625	1,700	1,520	2,570	1,800	1,700	1,520	895	678
5	735	895	3,380	625	1,600	1,520	2,330	1,800	1,520	1,600	895	625
6	895	798	2,450	625	1,520	1,520	1,800	1,600	1,340	1,520	895	895
7	830	705	1,900	625	1,340	1,700	1,700	1,520	1,600	1,340	1,110	830
8	575	678	1,600	600	1,340	1,520	1,520	1,520	1,520	1,260	1,110	600
9	528	1,180	1,430	600	1,800	1,520	1,520	1,520	1,430	1,430	965	650
10	550	765	1,260	600	2,000	1,520	2,110	1,520	1,520	1,700	965	650
11	705	1,430	1,180	625	1,700	1,520	2,330	1,520	1,430	1,800	1,110	650
12	2,330	1,110	1,430	625	1,600	1,430	2,000	1,600	1,260	1,520	1,110	2,230
13	1,110	965	2,830	625	1,430	1,430	1,800	1,340	1,340	1,520	965	1,010
14	895	1,600	8,070	600	1,520	1,520	1,800	1,260	1,520	1,520	895	910
15	705	1,520	5,360	600	1,180	1,340	1,600	1,520	1,520	1,700	1,180	815
16	798	2,110	3,240	550	1,700	1,340	1,520	1,800	1,340	2,000	1,110	815
17	1,180	1,600	2,450	1,800	2,000	1,340	1,600	1,700	1,340	1,900	1,260	860
18	798	1,520	2,000	3,520	1,600	1,600	3,240	1,520	1,260	1,430	1,180	815
19	705	1,180	2,000	4,880	1,340	1,800	2,960	1,600	1,700	1,430	1,180	815
20	678	1,180	1,900	3,380	1,260	1,520	2,700	1,600	1,800	1,260	1,180	860
21	678	1,040	1,520	2,570	1,180	1,340	2,450	1,800	1,800	1,520	1,180	690
22	650	965	1,340	4,110	1,110	1,340	2,110	2,450	1,700	1,430	1,180	610
23	650	895	1,180	12,200	1,180	1,340	2,000	2,110	1,700	1,340	1,040	690
24	650	895	1,110	7,030	1,110	1,260	2,000	1,700	1,520	1,260	1,040	770
25	798	895	1,040	4,410	1,110	1,260	2,330	1,900	1,800	1,340	1,040	815
26	678	895	965	3,810	1,340	1,180	2,110	2,960	1,800	965	1,040	770
27	1,040	895	895	3,100	1,260	1,110	2,110	3,660	1,700	965	895	540
28	2,830	830	965	2,570	1,180	1,040	2,110	2,960	1,430	965	798	505
29	1,800	895	895	2,330	.....	1,040	2,110	2,220	1,340	1,110	798	470
30	1,260	895	830	2,110	.....	1,180	2,110	1,900	1,180	1,180	830	407
31	1,340	.....	765	1,900	.....	1,700	.....	1,600	.....	1,110	1,110	.....
1919–20.												
1	442	2,640	1,170	1,280	2,780	610	1,280	1,120	1,060	2,360	1,120	730
2	1,170	1,850	860	1,120	2,360	610	1,500	1,170	1,060	2,230	1,170	730
3	610	2,360	770	1,010	2,100	610	1,280	910	1,280	2,100	1,170	770
4	470	3,370	770	1,010	1,730	610	2,230	860	1,610	2,100	1,120	770
5	470	2,640	730	960	1,610	610	5,720	815	2,100	1,850	1,280	730
6	470	2,100	730	910	1,390	540	2,920	815	1,970	1,610	1,280	770
7	610	1,500	690	815	1,850	442	2,230	1,280	2,100	1,730	1,280	610
8	470	1,500	575	770	1,730	456	1,730	1,850	2,100	1,850	1,500	650
9	540	1,220	505	690	1,390	505	1,500	1,970	2,100	1,970	1,390	650
10	342	1,010	505	690	1,220	540	1,610	1,610	1,610	1,850	1,280	540
11	407	1,060	470	690	1,010	575	1,500	1,280	1,970	1,610	1,390	770
12	470	960	505	690	910	1,120	1,060	1,120	1,730	1,390	1,340	3,520
13	575	860	505	650	910	2,100	1,500	1,170	1,610	1,850	1,500	2,500
14	442	1,220	428	610	860	2,360	1,170	1,060	1,970	1,340	1,500	2,920
15	407	1,390	463	540	815	1,850	1,170	1,120	3,520	1,850	1,280	1,970
16	442	4,280	428	960	815	1,390	1,280	1,170	2,500	1,850	1,280	1,500
17	470	2,920	2,100	6,400	770	1,170	1,280	1,500	2,230	2,100	1,170	1,170
18	730	2,100	2,920	4,280	690	1,390	1,170	2,360	2,100	2,100	730	1,220
19	540	2,500	2,100	5,890	690	1,390	1,060	1,730	1,850	1,610	690	1,010
20	470	1,970	2,230	3,670	690	1,280	1,500	1,500	1,850	1,500	770	1,060
21	470	1,610	2,100	2,500	610	1,280	1,280	1,280	2,100	1,390	960	1,220
22	610	1,730	1,850	1,850	610	1,280	1,220	815	2,230	1,500	1,170	1,970
23	690	1,610	2,230	1,610	610	1,170	1,060	1,010	1,730	1,060	1,170	2,100
24	690	1,610	3,070	1,610	610	1,170	1,010	1,060	1,230	1,060	1,060	1,170
25	540	1,280	3,970	2,500	610	1,340	960	860	1,280	960	770	2,780
26	470	860	2,640	4,920	610	1,170	910	770	1,170	1,120	730	2,640
27	505	690	2,230	3,970	610	1,170	960	770	1,170	1,220	730	2,360
28	442	960	1,850	8,360	610	1,390	1,390	860	1,390	1,500	910	2,640
29	860	1,010	1,500	5,400	610	1,390	1,280	860	1,610	1,610	730	1,970
30	1,010	1,500	1,500	4,280	.....	1,610	1,170	1,280	2,100	1,390	1,500	1,730
31	575	.....	1,500	3,370	.....	1,340	.....	1,170	.....	1,170	770	.....

Monthly discharge of Puyallup River at Alderton, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	2,830	528	941	2.30	2.65	57,900
November	2,110	678	1,080	2.63	2.93	64,300
December	8,070	765	2,180	5.32	6.13	134,000
January	12,200	550	2,250	5.49	6.33	138,000
February	2,110	1,110	1,500	3.66	3.81	83,300
March	2,000	1,040	1,440	3.51	4.05	88,500
April	3,240	1,520	2,040	4.98	5.56	121,000
May	3,660	1,260	1,860	4.54	5.23	114,000
June	1,800	1,180	1,520	3.71	4.14	90,400
July	2,000	965	1,400	3.41	3.93	86,100
August	1,260	798	1,030	2.51	2.89	63,300
September	2,230	407	781	1.90	2.12	46,500
The year	12,200	407	1,500	3.66	49.77	1,090,000
1919-20.						
October	1,170	342	562	1.37	1.58	34,600
November	4,280	690	1,740	4.24	4.73	104,000
December	3,970	428	1,420	3.46	3.99	87,300
January	8,360	540	2,390	5.83	6.72	147,000
February	2,780	610	1,100	2.68	2.89	63,300
March	2,360	442	1,110	2.71	3.12	68,200
April	5,720	910	1,530	3.73	4.16	91,000
May	2,360	770	1,200	2.93	3.38	73,800
June	3,520	1,060	1,810	4.41	4.92	108,000
July	2,360	960	1,640	4.00	4.61	101,000
August	1,500	690	1,120	2.73	3.15	68,900
September	3,520	540	1,510	3.68	4.11	89,800
The year	8,360	342	1,430	3.49	47.36	1,040,000

PUYALLUP RIVER AT PUYALLUP, WASH.

LOCATION.—Since November 16, 1919, in NE. ¼ sec. 20, T. 20 N., R. 4 E., seven-eighths mile below Puget Sound Electric Co.'s railway bridge, 1 mile northwest of Puyallup, Pierce County, three-fourths mile above Clark Creek, and 3½ miles below mouth of Stuck River. Prior to November 16, 1919, station was in sec. 21, T. 20 N., R. 4 E.

DRAINAGE AREA.—914 square miles (measured on Pls. IV and XI, Water-Supply Paper 313).

RECORDS AVAILABLE.—May 1, 1914, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank since December 3, 1919. Previous gages as follows: May 1, 1914, to November 15, 1919, Stevens continuous water-stage recorder on right bank about 1¼ miles above present site and at different datum; July 24, 1918, to December 3, 1919, Stevens continuous water-stage recorder on left bank about 400 feet above present location and at datum approximately 10 feet lower than present gage.

DISCHARGE MEASUREMENTS.—Made from highway bridge 2 miles above gage or from cable 50 feet below gage.

CHANNEL AND CONTROL.—Stream bed composed of light silt; shifting at all stages. Control formed by section of stream bed extending some distance downstream.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 32.03 feet at 4 a. m. January 23 (discharge, 36,500 second-feet); minimum stage from recorder, 17.61 feet at 8 a. m. October 23 (discharge, 988 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 10.4 feet at 3.30 p. m. January 28, may have been higher earlier in the day when recorder was not operating (discharge, 16,500 second-feet); minimum stage not registered because water was below intake for many days during year.

1914–1920: Maximum stage recorded, 34.15 feet at 4.45 p. m. December 18, 1917 (discharge, 40,500 second-feet); minimum stage recorded, 17.36 feet at 8 a. m. November 18, 1917 (discharge, 726 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Two hydroelectric plants, owned by the Puget Sound Traction, Light & Power Co., divert water above station. Water for the Electron plant is diverted from Puyallup River 10 miles above Electron into an equalizing basin having a capacity of 185 acre-feet; water used at this plant is returned directly to the river. Water for the Dieringer plant is diverted from White River at Buckley into Lake Tapps (capacity, 51,000 acre-feet), and after use is discharged into Stuck River.

REGULATION.—See "Diversions."

ACCURACY.—Stage-discharge relation changed during rise in stage on October 28, December 2 and 14, 1918, January 23, 1919, and May 28, 1920; changed gradually January 24 to July 14, 1919, January 31 to March 4, and June 13 to August 17, 1920. Rating curves used prior to November 15, 1919, well defined below 30,000 second-feet, rating curves used November 16, 1919, to January 27, 1920, well defined below 5,000 second-feet; poorly defined above. Standard rating curve used after January 28, 1920, well defined. Operation of water-stage recorder satisfactory except as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table the daily mean gage-height determined from gage-height graph by inspection or, for periods of high water, when diurnal fluctuation in stage was large, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Shifting-control method used January 24 to July 14, 1919, and January 31 to March 4 and June 13 to August 17, 1920. Records good.

COOPERATION.—Gage-height record furnished by Inter-County River Improvement Commission of King and Pierce counties.

Discharge measurements of Puyallup River at Puyallup, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 18	T. G. Bedford	18.53	1,980	Aug. 8	L. D. Carson	18.99	2,560
Nov. 21	do	18.75	2,440	Sept. 5	do	18.39	1,930
Dec. 11	Calkins and Carson	19.20	2,750	Oct. 22	do	[a]17.99	1,520
1919.				Nov. 17	Carson and McCombs	[b]19.78	3,950
Jan. 3	Kilgore and Calkins	18.99	2,140	1920.			
30	Calkins and Carson	20.06	4,510	Jan. 6	do	[c] 3.84	2,370
Feb. 19	do	19.64	3,240	30	L. D. Carson	[d] 7.69	9,530
Mar. 5	do	19.50	2,950	Mar. 5	John McCombs	3.80	1,930
20	do	19.50	3,220	Apr. 17	Kilgore and Lee	5.36	3,620
Apr. 10	do	20.24	4,970	June 12	R. B. Kilgore	5.85	4,130
30	L. D. Carson	20.31	4,680	July 28	Kilgore and Newton	4.87	3,160
June 17	Lee and Calkins	19.65	3,360	Sept. 8	H. W. Newton	3.48	1,910
July 15	L. D. Carson	20.06	4,280				

[a] Original gage above short-line bridge. Gage reading at temporary station, 13.32 feet; equivalent gage height at site used after Nov. 16, 1919, 3.25 feet.
[b] Original gage. Gage height at temporary station, 15.38 feet; at new station, 5.34 feet.
[c] Gage height at new station. Gage height at temporary station (abandoned), 13.89 feet.
[d] Gage height at new station.

Daily discharge, in second-feet, of Puyallup River at Puyallup, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1,900	2,380	1,810	1,710	3,240	2,580	3,710	4,300	3,630	3,080	2,380	1,930
2	1,900	2,520	4,180	1,970	3,310	3,310	3,630	4,300	3,470	2,520	2,260	2,150
3	1,900	2,200	14,900	1,970	2,940	3,960	4,470	4,040	3,630	2,520	2,100	2,040
4	1,840	2,140	10,500	1,860	3,080	3,160	5,580	3,630	3,790	3,470	2,150	1,880
5	1,960	2,140	7,820	1,480	3,010	2,860	5,580	3,310	4,040	3,960	2,200	1,830
6	1,390	2,080	5,970	1,860	2,860	3,010	4,650	3,080	4,300	4,040	2,260	1,980
7	1,600	1,970	4,830	1,860	2,520	3,240	4,130	2,940	4,650	3,310	2,440	1,630
8	1,780	1,920	3,960	1,920	2,650	3,240	3,880	2,940	4,220	3,160	2,320	1,730
9	1,720	1,920	3,470	1,860	3,880	3,080	3,630	3,160	3,550	3,310	2,260	1,820
10	1,660	1,760	2,940	1,860	3,630	3,080	4,470	3,240	3,080	3,550	2,150	1,830
11	1,780	3,390	2,520	1,860	3,010	2,940	5,010	3,160	2,940	3,880	2,260	1,880
12	3,200	2,940	2,450	1,520	2,790	2,650	4,470	3,160	3,080	3,880	2,440	2,500
13	1,780	2,860	5,820	1,760	2,720	2,720	4,040	3,080	3,080	3,470	2,100	1,730
14	1,780	2,860	15,000	1,860	2,650	2,790	3,790	2,940	3,310	3,550	2,040	1,290
15	1,550	3,010	11,800	1,860	2,520	2,450	3,470	3,310	3,390	3,820	2,150	1,680
16	1,670	3,550	7,510	1,860	2,520	2,320	3,080	3,710	3,240	4,160	2,200	1,830
17	2,220	2,580	3,880	4,510	3,710	2,520	4,130	3,310	3,160	4,080	2,040	1,930
18	1,730	2,790	4,470	11,100	3,160	3,080	6,170	2,580	3,310	3,580	2,500	1,830
19	1,550	2,580	3,960	13,000	2,940	3,630	5,770	4,130	4,470	2,970	2,560	1,930
20	1,100	2,580	4,040	7,940	2,520	3,080	5,390	4,650	5,010	2,970	2,440	1,830
21	1,440	2,380	3,160	5,580	2,320	2,790	5,010	5,010	5,010	2,900	2,380	1,370
22	1,550	2,080	2,860	13,400	2,450	2,650	4,300	4,220	4,650	2,900	2,380	1,730
23	1,550	1,970	2,860	32,600	2,580	2,580	3,880	4,470	4,830	2,900	2,260	1,930
24	1,600	1,970	2,520	18,500	2,380	2,720	3,960	3,710	3,630	2,900	1,930	1,930
25	1,660	2,080	2,260	10,500	2,320	2,380	4,300	3,630	3,310	2,830	2,260	2,040
26	1,500	2,020	2,450	8,690	2,720	2,320	3,880	5,580	3,550	2,630	2,380	2,040
27	1,950	2,080	2,200	6,980	2,650	2,260	4,040	7,190	4,130	2,500	2,200	1,780
28	4,970	1,710	2,260	5,970	2,580	2,260	4,220	6,770	4,040	2,500	2,100	1,370
29	3,630	1,920	2,140	4,650	.....	2,260	4,300	5,770	3,710	2,560	2,100	1,780
30	2,940	2,020	2,200	4,220	.....	2,860	4,300	4,830	3,240	2,380	2,150	1,880
31	2,790	.....	2,020	3,790	.....	3,790	.....	4,130	.....	2,500	2,040	.....
1919-20.												
1	1,780	2,850	2,950	3,270	5,970	1,890	2,350	2,440	2,720	3,700	2,190	1,630
2	2,040	3,190	2,300	3,270	5,310	2,030	2,350	1,960	3,280	3,700	2,440	1,630
3	1,930	2,700	2,170	2,850	4,430	1,960	2,190	2,110	3,700	3,550	2,270	1,820
4	1,730	3,500	1,990	1,850	4,080	1,960	2,620	2,030	3,410	3,160	2,270	1,750
5	1,330	3,040	1,990	2,140	3,860	1,960	8,530	2,190	3,700	3,410	2,350	1,630
6	1,780	2,440	1,850	2,220	3,860	1,820	5,750	2,440	3,160	3,280	2,350	1,630
7		2,200	1,850	2,220	4,430	1,570	5,090	3,040	3,700	3,040	2,440	1,750
8		1,930	1,850	2,060	3,410	1,820	4,650	5,310	4,220	3,280	2,440	1,820
9		1,500	1,990	2,060	3,550	1,820	3,860	5,090	4,430	3,550	2,720	1,890
10		1,830	2,650	1,990	3,160	1,890	3,280	4,870	3,860	3,550	2,440	1,690
11		1,730	2,470	1,660	3,550	1,890	2,820	4,650	4,030	3,040	2,720	1,750
12		1,830	2,380	1,920	2,720	1,890	3,280	3,860	3,860	3,280	2,620	2,930
13		1,830	2,380	1,990	2,530	3,410	4,220	3,860	3,040	3,280	2,530	2,930
14		2,040	1,990	1,990	2,440	4,430	3,860	3,700	4,650	2,440	2,530	3,280
15	1,500	3,640	2,380	1,990	2,270	3,160	3,700	3,550	7,350	2,440	2,350	3,160
16		5,400	2,650	3,240	2,530	2,530	3,550	3,280	5,750	2,930	2,440	2,620
17		2,950	4,830	8,400	2,350	2,190	3,410	5,970	5,090	3,550	2,440	2,190
18		3,160	5,180	6,520	2,350	2,110	2,820	6,660	4,220	3,280	2,030	2,030
19		3,380	3,490	8,400	2,190	2,030	3,550	4,870	3,700	3,550	1,890	1,820
20		3,270	3,270	7,800	2,190	1,890	4,220	4,030	3,040	3,040	1,960	2,190
21		3,380	2,850	5,700	1,960	1,690	3,860	2,620	3,700	2,720	2,030	2,350
22	1,630	2,750	2,950	3,610	1,750	1,890	3,040	2,270	4,650	2,620	1,960	2,720
23	1,580	2,850	3,060	2,950	1,630	1,890	3,160	1,750	4,030	2,350	2,190	2,930
24	1,450	3,490	5,250		1,960	1,960	2,350	2,030	3,280	2,190	2,030	3,280
25	1,450	3,380	5,300		2,030	2,110	1,820	1,960	3,040	2,630	2,030	3,700
				6,000								
26	1,080	3,050	4,340		2,110	2,190	2,030	1,960	2,620	2,110	1,890	3,410
27	1,330	3,380	3,610		2,030	2,110	2,350	2,030	2,530	2,440	1,960	4,030
28	1,410	2,220	3,380	16,500	1,890	1,820	3,040	2,190	3,550	2,720	1,890	3,550
29	1,630	2,300	3,160	13,000	1,630	2,190	2,930	2,530	4,220	2,930	1,820	2,820
30	1,580	2,380	3,270	9,500	.....	2,440	2,720	2,820	5,090	2,620	2,190	2,720
31	1,540	.....	3,490	8,050	.....	2,350	.....	2,930	.....	2,440	1,750	.....

NOTE.—Recorder not in operation Oct. 3–8 and Nov. 17–18, 1918, Oct. 7–21, 1919, and Jan. 24–27, 1920. Daily mean gage geights Oct. 3–8, and Nov. 17–18, 1918, determined by comparison with record obtained at temporary recording-gage station 1½ miles downstream. Discharge Oct. 7–21, 1919, determined from recorded range in stage; Jan. 24–27, 1920, from comparison with records of flow of near-by streams. Braced figures show mean discharge for periods included. Float at bottom of well for several hours on 11 days during December, 1919, 13 days during January, 11 days during February, 21 days during March, 2 days during April, 12 days during August, and 15 days during September, 1920. Recorder graph completed by aid of occasional staff-gage readings and general information.

Monthly discharge of Puyallup River at Puyallup, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 914 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches	Acre-feet.
1918–19.						
October	4,970	1,100	1,990			122,000
November	3,550	1,710	2,350			140,000
December	15,000	1,810	4,800			295,000
January	32,600	1,480	5,820			358,000
February	3,880	2,320	2,840			158,000
March	3,960	2,260	2,860			176,000
April	6,170	3,080	4,370			260,000
May	7,190	2,580	4,010			247,000
June	5,010	2,940	3,780			225,000
July	4,160	2,380	3,190			196,000
August	2,560	1,930	2,240			138,000
September	2,500	1,290	1,840			109,000
The year	32,600	1,100	3,350	3.67	49.82	2,420,000
1919–20.						
October	2,040		1,540			94,700
November	5,400	1,500	2,790			166,000
December	5,300	1,850	3,010			185,000
January	16,500	1,660	4,880			300,000
February	5,970	1,630	2,900			167,000
March	4,430	1,570	2,160			133,000
April	8,530	1,820	3,450			205,000
May	6,660	1,750	3,260			200,000
June	7,350	2,530	3,920			233,000
July	3,700	2,030	2,970			183,000
August	2,720	1,750	2,230			137,000
September	4,030	1,630	2,460			146,000
The year	16,500		2,960	3.24	44.10	2,150,000

WHITE RIVER AT BUCKLEY, WASH.

LOCATION.—In SE. ¼ sec. 34, T. 20 N., R. 6 E., at Northern Pacific Railway bridge 1 mile northeast of Buckley, Pierce County.

DRAINAGE AREA.—424 square miles (measured on Pl. XI, Water-Supply Paper 313).

RECORDS AVAILABLE.—April 22, 1899, to August 31, 1903 (gage-height record only, January 1, 1902, to August 31, 1903); June 8 to December 31, 1911; January 18, 1913, to September 30, 1920.

GAGE.—Stevens eight-day water-stage recorder on left bank 40 feet below railway bridge at end of concrete wall protecting abutment of bridge; installed January 9, 1917. Record from this gage supplemented during extremely low water April 25 to May 8, 1920, by measurements from a reference point on railway bridge to water surface and after May 9, 1920, by readings from chain gage installed at same reference point. Recorder inspected by O. E. Osgood.

The high water on January 23, 1919, cut through the left bank, making a channel back of the water-stage recorder. In this channel a staff gage was installed at railway bridge April 2, 1919; moved 700 feet upstream June 11, 1919. Gage read by O. E. Osgood and F. C. Rowland. For history of gages used prior to January 9, 1917, see Water-Supply Paper 462.

DISCHARGE MEASUREMENTS.—Measurements of flow in both channels made by wading or from railway bridge.

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel; shifting; gradient steep. One channel prior to flood of January 23, 1919; two channels after the flood. Right bank of main channel low and flat; left bank protected by concrete wing wall.

EXTREMES OF DISCHARGE.—Maximum combined daily discharge of river and flume during year ending September 30, 1919, 17,400 second-feet January 23; minimum combined daily discharge 417 second-feet September 30.

Extremes of discharge for year ending September 30, 1920, not determined; both probably lower than previous year.

1899–1901, 1911, and 1913–1920: Maximum daily discharge, including flume, 18,100 second-feet December 18, 1917; minimum daily discharge including flume, 349 second-feet November 19, 1917.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—White River flume diverts water from river half a mile above gage. Total monthly discharge is computed from determinations of combined flow of river and flume.

ACCURACY.—Stage-discharge relation changed during flood on January 23, 1919, and several other times, November 1, 1919, to April 6, 1920, from various causes, such as drift, clogged intake, repairs to dam, etc. Rating curve used prior to the change on January 23, 1919, well defined above but not defined below 100 second-feet. Rating curve used for main channel April 1 to October 31, 1919, well defined; curve used for secondary channel April 2 to May 12, 1919, poorly defined, and curve used June 12 to October 31, 1919, well defined below 200 second-feet. Stage-discharge relation not defined November 1, 1919, to April 6, 1920. Rating curve used for main channel April 6 to September 11, 1920, well defined below 3,000 second-feet; curve used September 12–30, 1920, poorly defined. Rating curve used for secondary channel April 1 to September 30, 1920, fairly well defined between 20 and 200 second-feet. Daily discharge of main channel ascertained by applying to rating table mean daily gage height obtained by inspecting gage-height graph or, for days of considerable variation in stage, by averaging results obtained for shorter periods. Daily discharge of secondary channel ascertained by applying to rating table mean of two gage-height observations daily or for days on which flow in flume was regulated, by averaging results obtained by applying observed gage heights for intervals indicated by gage-height graph for flume or, for days on which gage was not read or two readings were insufficient because of frequent regulation, from well-defined curve showing relation of flow in main and in south channels. Records prior to flood on January 23, 1919, are good except for periods during which intake was clogged or rating was not available; records from April to October, 1919, and April to September, 1920, fair; records for remainder of period, poor.

COOPERATION.—Puget Sound Traction, Light & Power Co. furnished gage-height record and made most of the discharge measurements.

Discharge measurements of White River at Buckley, Wash., during the years ending Sept. 30, 1919 and 1920.

Main channel.				South channel.			
Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Nov. 1	Parker and Osgood	23.14	268	Apr. 2	Lee and Osgood	1.86	55.9
1	do	23.61	495	3	Osgood and Lee	3.63	386
1919.				25	Osgood and Roland	2.82	175
Feb. 10	Osgood and Roland	22.28	558	July 7	do	2.66	97.8
Apr. 2	Lee and Osgood	22.21	639	8	do	2.01	31.4
3	Osgood and Lee	23.59	1,950	26	do	2.12	36.8
25	Osgood and Roland	22.94	1,190	Aug. 11	do	1.82	14.5
May 12	Osgood and Wolslegel	22.24	650	Sept. 9	do	1.43	1.4
July 7	Osgood and Roland	22.50	795	9	do	1.40	.68
8	do	21.94	443	25	do	1.36	.60
25	do	22.04	514	Oct. 25	do	1.34	.47
Aug. 11	do	21.50	279	27	L. D. Carson	1.35	.36
Sept. 9	do	20.01	13.1	1920.			
25	do	20.00	11.3	Feb. 4	Osgood and Roland	2.36	66.9
Oct. 25	do	20.00	7.9	Apr. 10	Osgood and Forest	2.48	84.5
27	Carson and Osgood	19.96	6.0	27	do	1.88	31.6
27	do	19.96	6.0	June 12	do	2.52	105
Dec. 29	Osgood and Wolslegel	25.06	726	25	do	2.20	60.2
1920.							
Jan. 6	do	22.45	61.8				
7	do	22.00	31.0				
Feb. 5	do	24.92	878				
9	Osgood and Forest	24.48	540				
25	do	22.64	51.2				
Mar. 10	do	22.47	32.1				
25	do	22.59	36.2				
Apr. 19	do	25.38	1,360				
26	do	22.24	53.0				
May 8	Kilgore and Lee	26.14	2,420				
25	R. B. Kilgore	22.10	31.3				
June 11	Osgood and Forest	25.20	1,170				
26	do	24.55	624				
Aug. 26	Osgood and Osgood	21.68	7.8				
Sept. 6	Osgood and Roland	21.97	22.9				
20	Osgood and Osgood	22.45	22.6				

Daily discharge, in second-feet, of White River at Buckley, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	.....	400	100	203			1,160	1,550	1,680	469	307	400
2	.....	503	1,750	200			1,240	1,540	1,270	133	320	21
3	.....	298	6,300	203			1,940	1,460	1,470	591	520	11
4	.....	105	3,800	196			2,230	1,360	1,420	1,620	180	11
5	.....		2,590	186	600	300	1,990	857	1,540	1,870	230	10
6	.....		1,600	160			1,660	669	2,200	1,710	250	15
7	.....	80	1,130	153			1,060	570	2,340	960	380	11
8	.....		756	150			955	660	1,960	920	274	11
9	.....		308	136			845	875	730	980	312	10
10	.....	355	224	108			1,300	973	330	1,160	500	9
11	.....	777	200	100			1,510	1,140	620	1,270	230	13
12	.....	757	309	103			1,240	724	772	1,480	190	16
13	.....	546	1,760	98			1,330	630	835	1,440	46	11
14	.....		6,470	103			859	590	1,070	1,050	33	10
15	.....		4,880	108			723	730	1,280	1,160	33	11
16	.....	80	2,460	113	400	350	583	740	883	1,220	41	10
17	.....		1,220	981			930	400	810	1,220	250	10
18	.....	483	647	4,120			1,910	840	1,300	1,070	186	10
19	.....	339	410	4,190			1,960	1,740	2,190	879	115	11
20	.....	340	323	1,920			1,680	1,960	2,510	940	47	11
21	.....	214	396	1,590			1,230	2,160	2,580	489	41	9
22	.....		568	8,310			1,070	2,630	2,580	523	44	9
23	.....		314	17,000			1,030	1,350	2,390	405	62	9
24	.....		292	9,000			1,190	1,170	708	320	180	10
25	.....		597	4,500	400		1,310	1,380	715	630	45	10
26	.....	70	258	3,500		400	1,280	2,260	1,130	655	44	10
27	.....		239	2,400			1,550	3,490	1,690	700	45	9
28	579		292	1,700			1,400	3,320	1,680	410	48	8
29	538		566	1,000	.....		1,450	2,690	1,450	358	37	7
30	488		236	800	.....		1,520	2,240	823	230	15	7
31	395	.....	214	500	.....		.....	1,790	.....	430	73	.....

Daily discharge, in second-feet, of White River at Buckley, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.							
1	11		225	930	306	546	14
2	13		102	1,310	912	272	70
3	13		79	1,180	825	127	10
4	11	650	54	780	1,040	39	16
5	10			910	1,300	10	29
6	10		1,250	905	910	120	21
7	10	1,820		884	675	340	16
8	10	1,520		1,140	849	852	14
9	9	1,390		1,220	1,030	183	13
10	8	1,260	2,140	1,150	1,140	175	12
11	10	1,210	2,080	1,220	1,110	324	420
12	14	1,320	1,780	1,110	860	340	263
13	12	1,640	1,780	1,100	427	230	98
14	10	1,520	1,780	1,500	290	144	950
15	10	1,450	1,650	1,920	331	588	755
16	9	1,390	1,770	1,520		44	400
17	24	1,320	2,480	1,460		36	250
18	18	1,260	2,650	1,050		25	15
19	13	1,450	2,080	945	800	15	520
20	10	1,630	1,290	950		12	552
21	12	1,160	458	1,150		27	261
22	21		232	1,460		34	135
23	17	650	91	1,260	89	29	337
24	12		59	998	95	22	684
25	10	54	104	824	60	14	413
26	9	51	60	671	102	13	1,170
27	8	379	50	1,190	360	10	1,250
28	12	709	385	1,460	380	17	97
29	20	581	837	1,650	318	31	158
30	16	400	1,000	1,630	294	31	376
31	18	.....	980	.....	370	15	.....

NOTE.—Daily discharge not determined Oct. 1-27, Nov. 5-9, 14-17, and 22-30, 1918; intake clogged on stage below limit for which rating curve is defined. Mean discharge for month of October and estimates of discharge for periods in November determined by detailed study of gage-height charts of river and flume, gage readings at the diversion dam half a mile above gage, and knowledge of conditions at the station. Discharge Jan. 23 to Mar. 31, 1919, determined from the difference in flow of Puyallup River at gaging stations at Alderton and Puyallup. Comparisons of discharge indicate that combined flow of White River and flume at Buckley, corrected for storage in Lake Tapps, is about 85 per cent of inflow into Puyallup River between Alderton and Puyallup. Daily discharge April to October, 1919, and April to September, 1920, obtained by rating main and secondary channels separately and combining results. Braced figures show mean discharge for periods included.

Monthly discharge of White River and flume at Buckley, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 424 square miles.]

Month.	Discharge in second-feet.						Run-off (combined).	
	Combined.		River (mean).	Flume (mean).	Combined.			
	Maximum.	Minimum.			Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.								
October	2,510	.....	80.0	847	927	2.19	2.52	57,000
November	1,650	740	216	732	948	2.24	2.50	56,400
December	7,280	900	1,330	1,000	2,330	5.50	6.34	143,000
January	17,400	693	2,060	853	2,910	6.86	7.91	179,000
February	.....	.....	471	717	1,190	2.81	2.93	66,100
March	.....	.....	352	864	1,220	2.88	3.32	75,000
April	3,040	1,340	1,340	714	2,050	4.83	5.39	122,000
May	4,410	1,510	1,440	873	2,310	5.45	6.28	142,000
June	2,700	1,730	1,430	784	2,210	5.21	5.81	132,000
July	2,180	1,140	880	810	1,690	3.99	4.60	104,000
August	1,090	734	164	821	985	2.32	2.68	60,600
September	974	417	23.7	613	637	1.50	1.67	37,900
The year	17,400	417	818	805	1,620	3.82	51.95	1,180,000
1919–20.								
October	674	400	12.6	485	498	1.17	1.35	30,600
November	.....	.....	[a] 200	1,030	1,230	2.90	3.24	73,200
December	.....	.....	[a] 500	846	1,350	3.18	3.67	83,000
January	.....	.....	[a] 1,400	698	2,100	4.95	5.71	129,000
February	.....	.....	[a] 800	668	1,470	3.47	3.74	84,600
March	.....	.....	[a] 120	808	928	2.19	2.52	57,100
April	.....	1,190	979	513	1,490	3.51	3.92	88,700
May	2,730	1,270	1,050	675	1,720	4.06	4.68	106,000
June	2,660	1,310	1,180	707	1,890	4.46	4.98	112,000
July	2,030	730	635	747	1,380	3.25	3.75	84,800
August	1,130	609	150	782	932	2.20	2.54	57,300
September	1,980	533	311	627	938	2.21	2.47	55,800
The year	.....	.....	610	716	1,330	3.14	42.57	962,000

[a] Discharge assumed as 85 per cent of difference between mean monthly discharge of Puyallup River at Puyallup and at Alderton, corrected for storage in Lake Tapps, and less mean monthly discharge of White River flume.

WHITE RIVER FLUME AT BUCKLEY, WASH.

LOCATION.—In sec. 35, T. 20 N., R. 6 E., 800 feet below intake, on left side of White River half a mile above Northern Pacific Railway crossing and 1 mile northeast of Buckley, Pierce County.

RECORDS AVAILABLE.—January 18, 1913, to September 30, 1920.

GAGE.—Stevens long-distance water-stage recorder with transmitter at stilling well on right side of flume 800 feet below headgate and recorder in gate house; installed January 12, 1918. Prior to January 12, 1918, Fuller water-stage recorder 800 feet below headgate. Recorder inspected by O. E. Osgood.

DISCHARGE MEASUREMENTS.—Made from footbridge 8 feet below gage.

CHANNEL AND CONTROL.—Control formed by long section of flume bottom below gage. A rock spill a quarter of a mile below gage is partial control also. Stage-discharge relation affected by variable quantity of rocks which work their way from intake to rock spill.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 6.20 feet at 4.30 p. m., October 28 (discharge, 2,140 second-feet); no flow in flume when headgates are closed for cleaning flume or on account of high water.

Maximum stage during year ending September 30, 1920, from recorder, 6.15 feet December 17 (discharge, 1,960 second-feet); no flow in flume when headgates are closed.

1913–1920: Maximum stage recorded on October 28, 1918; no flow in flume when headgates are closed.

ICE.—Stage-discharge relation affected by ice during severe winters.

REGULATION.—Gates at intake are operated frequently to control flow.

ACCURACY.—Stage-discharge relation changed frequently; affected by rocks washed into flume and by repairs to flume; affected by ice December 9–16, 1919. Rating curves well defined by frequent measurements. Shifting-control methods used January 21 to February 9 and July 27 to August 8, 1919, and March 26 to May 23 and June 13–25, 1920. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table the daily mean gage height determined from gage-height graph by inspection, or for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent except for period when stage-discharge relation was affected by ice.

COOPERATION.—Puget Sound Power & Light Co. furnished gage-height record and most of discharge measurements.

Flume diverts water from left bank of White River in SE. ¼ sec. 35, T. 20 N., R. 6 E. Water is used for power development at Dieringer and is discharged into Stuck River.

Discharge measurements of White River flume at Buckley, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 10	O. E. Osgood	2.88	646	Oct. 27	Carson and Osgood	1.98	401
25	....do	3.61	960	Dec. 29	Osgood and Wolslegel	2.76	667
31	G. L. Parker	2.76	731				
Nov. 2	....do	1.41	251	1920.			
25	Osgood and Roland	3.06	741	Jan. 6	....do	3.22	812
Dec. 10	....do	4.48	1,240	Feb. 5	....do	2.93	727
16	....do	5.52	1,680	25	Osgood and Forest	2.70	630
				Mar. 10	....do	2.50	556
1919.				25	....do	3.37	857
Jan. 10	O. E. Osgood	2.66	623	Apr. 26	....do	4.94	1,330
20	....do	6.02	1,930	May 9	Wolslegel and Forest	5.06	1,300
Feb. 10	Osgood and Wolslegel	3.06	652	24	Osgood and Kilgore	4.95	1,380
26	Osgood and Roland	3.90	973	24	....do	4.94	1,360
Mar. 10	Osgood and Wolslegel	3.98	1,020	25	....do	3.50	840
Apr. 2	Osgood and Lee	3.74	911	25	....do	3.50	861
25	Osgood and Roland	3.34	776	28	Osgood and Forest	3.02	690
May 10	Osgood and Wolslegel	3.73	857	June 12	....do	3.14	713
July 8	Osgood and Roland	3.48	853	26	....do	3.04	768
26	....do	2.95	657	July 9	Wolslegel and Forest	2.54	624
Aug. 9	....do	3.28	799	Aug. 26	Osgood and Osgood	2.65	631
9	....do	2.60	590	Sept. 6	Osgood and Roland	2.45	575
Sept. 25	....do	2.54	567	20	Osgood and Osgood	2.84	687
Oct. 25	....do	2.14	428				

Daily discharge, in second-feet, of White River flume at Buckley, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	588	546	853	702	1,400	994	856	822	786	1,320	754	427
2	558	530	1,450	686	763	692	901	765	839	1,800	711	702
3	648	611	923	686	1,190	970	430	583	751	1,260	499	702
4	558	816	670	654	631	1,260	805	466	897	384	792	654
5	984	743	730	654	680	1,180	699	822	958	303	744	622
6	836	707	953	638	572	1,180	554	908	319	379	784	735
7	975	689	1,050	622	611	1,100	802	994	0	795	713	638
8	638	671	1,270	606	368	994	674	995	289	804	805	575
9	560	671	1,440	606	299	1,030	706	890	1,510	856	701	606
10	590	458	1,320	622	599	966	957	818	1,860	890	545	560
11	944	220	1,240	622	877	994	788	625	1,370	803	814	693
12	1,640	37	1,050	622	674	924	662	994	958	529	866	958
13	1,080	360	1,130	606	674	734	436	958	958	440	905	670
14	819	1,170	806	590	767	754	754	924	804	805	905	670
15	670	1,360	147	590	518	771	722	994	584	890	975	670
16	806	1,570	824	661	676	577	761	1,100	924	958	975	670
17	1,050	1,250	1,370	1,700	578	839	856	1,470	972	803	797	638
18	785	667	1,650	1,920	596	832	641	795	539	600	853	622
19	702	718	1,570	1,920	619	773	507	37	0	608	940	670
20	670	654	1,480	1,870	994	856	499	61	54	576	975	686
21	638	739	1,140	1,160	949	856	771	195	114	1,030	975	575
22	575	819	891	779	451	760	738	752	123	994	940	544
23	590	752	1,050	392	407	486	722	1,910	255	1,100	890	560
24	718	735	940	509	767	778	754	1,690	1,860	1,140	739	575
25	940	702	599	438	805	822	788	1,350	1,860	730	940	575
26	785	686	870	392	786	805	679	1,060	1,450	562	905	575
27	1,340	670	853	508	866	805	546	924	594	477	785	528
28	1,930	752	788	729	958	805	805	924	490	771	686	468
29	1,130	836	490	1,070	.....	793	788	773	463	856	752	424
30	798	835	768	1,440	.....	604	805	709	924	954	870	410
31	707	.....	686	1,650	.....	856	.....	758	.....	706	910	.....
1919–20.												
1	498	1,690	511	180	393	577	559	1,300	414	1,720	430	560
2	646	1,780	819	179	633	594	518	1,300	0	1,060	739	577
3	498	1,320	718	598	760	577	495	1,260	372	1,060	867	594
4	453	1,780	702	952	743	594	1,300	1,220	1,020	732	952	577
5	424	1,550	686	898	709	594	1,540	788	1,100	366	1,020	544
6	424	1,160	670	828	660	594	1,030	772	1,100	648	941	512
7	424	975	638	800	468	577	64	491	1,060	858	746	528
8	424	785	622	760	364	560	0	329	934	691	271	577
9	410	702		743	586	577	0	888	730	510	890	594
10	392	686		709	623	594	0	171	730	408	958	560
11	453	785		692	367	577	0	0	730	324	766	698
12	498	718		676	1,060	863	0	0	730	467	784	1,410
13	468	670	200	676	1,010	1,600	0	0	718	800	894	1,100
14	438	802		660	819	1,660	0	0	740	952	915	1,080
15	424	1,450		828	501	1,500	0	0	745	912	428	410
16	410	1,870		1,470	741	1,260	0	0	733	604	982	453
17	645	1,870	1,550	1,150	751	1,100	0	99	803	694	857	619
18	573	1,610	1,620	709	811	970	0	76	1,060	330	676	811
19	483	1,780	1,650	743	777	898	0	65	1,030	436	643	256
20	453	1,240	1,780	709	760	864	0	671	1,040	417	760	266
21	453	1,090	1,740	798	726	898	292	1,330	928	750	846	542
22	544	1,120	1,650	772	692	881	291	1,410	935	856	916	842
23	544	587	1,780	777	676	828	527	1,450	784	949	916	687
24	483	132	1,920	615	660	864	948	1,410	772	959	881	539
25	438	0	1,720	185	643	881	1,140	1,230	760	670	709	645
26	424	0	1,080	253	626	530	1,340	1,250	766	937	610	294
27	410	213	858	339	626	496	1,340	1,290	263	779	692	544
28	524	802	491	679	594	794	1,340	906	0	849	762	745
29	654	940	654	881	594	568	1,340	483	0	921	920	778
30	560	862	409	787	.....	606	1,340	361	222	819	864	521
31	555	.....	366	580	.....	575	.....	390	.....	667	594	.....

NOTE.—Braced figures showing mean discharge for periods included were estimated from observer's notes and fragmentary gage-height record.

Monthly discharge of White River flume at Buckley, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	1,930	558	847	52,100
November	1,570	37	732	43,600
December	1,650	147	1,000	61,500
January	1,920	392	859	52,800
February	1,400	299	717	39,800
March	1,260	486	864	53,100
April	957	430	714	42,500
May	1,910	37	873	53,700
June	1,860	0	784	46,700
July	1,800	303	810	49,800
August	975	499	821	50,500
September	958	410	613	36,500
The year	1,930	0	805	583,000
1919–20.				
October	654	392	485	29,800
November	1,870	0	1,030	61,300
December	1,920	.....	846	52,000
January	1,470	179	698	42,900
February	1,060	364	668	38,400
March	1,660	496	808	49,700
April	1,540	0	513	30,500
May	1,450	0	675	41,500
June	1,100	0	707	42,100
July	1,720	324	747	45,900
August	1,020	271	782	48,100
September	1,410	258	627	37,300
The year	1,920	0	716	520,000

DUWAMISH RIVER BASIN.

CEDAR RIVER AT CEDAR FALLS, WASH.

LOCATION.—In sec. 4, T. 22 N., R. 8 E., below Seattle municipal power plant at Cedar Falls, King County, and 3½ miles above Taylor Creek.

DRAINAGE AREA.—83 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 9, 1914, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank, 0.7 mile below power plant; installed April 8, 1914; inspected by G. H. Moore and T. S. Beals.

DISCHARGE MEASUREMENTS.—Made from cable 90 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel; shifts at extremely high water. Banks high. One channel at all stages. Stage of zero flow, according to measurements made September 9, 1919, at gage height 3.2 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 6.9 feet at 1 p. m., January 23, when pipe line broke (discharge, 1,280 second-feet); minimum stage, from recorder, 3.69 feet at. 7 p. m. August 27 (discharge, 8 second-feet).

Maximum stage during year ending September 30, 1920, from water-stage recorder, 6.06 feet from 7 to 11 a. m. January 31 (discharge, 776 second-feet); minimum stage, from recorder, 4.25 feet from 6 to 8 p. m., October 7 (discharge, 57 second-feet).

1914–1920: Maximum stage recorded, 11.4 feet at 9 a. m., December 19, 1917 (discharge, 6,290 second-feet); minimum stage recorded, 3.32 feet at 4 p. m. November 25, 1917 (discharge, zero).

ICE.—Stage-discharge relation not affected by ice.

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DIVERSIONS.—Seattle municipal power plant diverts water directly from Cedar Lake through a pressure pipe and returns it to the river at the plant above the gage. Practically the entire low-water flow is carried through the plant.

REGULATION.—Flow partly controlled by storage and release of water in Cedar Lake reservoir to accommodate requirements of Seattle municipal power plant.

ACCURACY.—Stage-discharge relation changed slightly on night of December 3, 1918. Rating curves well defined. Operation of water-stage recorder excellent except for periods October 14–19 and December 24–31, 1918. Daily discharge ascertained by use of discharge integrator. Records excellent except for periods for which no gage-height record was obtained from water-stage recorder.

COOPERATION.—Gage-height record and part of the discharge measurements furnished by city engineer of Seattle.

Discharge measurements of Cedar River at Cedar Falls, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Jan. 8	Hunt and Moore	5.32	353	Mar. 17	G. H. Moore	5.23	350
June 19	R. B. Kilgore	5.37	413	July 19	R. B. Kilgore	4.86	212
20	do	5.35	402	Sept. 18	do	5.13	312
July 7	do	5.20	334	19	do	4.88	217
8	do	5.24	357				
Sept. 9	do	4.71	140				
9	do	4.35	67.2				

Daily discharge, in second-feet, of Cedar River at Cedar Falls, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	114	547	281	350	605	301	241	396	644	350	123	60
2	105	498	376	380	610	262	234	402	525	321	107	88
3	106	453	960	394	354	294	236	388	422	334	88	97
4	108	433	835	385	110	294	252	328	428	277	123	113
5	109	400	756	356	110	294	258	380	433	281	124	101
6	102	345	688	394	107	292	234	408	430	266	126	78
7	111	348	412	393	114	296	266	400	412	312	124	59
8	109	345	290	379	294	286	278	410	354	336	122	92
9	113	343	327	352	294	244	285	406	414	320	104	102
10	115	323	344	366	330	278	293	404	422	315	87	106
11	154	334	360	352	337	280	306	366	418	317	114	124
12	168	329	378	256	342	276	333	412	422	296	116	66
13	132	339	646	282	336	274	288	404	412	256	120	60
14		520	840	334	334	273	326	411	382	306	129	62
15		649	672	338	331	262	327	414	332	313	112	102
16	190	622	612	384	295	236	362	414	384	313	98	115
17		615	547	383	344	256	372	404	390	316	84	111
18		633	520	494	345	258	378	350	384	312	140	114
19		506	500	750	346	301	361	402	385	304	119	124
20	230	348	472	758	338	270	311	406	384	277	118	78
21	238	348	448	739	330	256	362	410	348	228	114	62
22	262	341	331	846	288	254	379	409	312	198	101	94
23	288	340	292	798	278	210	374	412	360	191	106	117
24	303	331		660	310	230	388	400	364	168	60	114
25	305	340	600	652	320	238	291	348	368	164	98	118
26	306	318		754	313	238	368	422	370	160	104	125
27	321	292		742	301	237	318	436	369	90	100	84
28	345	286		692	301	239	374	625	351	134	110	80
29	462	312	400	646	.....	232	390	725	287	136	100	105
30	664	325		612	.....	202	394	672	350	121	70	126
31	618	.....		610	.....	235	.....	664	.....	130	60	.....

Daily discharge, in second-feet, of Cedar River at Cedar Falls, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	134	298	378	340	536	339	320	319	332	294	102	110
2	134	304	382	362	542	340	330	279	327	301	110	108
3	134	318	373	360	531	336	321	313	335	310	120	108
4	94	335	372	349	516	334	329	312	342	270	118	102
5	70	329	364	365	510	335	390	316	336	264	116	93
6	122	326	352	363	482	326	360	318	298	302	116	102
7	123	317	322	361	458	300	356	324	263	309	115	106
8	124	312	342	370	420	322	345	331	247	296	104	118
9	122	294	338	360	450	320	336	296	257	296	110	128
10	124	302	345	358	448	319	328	331	341	302	120	124
11	132	278	344	322	446	312	290	322	339	269	116	126
12	208	306	342	345	440	321	334	324	334	303	112	130
13	210	315	338	342	440	344	339	314	295	248	114	211
14	212	320	313	331	432	330	342	323	330	202	106	293
15	216	366	334	343	405	344	336	324	337	198	98	294
16	217	329	323	372	425	332	340	284	336	196	107	290
17	218	338	349	394	434	324	319	311	334	196	120	286
18	220	347	342	370	432	322	291	329	331	176	112	278
19	224	352	333	402	429	316	330	328	324	203	110	252
20	250	346	334	382	425	305	329	320	290	216	115	286
21	254	347	317	370	412	274	329	324	330	210	108	286
22	258	340	331	374	392	310	332	334	338	156	90	295
23	264	319	344	384	387	318	330	300	326	126	110	297
24	264	336	370	396	404	318	321	328	334	120	118	312
25	180	350	342	454	389	316	280	341	330	100	126	312
26	95	352	340	450	387	318	323	342	316	136	106	290
27	194	326	335	455	374	311	321	334	260	140	116	314
28	210	363	318	532	354	284	329	341	309	130	104	313
29	214	374	340	662	324	312	332	342	308	126	110	309
30	196	362	352	736	.....	326	334	294	304	118	118	308
31	217	.....	352	657	.....	320	.....	292	.....	118	118	.....

NOTE.—Oct. 14–19 and Dec. 21–31, 1918, recorder clock not running but range of stage recorded; discharge ascertained by comparison with record of flow at Landsberg after estimating inflow between Cedar Falls and Landsberg. Braced figures show mean discharge for periods included.

Monthly discharge of Cedar River at Cedar Falls, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 83 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	664	102	227	.....	.....	14,000
November	649	286	405	.....	.....	24,100
December	960	281	506	.....	.....	31,100
January	846	256	511	.....	.....	31,400
February	610	107	311	.....	.....	17,300
March	301	202	261	.....	.....	16,000
April	394	234	319	.....	.....	19,000
May	725	328	433	.....	.....	26,600
June	644	287	395	.....	.....	23,500
July	350	90	253	.....	.....	15,600
August	140	60	106	.....	.....	6,520
September	126	59	95.9	.....	.....	5,710
The year	960	59	319	3.84	52.12	231,000
1919–20.						
October	264	70	182	.....	.....	11,200
November	374	278	330	.....	.....	19,600
December	382	313	344	.....	.....	21,200
January	736	322	408	.....	.....	25,100
February	542	324	435	.....	.....	25,000
March	344	274	320	.....	.....	19,700
April	390	280	330	.....	.....	19,600
May	342	279	319	.....	.....	19,600
June	342	247	316	.....	.....	18,800
July	310	100	214	.....	.....	13,200
August	126	90	112	.....	.....	6,890
September	314	93	219	.....	.....	13,000
The year	736	70	293	3.53	48.05	213,000

CEDAR RIVER NEAR LANDSBERG, WASH.

LOCATION.—In sec. 17, T. 22 N., R. 7 E., 1¾ miles above intake of Seattle water-supply system at Landsberg, 3 miles northeast of Ravensdale, King County, and 5 miles below Taylor Creek.

DRAINAGE AREA.—135 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 30, 1914, to September 30, 1920; July 25, 1895, to September 30, 1898, at Clifford Bridge, 2 miles below present gage; March 24, 1901, to April 30, 1912, at intake of Seattle water-supply system, 1¾ miles below present gage. Early records not exactly comparable with those for present site because of small difference in drainage area.

GAGE.—Stevens continuous water-stage recorder installed April 29, 1914, on right bank; inspected by G. H. Moore and T. S. Beals.

DISCHARGE MEASUREMENTS.—Made from cable at gage or by wading.

CHANNEL AND CONTROL.—Bed composed of large boulders and gravel. Control formed by broad riffle about 1,200 feet below gage; shifts at extremely high water. Logs may lodge on riffle. One channel at all stages. Stage of zero flow according to measurements made August 27, 1916, about gage height 2.5 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 9.6 feet at 9 p. m. January 22 (discharge, 3,160 second-feet); minimum stage from recorder, 4.33 feet at 10 p. m. September 28 (discharge, 218 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 7.8 feet at about 9 a. m. January 28 (discharge, 1,860 second-feet); minimum stage, from recorder, 4.35 feet at noon and 11 p. m. October 7 and noon October 9 (discharge, 222 second-feet).

1914–1920: Maximum stage from recorder, 13.55 feet at 10 p. m. December 29, 1917 (discharge, 7,500 second-feet); minimum stage from recorder, 4.35 feet at 1 a. m. October 15, 1914 (discharge, 162 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—Flow partly controlled by storage and release of water in Cedar Lake reservoir to accommodate requirements of Seattle municipal power plant.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder excellent except as indicated in footnote to table of daily discharge. Daily discharge ascertained by use of discharge integrator except as indicated in footnote to table of daily discharge and except January 22 and 23, 1919, when, because of considerable variation in stage, discharge was determined by averaging results obtained by applying mean gage height for short intervals to rating table. Records excellent except for periods when recorder was out of order, for which they are fair.

COOPERATION.—Gage-height record and part of discharge measurements furnished by city engineer of Seattle.

Discharge measurements of Cedar River near Landsberg, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
June 20	R. B. Kilgore	5.98	759	Mar. 18	Moore and Beals	6.00	795
July 8	do	5.74	680	July 20	R. B. Kilgore	5.32	509
Sept. 10	do	4.86	354	Sept. 18	do	5.30	512

Daily discharge, in second-feet, of Cedar River near Landsberg, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	237		510	740	1,270		776	927	1,180	698	390	248
2	231		919	760	1,260		762	962	1,040	670	366	266
3	230		1,900	770	1,020		770	920	901	681	347	280
4	230		1,620	780	674		865	849	892	629	377	291
5	244		1,390	750			831	886	888	623	376	282
6	243		1,230	800			772	898	872	614	376	281
7	254	640	883	790		940	780	884	852	646	373	250
8	240		691	784			772	893	774	672	364	266
9	240		709	750			783	894	856	648	348	282
10	240		707	775			872	897	886	644	331	287
11	356		719	775	850		852	872	870	641	348	310
12	430		808	696			849	906	858	624	352	338
13	305			700		857	780	892	848	580	352	266
14	307	809		760		837	816	890	835	624	355	251
15	310	1,020	1,400	755		827	790	944	760	627	348	273
16	354	995		808		781	812	970	803	621	323	294
17	512	946		1,220		848	929	934	802	620	308	296
18	448	923	1,050	1,660		909	968	864	785	614	347	289
19	430	778	1,010	1,830		936	932	912	783	614	335	295
20		588	970	1,650		886	893	905	778	586	326	270
21		574	900	1,560		838	956	904	744	551	331	236
22		565	781	2,410		822	926	912	702	503	308	256
23		552	647	2,480	930	772	902	898	736	500	310	274
24		559	1,030	1,880		782	914	875	752	476	262	281
25	700	557	1,060	1,690		761	963	835	740	467	292	277
26		545	972	1,740		764	958	963	746	453	294	278
27		510	774	1,650		754	878	998	741		292	265
28		534	775				920	1,100	723	400	288	233
29		546	766	1,400	.....	750	914	1,240	660		290	267
30		558	760		.....		910	1,220	700		264	285
31		.....	762		.....		.....	1,190	.....	386	250	.....
1919–20.												
1	302	752	658	703	1,360	710	764	754	661	599	353	293
2	300	676	638	708	1,320	708	772	706	659	606	351	288
3	302	638	628	700	1,190	704	745	714	666	616	352	290
4	262	804	622	684	1,110	710	1,050	720	668	576	348	280
5	238	740	605	690	1,080	713	1,520	712	666	570	341	276
6	263	660	590	680	1,080	704	1,140	725	636	604	334	273
7	273	624	556	677	1,020	670	1,020	720	626	609	329	286
8	278	585	562	676	956	688	928	734	616	603	318	292
9	277	544	550	668	972	698	858	698	606	599	320	300
10	278	572	549	662	958	692	861	720	688	603	324	331
11	309	595	549	630	946	686	814	699	687	568	320	346
12	376	581	543	646	925	751	846	694	685	638	309	510
13	364	585	534	649	914	1,100	884	682	646	579	308	526
14	358	652	513	646	902	1,050	854	679	710	519	300	652
15	360	974	518	664	870	915	831	674	725	510	295	592
16	358	906	534	890	887	840	830	640	702	490	295	541
17	388	786	762	1,210	882	796	817	712	711	485	306	516
18	386	727	688	1,170	879	776	780	715	700	464	304	496
19	377	816	641	1,320	870	774	869	695	690	480	296	464
20	400	752	671	1,090	858	759	869	686	640	491	301	492
21	408	707	662	970	842	715	843	682	676	491	296	553
22	498	671	671	920	806	746	838	682	686	446	290	570
23	475	620	740	892	780	742	812	656	679	402	295	594
24	446	634	1,010	906	782	790	792	678	676	394	302	664
25	389	637	920	1,400	777	766	778	678	671	372	304	652
26	252	624	803	1,260	768	750	792	676	656	382	289	604
27	346	593	732	1,370	754	744	763	672	590	388	304	599
28	392	610	682	1,760	731	712	770	676	624	378	297	580
29	472	665	690	1,700	694	780	760	685	624	375	338	558
30	414	669	768	1,670	.....	804	760	652	616	364	352	552
31	430	.....	750	1,570	.....	782	.....	638	.....	364	308	.....

NOTE.—Only total range of stage recorded for each of following periods when clock of gage did not run: Oct. 20 to Nov. 13, Dec. 13–17, 1918, Jan. 28–31, Feb. 4 to Mar. 12, Mar. 27–31, and July 27–30, 1919; discharge obtained by estimating inflow between Cedar Falls and Landsberg from hydrographic comparison of inflow with South Fork of Snoqualmie River and then adding estimated inflow to results at Cedar Falls. Recorder clock did not run Dec. 10–14, 1919; slight range in stage indicated by instrument and probable gage-height graph was sketched on chart by comparison with record of flow at Cedar Falls. Clock stopped Jan. 23 to Feb. 2, Feb. 16–29, Mar. 9–14, 1920; no clock on recorder Mar. 15 to May 6, 1920; probable gage-height graph sketched on chart after detailed study of range in stage indicated by instrument during each period and records of flow at Cedar Falls and Landsberg weir. Braced figures show mean discharge for periods included.

Monthly discharge of Cedar River near Landsberg, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 135 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October		230	459			28,200
November	1,020	510	663			39,500
December	1,900	510	1,010			62,100
January	2,480	696	1,210			74,400
February	1,270		914			50,800
March			860			52,900
April	968	762	862			51,300
May	1,240	835	943			58,000
June	1,180	660	817			48,600
July	698		568			34,900
August	390	250	330			20,300
September	338	233	276			16,400
The year	2,480	230	742	5.50	74.66	537,000
1919–20.						
October	498	238	354			21,800
November	974	544	680			40,500
December	1,010	513	656			40,300
January	1,760	630	974			59,900
February	1,360	694	928			53,400
March	1,100	670	767			47,200
April	1,520	745	865			51,500
May	754	638	692			42,500
June	725	590	663			39,500
July	638	364	502			30,900
August	353	289	315			19,400
September	664	273	466			27,700
The year	1,760	238	654	4.84	65.88	475,000

SNOHOMISH RIVER BASIN.

SOUTH FORK OF SKYKOMISH RIVER NEAR INDEX, WASH.

LOCATION.—In NE. ¼ sec. 29, T. 27 N., R. 10 E., 300 feet above Sunset Falls, 2 miles southeast of Index and mouth of North Fork, Snohomish County.

DRAINAGE AREA.—351 square miles (measured on topographic and county maps).

RECORDS AVAILABLE.—October 1, 1902, to September 30, 1905; April 26, 1911, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank; installed September 14, 1920; inspected by Bert Kanters. Prior to September 14, 1920, inclined and vertical staff gage at same datum and site; read by Roy Williams and Gene Brown. Location of gage unchanged since establishment. Datum raised 0.61 foot April 26, 1911, and lowered 1.00 foot April 19, 1914; after which there has been no change.

DISCHARGE MEASUREMENTS.—Made from cable a mile below gage, from bridge 100 feet below gage, or by wading nearly a mile below gage.

CHANNEL AND CONTROL.—Bed at measuring section composed of gravel and small boulders. Sunset Falls, 300 feet below gage, forms solid rock control. Stage-discharge relation changed by blasting at falls in July, 1914, and by shifting of channel above falls during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 16.0 feet at 7.30 a. m. December 14 (discharge, 25,900 second-feet); minimum stage recorded, 1.00 foot September 29-30 (discharge, 359 second-feet).

Maximum stage recorded during year ending September 30, 1920, 16.5 feet at 2.05 p. m. November 15 (discharge, 26,400 second-feet); minimum stage recorded 0.90 foot October 7 (discharge, 333 second-feet).

1902–1905; 1911–1920: Maximum stage recorded, 22.6 feet at 9 a.m. December 18, 1917 (discharge, 47,000 second-feet; minimum stage recorded, 0.54 foot September 30, 1915 (discharge, 262 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed slightly during flood on December 14, 1918. Rating curve used before the change well defined below 12,000 second-feet; curve used after the change well defined below 16,000 second-feet. Gage read to half-tenths once daily, more often at extremely high stages during 1919. Daily discharge ascertained by applying daily mean gage height to rating table. Records for years ending September 30, 1919 and 1920, excellent. Revised records, 1902–1905, and 1911–1914, determined from a rating curve well defined below 10,000 second-feet using gage heights reduced to datum of present gage. Records for these periods excellent except for extremely high stages and for periods for which mean discharge was estimated by comparison with records of flow of Snoqualmie River, for which they are poor.

Discharge measurements of South Fork of Skykomish River near Index, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 8	T. G. Bedford	3.16	1,360	Aug. 31	Bert Kanters	2.48	885
1919.				Sept. 2	do	1.89	647
June 21	L. D. Carson	7.49	5,770	4	do	1.66	657
23	do	6.69	4,670	6	do	1.48	516
Sept. 18	do	1.50	521	8	do	1.37	447
1920.				9	do	2.08	760
May 19	R. B. Kilgore	5.37	3,170	12	do	7.84	6,230
July 14	Newton and Lee	3.75	1,790	14	McCombs and Kanters	10.22	10,500
Aug. 26	Parker and Kanters	1.23	430	16	Bert Kanters	5.25	3,010
26	do	1.22	403	18	do	4.05	1,860
29	Bert Kanters	2.87	1,120	21	do	6.83	4,620
				23	do	5.43	3,180

Daily discharge, in second-feet, of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1902-3.												
1		1,620	11,100	2,520	1,360	1,020	2,220	2,150	6,960	4,610	1,360	728
2		1,940	4,720	3,000	1,020	974	2,220	2,600	5,760	3,710	1,410	654
3		2,360	3,080	26,000	1,110	930	2,010	2,600	4,610	3,440	1,260	654
4	850	1,940	3,000	12,400	1,020	1,020	2,220	3,350	4,200	3,260	1,160	654
5		1,560	2,440	7,110	1,020	846	1,460	3,800	3,620	3,710	1,160	618
6		1,310	2,010	5,640	974	846	1,510	4,500	5,640	3,170	1,160	690
7	690	1,800	1,680	4,100	974	930	1,740	4,300	6,960	2,920	1,210	3,260
8	654	3,080	1,560	3,260	930	846	2,080	3,440	9,280	2,920	1,160	1,870
9	654	2,760	2,840	3,080	1,310	846	1,620	3,710	9,660	3,170	1,160	1,410
10	618	2,440	2,220	2,760	2,010	1,620	1,410	3,620	8,910	3,000	1,160	3,260
11	618	3,260	1,870	2,440	1,410	2,150	1,560	3,260	9,280	3,080	1,160	2,220
12	584	2,840	1,560	2,150	1,160	1,460	1,160	5,050	7,110	3,080	1,160	2,150
13	550	2,150	1,460	1,940	1,110	1,260	1,110	5,760	6,820	2,840	1,060	2,080
14	550	1,740	1,360	1,740	974	1,210	1,110	4,830	5,760	2,680	1,060	2,150
15	550	1,620	1,210	1,620	1,020	1,110	1,110	4,940	7,260	2,520	1,060	1,800
16	584	2,360	1,110	1,560	930	930	1,160	4,610	8,910	2,440	930	1,160
17	584	3,080	1,060	1,460	930	888	1,310	3,710	6,960	2,680	888	1,260
18	550	3,530	1,020	1,460	888	846	1,360	3,260	6,400	2,680	888	974
19	518	2,520	974	1,940	888	806	1,360	2,920	4,500	2,760	930	974
20	518	1,940	974	3,080	846	846	1,360	2,680	6,270	2,520	888	1,060
21	518	1,620	888	4,720	888	806	1,460	2,290	5,760	2,760	846	1,160
22	457	1,510	888	3,900	888	888	2,150	2,220	4,500	3,260	806	3,080
23	457	1,410	888	3,350	1,020	930	2,290	2,220	4,610	2,440	846	1,940
24	487	1,680	1,060	3,530	1,060	930	2,080	2,600	4,500	2,520	846	1,360
25	487	1,560	5,760	4,100	1,060	1,310	2,520	3,440	5,160	1,940	846	2,080
26	457	1,410	6,270	2,760	1,060	1,460	3,260	4,100	6,540	1,800	806	1,740
27	457	1,620	3,800	2,220	1,060	1,260	2,760	4,100	7,110	1,620	806	1,740
28	584	1,460	3,000	1,940	1,020	2,600	2,520	3,900	5,760	1,620	766	1,410
29	1,060	1,360	2,220	1,620	.....	2,920	2,360	3,710	4,500	1,510	766	1,680
30	1,510	3,350	2,840	1,460	.....	2,360	2,290	5,640	4,610	1,460	766	1,510
31	1,800	.....	3,440	1,410	.....	2,680	.....	8,380	.....	1,410	766	.....
1903-4.												
1	1,310	1,460	10,200	1,310	1,110	846	1,020	3,350	3,900	4,400	1,210	550
2	1,360	1,680	7,720	930	1,060	806	1,210	2,920	4,100	3,900	1,210	550
3	1,310	1,740	4,300	1,210	1,110	846	1,210	2,920	5,400	4,000	1,110	518
4	3,080	1,510	3,000	1,410	1,160	806	1,210	2,920	4,720	3,530	1,110	584
5	6,960	3,080	2,290	1,360	1,210	974	1,740	3,080	5,400	4,000	1,060	584
6	7,560	5,280	2,360	1,310	1,210	2,010	2,290	2,520	5,520	3,710	1,060	618
7	4,500	3,170	2,220	1,680	1,160	4,720	1,800	2,600	3,900	3,530	1,020	618
8	3,080	2,360	1,940	2,150	1,060	4,720	1,560	2,290	3,260	3,080	1,020	618
9	3,080	2,010	1,680	2,220	1,020	3,350	1,940	2,150	3,800	3,080	888	618
10	3,170	2,150	1,620	1,940	930	3,170	3,260	2,290	3,440	3,080	846	690
11	3,530	2,150	1,110	2,600	888	2,440	4,300	2,220	3,080	2,840	806	766
12	3,900	2,220	1,060	2,600	930	1,510	5,760	2,520	3,440	2,680	766	487
13	2,920	1,740	1,940	7,560	888	1,410	7,410	3,080	3,530	2,080	766	457
14	2,680	1,560	1,680	9,470	846	1,360	7,720	3,900	4,720	1,800	766	457
15	2,080	1,510	3,170	4,940	806	1,260	5,400	3,530	4,720	1,940	766	457
16	1,800	1,360	4,000	3,710	766	1,260	5,050	3,170	4,610	2,010	766	457
17	1,620	1,260	2,760	3,260	806	1,260	4,200	3,350	4,100	2,440	728	457
18	1,460	1,160	2,150	2,760	766	1,210	4,100	4,200	5,880	2,080	690	457
19	1,940	1,110	2,520	3,000	806	1,160	4,300	3,900	4,500	1,740	690	429
20	1,310	1,060	2,680	1,870	766	1,110	4,500	3,800	4,000	1,800	654	429
21	1,210	1,680	2,290	1,740	1,020	1,110	4,610	4,610	3,900	1,800	654	403
22	1,210	2,150	2,290	1,680	1,210	1,110	3,900	5,400	3,620	1,870	618	457
23	1,110	1,740	2,010	1,460	1,460	974	3,350	4,940	3,080	1,080	584	457
24	1,020	1,510	1,620	1,680	1,210	930	2,760	4,500	2,680	1,510	584	429
25	974	1,360	1,680	1,020	1,060	888	2,760	3,800	2,760	1,410	550	429
26	930	2,220	1,510	1,410	974	846	2,920	3,900	3,440	1,410	550	429
27	974	9,850	1,510	1,620	1,020	806	4,720	4,300	3,800	1,460	550	429
28	2,440	4,610	1,410	1,260	930	806	5,640	4,720	4,200	1,310	618	429
29	2,760	4,300	1,310	1,160	930	974	6,680	4,500	4,400	1,310	690	888
30	2,080	8,040	1,510	1,160	.....	1,160	4,000	4,400	4,830	1,110	618	654
31	1,510	.....	1,410	1,110	.....	1,060	.....	3,900	.....	1,160	550	.....

Daily discharge, in second-feet, of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1904–5.												
1	584	618	2,840	1,560	1,260	3,170	1,360	1,560	4,400	1,680	766	654
2	518	690	2,220	2,360	1,160	4,200	1,360	1,410	3,620	1,510	766	584
3	487	806	1,870	2,760	1,210	4,610	1,310	1,410	5,640	1,460	690	584
4	457	654	1,560	2,920	1,110	4,500	1,260	1,410	4,830	1,460	690	584
5	457	618	1,460	2,920	1,020	3,800	3,710	1,620	3,170	1,410	690	518
6	429	584	1,310	1,800	888	3,170	1,510	1,800	3,080	1,410	690	518
7	403	930	1,210	1,560	1,020	2,760	1,800	2,220	3,080	1,310	690	518
8	379	1,110	1,160	1,410	888	2,760	2,150	3,080	3,440	1,260	654	584
9	379	806	1,060	1,310	846	3,080	1,680	2,840	3,620	1,310	690	766
10	356	728	1,020	1,740	846	3,530	1,410	2,150	3,530	1,310	654	690
11	690	584	1,210	1,060	690	4,200	1,410	1,870	3,260	1,210	654	618
12	846	550	1,210	1,020	690	2,840	1,510	1,800	3,000	1,020	618	618
13	550	518	1,460	930	690	2,360	1,680	1,560	2,920	974	618	618
14	618	518	6,540	930	690	2,150	1,680	4,000	2,920	1,110	618	584
15	457	1,210	6,960	930	690	2,220	1,510	2,760	2,440	1,060	846	584
16	584	1,410	4,720	930	690	2,220	1,460	2,360	1,940	1,060	2,150	584
17	766	3,260	4,830	930	654	2,220	1,410	2,920	2,010	1,060	2,360	690
18	618	2,150	5,760	888	618	2,360	1,560	2,150	2,080	974	1,410	930
19	728	4,830	6,140	930	888	2,220	1,870	2,010	2,080	930	974	846
20	654	7,110	3,530	930	1,020	2,080	2,290	1,940	2,150	930	930	1,740
21	618	7,410	2,840	888	1,360	2,290	2,290	1,940	2,080	974	806	1,160
22	618	9,470	2,150	930	2,220	2,220	2,680	2,010	1,940	974	728	1,020
23	618	4,400	2,010	974	2,600	2,220	3,000	2,080	1,800	930	654	1,160
24	550	2,840	1,684	1,310	2,920	2,520	3,530	2,440	1,740	888	618	1,210
25	518	3,260	1,460	1,410	5,160	2,520	4,000	2,290	1,560	846	550	1,260
26	487	3,530	1,360	1,260	2,680	2,360	3,620	2,440	1,870	806	550	3,900
27	457	4,610	1,260	3,620	2,760	2,010	3,620	2,920	2,440	806	550	2,440
28	457	5,050	1,410	3,350	3,080	1,940	2,220	3,170	2,220	846	550	1,740
29	403	3,800	1,620	1,940	.....	1,740	1,870	3,350	2,080	846	550	1,740
30	487	3,710	2,150	1,740	.....	1,560	1,620	3,800	1,740	806	584	1,740
31	766	.....	1,940	1,460	.....	1,410	.....	4,500	.....	806	846	.....
1911.												
1	.....	.....	.....	.....	.....	.....	.....	3,000	5,280	2,440	888	487
2	.....	.....	.....	.....	.....	.....	.....	3,530	5,050	2,520	846	487
3	.....	.....	.....	.....	.....	.....	.....	3,900	4,720	2,680	806	518
4	.....	.....	.....	.....	.....	.....	.....	5,160	3,440	2,840	766	584
5	.....	.....	.....	.....	.....	.....	.....	4,830	3,350	3,080	766	654
6	.....	.....	.....	.....	.....	.....	.....	3,800	3,260	3,000	766	806
7	.....	.....	.....	.....	.....	.....	.....	3,080	3,530	2,760	766	846
8	.....	.....	.....	.....	.....	.....	.....	3,440	3,350	2,440	690	888
9	.....	.....	.....	.....	.....	.....	.....	3,170	3,710	2,150	690	846
10	.....	.....	.....	.....	.....	.....	.....	2,680	4,400	2,080	690	728
11	.....	.....	.....	.....	.....	.....	.....	2,600	7,410	2,010	690	690
12	.....	.....	.....	.....	.....	.....	.....	2,520	6,960	2,150	654	618
13	.....	.....	.....	.....	.....	.....	.....	2,680	6,540	2,220	654	2,010
14	.....	.....	.....	.....	.....	.....	.....	2,520	5,640	2,290	618	1,560
15	.....	.....	.....	.....	.....	.....	.....	2,680	5,050	2,440	618	2,600
16	.....	.....	.....	.....	.....	.....	.....	4,200	4,720	2,520	618	4,500
17	.....	.....	.....	.....	.....	.....	.....	3,620	4,100	2,220	584	3,800
18	.....	.....	.....	.....	.....	.....	.....	4,200	3,900	1,940	584	2,010
19	.....	.....	.....	.....	.....	.....	.....	3,710	3,350	1,740	584	1,560
20	.....	.....	.....	.....	.....	.....	.....	3,350	3,080	1,620	654	1,360
21	.....	.....	.....	.....	.....	.....	.....	3,350	3,080	1,460	690	1,460
22	.....	.....	.....	.....	.....	.....	.....	3,530	3,620	1,410	618	1,460
23	.....	.....	.....	.....	.....	.....	.....	3,080	3,000	1,310	550	1,310
24	.....	.....	.....	.....	.....	.....	.....	2,840	2,600	1,260	550	1,020
25	.....	.....	.....	.....	.....	.....	.....	3,260	2,680	1,260	559	930
26	.....	.....	.....	.....	.....	.....	2,920	3,080	3,080	1,260	518	846
27	.....	.....	.....	.....	.....	.....	2,680	3,170	3,440	1,110	518	806
28	.....	.....	.....	.....	.....	.....	2,290	3,350	2,920	1,060	518	766
29	.....	.....	.....	.....	.....	.....	2,360	4,000	2,520	974	487	728
30	.....	.....	.....	.....	.....	.....	2,520	5,400	2,440	974	487	690
31	.....	.....	.....	.....	.....	.....	.....	6,400	.....	930	487	.....

Daily discharge, in second-feet, of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911–12.												
1	654	403	2,600	974	2,920	1,060	1,510	2,220	5,160	2,760	1,020	3,900
2	618	403	2,220	930	2,350	974	1,620	1,870	4,200	2,680	930	2,360
3	584	403	2,010	888	2,080	888	2,010	1,740	3,800	2,440	930	2,600
4	584	487	1,800	766	1,620	846	2,150	1,800	3,800	2,440	846	2,150
5	550	584	1,800	690	1,360	846	1,870	1,870	4,200	2,920	806	1,800
6	550	1,060	1,800	690	1,110	846	1,800	2,150	5,160	2,360	766	1,110
7	518	6,680	1,680	888	1,020	806	1,740	1,870	6,010	2,220	766	1,620
8	487	4,400	2,760	1,060	930	728	1,680	4,720	6,270	2,150	1,110	2,150
9	487	3,350	4,000	1,110	3,170	728	1,870	5,830	5,400	2,150	1,210	1,870
10	487	2,150	3,620	2,220	3,800	728	2,760	5,050	4,610	2,150	1,160	1,210
11	518	1,940	3,000	3,800	3,170	728	2,680	4,400	4,830	2,150	1,110	1,110
12	518	1,940	3,260	4,500	3,000	690	2,290	5,280	5,050	2,080	930	1,310
13	487	1,560	2,600	6,140	2,840	690	2,150	6,270	4,610	2,080	846	1,360
14	806	3,800	2,220	7,880	2,680	690	1,940	7,720	5,160	1,940	766	1,310
15	1,260	2,840	2,010	4,940	2,600	728	1,680	6,960	3,800	1,940	846	1,210
16	1,060	2,080	2,220	3,800	4,940	766	1,620	5,520	3,080	1,870	1,110	1,160
17	840	10,200	1,870	3,260	4,400	806	1,680	5,400	3,440	1,870	1,510	1,110
18	728	15,100	1,680	2,290	3,800	930	1,620	5,160	4,200	1,800	690	690
19	654	24,800	1,620	1,940	3,260	846	1,620	5,050	5,050	1,740	1,020	728
20	618	12,600	1,460	1,940	2,680	806	1,460	7,880	5,520	1,550	930	766
21	550	6,960	1,360	2,010	2,080	766	1,360	7,880	5,050	1,510	846	766
22	487	4,720	1,460	1,800	2,010	806	1,360	5,760	3,620	1,410	846	806
23	487	3,530	2,920	2,440	1,940	846	1,450	4,000	3,620	1,360	806	846
24	518	2,920	2,080	2,920	1,560	846	1,310	3,620	4,610	1,260	766	846
25	550	5,880	2,010	4,400	1,510	888	1,360	4,400	4,500	1,260	766	888
26	518	6,270	1,940	3,530	1,360	1,060	1,410	5,050	4,610	1,160	690	888
27	487	4,830	1,620	3,170	1,260	1,360	1,510	5,160	4,000	1,060	518	930
28	457	3,530	1,310	4,200	1,160	1,460	1,620	4,830	3,000	1,020	334	930
29	457	2,760	1,210	5,400	1,110	1,620	2,150	4,500	2,520	974	313	930
30	429	2,680	1,110	5,400	.....	1,510	2,680	3,710	2,150	974	334	930
31	429	.....	974	3,620	.....	1,410	.....	3,620	.....	974	930	.....
1912–13.												
1										5,400	2,360	766
2										4,940	2,290	766
3										4,300	2,150	766
4									8,300	4,400	1,940	7,110
5										5,050	1,870	4,000
6										6,010	1,800	2,360
7									7,410	5,520	1,800	1,870
8										4,830	1,800	1,800
9										5,050	1,620	1,800
10										6,140	1,560	1,360
11									7,600	4,610	1,410	1,260
12										4,400	1,210	1,160
13										4,400	1,160	1,110
14									5,880	3,620	1,110	1,060
15					1,600				5,280	3,620	1,110	974
16	1,100	2,800	1,700	1,700		1,600	2,700	4,900	5,050	3,350	1,020	930
17									4,830	3,440	1,260	888
18									5,050	4,300	1,160	974
19									7,110	4,940	1,020	930
20									6,540	5,280	930	806
21									6,270	5,520	930	806
22									6,400	5,050	930	1,410
23									7,260	4,610	1,020	1,310
24									6,010	4,300	930	1,020
25									5,880	3,530	930	888
26									5,400	3,440	930	846
27									5,520	2,920	930	806
28									5,400	2,680	846	766
29					.....				5,050	2,600	846	766
30					.....				6,270	2,290	846	728
31		.....			.....		.....		.....	2,220	846	.....

Daily discharge, in second-feet, of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913–14.												
1	690	1,110	2,760	846	1,350	4,440	1,520	3,290	4,650	2,470		
2	728	1,160	2,520	846	1,410	3,290	1,580	4,650	4,870	2,620		
3	766	1,260	2,150	806	1,300	3,290	1,640	5,560	4,440	2,390		
4	766	1,160	1,870	2,840	1,350	2,170	2,310	4,440	3,290	2,240		
5	728	1,510	1,740	11,900	1,300	2,170	3,840	3,470	2,780	2,030		
6	766	2,150	1,560	24,800	1,200	1,770	3,120	3,470	2,470	1,960		
7	846	2,440	1,510	11,700	1,010	1,770	3,120	3,470	2,940	1,700		
8	1,020	2,290	1,460	6,960	930	1,770	3,290	3,650	3,200	1,640		400
9	1,210	2,220	1,360	4,830	850	1,770	3,650	3,560	2,780			
10	2,520	2,150	1,310	3,620	812	1,890	3,840	3,840	2,390			
11	12,400	2,220	1,260	2,920	812	1,890	3,470	3,650	2,620			
12	5,520	2,440	1,260	2,520	850	2,030	3,650	4,240	2,940			
13	6,540	2,680	1,310	2,150	850	2,310	4,040	5,320	2,860			
14	4,610	2,760	1,260	1,870	850	4,440	4,870	6,670	3,290			
15	3,710	3,000	1,310	1,800	812	4,870	7,580	6,540	4,140			1,640
16	3,080	11,300	1,210	1,800	850	5,090	5,800	5,560	4,040		500	1,470
17	2,760	5,050	1,260	1,680	890	4,440	3,840	5,200	3,940			1,100
18	2,360	4,000	1,210	1,560	890	3,840	4,640	4,980	3,650			1,300
19	2,440	3,170	1,110	1,460	972	3,290	5,440	4,870	3,030			2,390
20	2,440	3,000	1,020	1,410	1,010	3,470	5,560	4,760	2,940	1,150		3,120
21	2,360	2,440	974	1,360	1,150	2,780	4,140	4,650	3,030			1,960
22	2,290	2,360	930	1,410	1,890	2,470	3,560	4,870	2,620			1,300
23	2,220	3,170	888	1,360	2,100	2,170	3,120	4,650	2,030			1,060
24	2,010	3,080	846	1,310	3,290	2,470	2,940	4,540	2,240			972
25	1,680	3,260	806	1,310	3,120	2,470	2,620	4,340	2,620			1,010
26	1,510	3,800	766	1,260	2,950	1,890	2,700	4,040	2,470			930
27	1,510	3,800	766	1,260	2,780	2,030	2,780	3,470	2,470			1,410
28	1,410	2,920	766	1,210	5,090	1,770	2,620	3,030	2,310			1,060
29	1,310	3,260	766	1,260	.....	1,300	2,310	2,700	2,470			850
30	1,210	3,260	728	1,310	.....	1,640	2,470	2,940	2,780			850
31	1,160	.....	766	1,310	.....	1,410	.....	3,840	.....			.....
1918–19.												
1	387	3,040	1,250	1,130	1,770	1,130	3,180	4,690	3,720	3,180	1,250	560
2	387	2,280	4,980	1,130	1,560	820	3,280	4,190	3,610	3,390	1,250	560
3	417	2,280	16,300	1,070	1,490	1,630	3,610	3,390	3,950	3,720	1,190	560
4	387	2,020	15,800	1,020	1,430	1,490	5,090	2,880	4,310	3,830	1,250	483
5	560	1,940	6,980	970	1,310	1,370	3,830	2,690	5,230	4,070	1,190	520
6	970	1,640	4,310	970	1,250	1,310	3,180	2,510	4,950	4,190	1,190	520
7	820	1,500	3,470	870	1,190	1,190	2,690	2,690	4,310	3,180	1,190	640
8	560	1,310	3,250	870	1,130	1,130	2,420	3,500	3,950	3,080	1,130	560
9	483	1,400	2,370	820	1,310	1,070	2,160	3,830	4,190	3,390	1,130	520
10	1,190	3,470	2,020	820	1,430	1,130	4,560	3,390	3,720	3,830	1,020	483
11	1,430	3,040	1,800	820	1,370	1,370	3,610	3,180	3,280	3,720	970	483
12	3,700	2,370	12,000	820	1,250	1,250	2,780	3,080	2,980	3,180	970	640
13	1,640	2,550	19,400	820	1,250	1,130	2,510	2,780	3,390	3,180	920	920
14	1,310	3,470	23,300	775	1,130	1,160	2,240	3,080	3,500	2,980	870	1,070
15	970	3,820	7,630	820	1,130	1,190	1,920	3,830	3,720	3,390	820	1,130
16	970	3,470	5,090	970	1,490	1,020	1,920	4,430	3,500	3,500	820	1,130
17	1,570	2,940	3,720	11,700	1,840	1,250	2,000	3,720	3,610	2,780	820	970
18	1,190	2,100	3,080	13,100	1,630	2,510	4,430	3,610	3,830	2,420	820	520
19	1,130	2,020	2,600	7,630	1,370	2,240	4,070	3,950	4,950	2,240	775	483
20	1,020	1,780	2,240	4,560	1,250	1,920	4,190	4,430	5,810	1,920	730	483
21	1,070	1,640	2,000	3,610	1,250	1,840	3,500	5,660	5,660	2,000	730	483
22	920	1,500	1,840	17,000	1,070	1,770	2,980	7,270	5,090	1,920	730	449
23	1,250	1,370	1,630	18,000	1,070	1,700	2,880	5,510	4,690	1,920	730	449
24	2,100	1,310	1,560	7,100	920	1,630	3,390	4,950	4,310	1,840	640	417
25	1,780	1,190	1,370	4,690	1,560	1,560	3,280	6,120	4,560	1,920	640	417
26	1,500	1,130	1,310	4,190	1,630	1,490	3,080	9,350	4,820	1,630	640	417
27	7,860	1,070	1,310	3,280	970	1,370	4,310	12,400	4,190	1,490	640	417
28	14,000	1,190	1,630	2,980	1,020	1,490	4,190	9,770	3,720	1,310	600	387
29	6,980	1,130	1,560	2,420	.....	1,920	4,430	7,270	3,080	1,310	560	359
30	3,940	1,370	1,370	2,240	.....	2,600	4,690	5,230	2,880	1,250	560	359
31	3,470	.....	1,250	1,920	.....	3,610	.....	3,950	.....	1,250	560	.....

Daily discharge, in second-feet, of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	417	5,200	1,380	2,480	3,810	713	1,200	2,390	1,720	3,160	713	713
2	449	3,260	1,200	2,120	3,160	713	1,140	2,570	2,120	2,960	713	673
3	417	2,040	1,090	1,880	2,660	713	1,040	1,650	2,660	2,660	713	594
4	417	2,960	1,090	1,650	2,390	713	1,140	1,580	3,590	2,570	633	556
5	359	2,210	1,040	1,510	2,210	798	2,570	1,720	3,590	2,040	633	519
6	359	1,040	990	1,380	2,390	753	1,880	2,210	3,160	2,040	633	519
7	333	1,090	890	1,260	3,370	713	1,720	3,370	3,160	2,040	633	483
8	359	1,140	890	1,200	2,660	753	1,580	4,410	4,410	2,040	633	483
9	449	1,040	843	1,090	2,210	940	1,380	4,050	3,370	1,880	633	798
10	449	990	713	1,090	1,960	890	1,380	3,370	3,480	1,880	633	1,260
11	1,200	1,040	713	990	1,800	890	1,320	2,760	3,590	1,720	594	4,290
12	940	990	713	990	1,650	1,380	1,580	2,570	3,060	1,720	594	6,060
13	713	990	940	940	1,510	10,100	1,880	2,760	2,960	1,720	594	4,410
14	594	3,590	940	990	1,440	4,540	1,720	2,760	3,700	1,720	556	10,200
15	519	26,400	940	1,510	1,320	2,860	1,510	2,660	4,410	1,650	556	4,700
16	449	16,500	990	2,480	1,260	2,210	1,580	2,760	3,590	1,510	556	2,960
17	483	8,350	10,100	7,990	1,200	1,720	1,440	5,340	4,290	1,380	519	2,210
18	483	6,670	4,050	13,100	1,200	1,650	1,320	2,660	3,590	1,380	483	1,880
19	417	6,360	3,370	8,530	1,090	1,380	1,720	3,160	3,160	1,260	449	1,540
20	417	3,930	4,540	4,800	1,090	1,380	1,650	2,860	3,160	1,140	449	1,510
21	633	4,670	5,060	3,370	990	1,440	1,440	2,570	3,260	1,090	483	3,610
22	1,510	3,810	3,930	2,480	990	1,440	1,440	2,210	3,700	940	449	4,000
23	1,580	3,590	5,200	2,210	890	1,320	1,200	2,120	2,760	940	483	3,260
24	798	2,760	14,000	2,210	890	1,720	1,200	1,960	2,210	940	417	2,660
25	633	2,300	6,360	4,800	843	1,320	1,720	1,800	2,210	890	449	2,480
26	556	1,880	5,620	2,860	843	1,200	1,720	1,720	2,040	798	417	3,060
27	519	1,880	5,620	2,760	798	1,200	2,390	1,960	1,960	798	483	4,050
28	556	1,720	3,370	14,400	753	1,090	2,860	1,960	2,390	798	1,200	2,960
29	713	1,580	2,760	7,150	713	1,200	2,570	1,800	2,760	798	1,140	2,390
30	633	1,510	3,700	5,910	.....	1,380	2,210	1,720	3,060	798	1,320	2,000
31	633	.....	2,960	5,060	.....	1,320	.....	1,580	.....	713	890	.....

NOTE.—Discharge Oct. 7, 1902, to Jan. 31, 1914, revised, and supersede records published in previous water-supply papers. Discharge Oct. 1–6, 1902, estimated by comparison with record of flow of Cedar River near Ravensdale. Gage-heights Jan. 3 and 4, 1903, estimated by observer as water was over top of gage. Gage-height record Oct. 1–21, 1912, previously published, was discarded, as comparison with records for adjacent streams indicates that it is in error.

Monthly discharge October, 1912, to May, 1913, estimated by comparison with record showing sum of the discharge of North, Middle, and South forks of Snoqualmie River by months over a period of seven years. Discharge June 1–16, 8–13, 1913, July 9–31, Aug. 1–31, and Sept. 1–14, 1914, estimated by similar comparison.

Gage-height Jan. 6, 1914, estimated by observer as water was over top of gage. Gage destroyed by falling tree Feb. 25, 1914, and replaced Apr. 19; gage-height record obtained by measuring down from reference point Feb. 26 to Apr. 18. Stage-discharge relation affected by backwater caused by logging operations over Sunset Falls July 9 to Sept. 14, 1914.

Discharge Nov. 9 and Dec. 11, 1918, estimated by comparison with record of flow of North Fork of Skykomish River at Index and Middle Fork of Snoqualmie River near North Bend. Discharge Mar. 14, 1919, interpolated. Braced figures show mean discharge for periods included.

Monthly discharge of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920.

[Drainage area, 351 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1902–3.						
October	1,800	457	697	1.99	2.29	42,900
November	3,530	1,310	2,090	5.95	6.64	124,000
December	11,100	888	2,530	7.21	8.31	156,000
January	26,000	1,410	3,880	11.1	12.80	239,000
February	2,010	846	1,070	3.05	3.18	59,400
March	2,920	806	1,280	3.65	4.21	78,700
April	3,260	1,110	1,830	5.21	5.81	109,000
May	8,380	2,150	3,800	10.8	12.45	234,000
June	9,660	3,620	6,260	17.8	19.86	372,000
July	4,610	1,410	2,690	7.66	8.83	165,000
August	1,410	766	1,000	2.85	3.29	61,500
September	3,260	618	1,600	4.56	5.09	95,200
The year	26,000	457	2,400	6.84	92.76	1,740,000

Monthly discharge of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1903–4.						
October	7,560	930	2,420	6.89	7.94	149,000
November	9,850	1,060	2,570	7.32	8.17	153,000
December	10,200	1,060	2,550	7.26	8.37	157,000
January	9,470	930	2,340	6.67	7.69	144,000
February	1,460	766	1,000	2.85	3.07	57,500
March	4,720	806	1,510	4.30	4.96	92,800
April	7,720	1,020	3,710	10.6	11.83	221,000
May	5,400	2,150	3,540	10.1	11.64	218,000
June	5,880	2,680	4,090	11.7	13.05	243,000
July	4,400	1,110	2,380	6.78	7.82	146,000
August	1,210	550	790	2.25	2.59	48,600
September	888	403	527	1.50	1.67	31,400
The year	10,200	403	2,290	6.52	88.80	1,660,000
1904–5.						
October	846	356	546	1.56	1.80	33,600
November	9,470	518	2,590	7.38	8.23	154,000
December	6,960	1,020	2,510	7.15	8.24	154,000
January	3,620	888	1,570	4.47	5.15	96,500
February	5,160	618	1,440	4.10	4.27	80,000
March	4,610	1,410	2,690	7.66	8.83	165,000
April	4,000	1,260	2,080	5.93	6.62	124,000
May	4,500	1,410	2,380	6.78	7.82	146,000
June	5,640	1,560	2,760	7.86	8.77	164,000
July	1,680	806	1,100	3.13	3.61	67,600
August	2,360	550	811	2.31	2.66	49,900
September	3,900	518	1,040	2.96	3.30	61,900
The year	9,470	356	1,790	5.10	69.30	1,300,000
1911						
April 26–30	2,920	2,290	2,550	7.26	1.35	25,300
May	6,400	2,520	3,550	10.1	11.64	218,000
June	7,410	2,440	4,010	11.4	12.72	239,000
July	3,080	930	1,940	5.53	6.38	119,000
August	888	487	642	1.83	2.11	39,500
September	4,500	487	1,250	3.56	3.97	74,400
The period						715,000
1911–12						
October	1,260	429	593	1.69	1.95	36,500
November	24,800	403	4,700	13.4	14.95	280,000
December	4,000	974	2,070	5.90	6.80	127,000
January	7,880	690	2,890	8.23	9.49	178,000
February	4,940	930	2,340	6.67	7.19	135,000
March	1,620	690	926	2.64	3.04	56,900
April	2,760	1,310	1,800	5.13	5.72	107,000
May	7,880	1,740	4,560	13.0	14.99	280,000
June	6,270	2,150	4,370	12.5	13.95	260,000
July	2,920	974	1,810	5.16	5.95	111,000
August	1,510	313	853	2.43	2.80	52,400
September	3,900	690	1,340	3.82	4.26	79,700
The year	24,800	313	2,350	6.70	91.09	1,700,000
1912–13						
October			1,100	3.13	3.61	67,600
November			2,800	7.98	8.90	167,000
December			1,700	4.84	5.58	105,000
January			1,700	4.84	5.58	105,000
February			1,600	4.56	4.75	88,900
March			1,600	4.56	5.26	98,400
April			2,700	7.69	8.58	161,000
May			4,900	14.0	16.14	301,000
June			6,730	19.2	21.42	400,000
July	6,140	2,220	4,280	12.2	14.07	263,000
August	2,360	846	1,310	3.73	4.30	80,600
September	7,110	728	1,400	3.99	4.45	83,300
The year			2,650	7.55	102.64	1,920,000

Monthly discharge of South Fork of Skykomish River near Index, Wash., for the years ending Sept. 30, 1903–1905; 1911–1914; 1919 and 1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1913–14.						
October	12,400	690	2,410	6.87	7.92	148,000
November	11,300	1,110	2,950	8.40	9.37	176,000
December	2,760	728	1,270	3.62	4.17	78,100
January	24,800	806	3,310	9.43	10.87	204,000
February	5,090	812	1,520	4.33	4.51	84,400
March	5,090	1,300	2,660	7.58	8.74	164,000
April	7,580	1,520	3,540	10.1	11.27	211,000
May	6,670	2,700	4,330	12.3	14.18	266,000
June	4,870	2,030	3,080	8.77	9.78	183,000
July	2,620	.....	1,400	3.99	4.60	86,100
August	.....	.....	500	1.42	1.64	30,700
September	3,120	.....	934	2.66	2.97	55,600
The year	24,800	.....	2,330	6.64	90.02	1,690,000
1918–19.						
October	14,000	387	2,130	6.07	7.00	131,000
November	3,820	1,070	2,040	5.81	6.48	121,000
December	23,300	1,250	5,110	14.6	16.83	314,000
January	18,000	775	3,840	10.9	12.57	236,000
February	1,840	920	1,320	3.76	3.92	73,300
March	3,610	820	1,560	4.44	5.12	95,900
April	5,090	1,920	3,350	9.54	10.64	199,000
May	12,400	2,510	4,750	13.5	15.56	292,000
June	5,810	2,880	4,120	11.7	13.05	245,000
July	4,190	1,250	2,680	7.64	8.81	165,000
August	1,250	560	882	2.51	2.89	54,200
September	1,130	359	580	1.65	1.84	34,500
The year	23,300	359	2,710	7.72	104.71	1,960,000
1919–20.						
October	1,580	333	612	1.74	2.01	37,600
November	26,400	990	4,050	11.5	12.83	241,000
December	14,000	713	3,100	8.83	10.18	191,000
January	14,400	940	3,590	10.2	11.76	221,000
February	3,810	713	1,660	4.73	5.10	95,500
March	10,100	713	1,630	4.64	5.35	100,000
April	2,860	1,040	1,650	4.70	5.24	98,200
May	5,340	1,580	2,550	7.26	8.37	157,000
June	4,410	1,720	3,100	8.83	9.85	184,000
July	3,160	713	1,550	4.42	5.10	95,300
August	1,320	417	634	1.81	2.09	39,000
September	10,200	483	2,560	7.29	8.13	152,000
The year	26,400	333	2,220	6.32	86.01	1,610,000

NOTE.—Monthly discharge, October, 1902, to September, 1905, and April, 1911, to January, 1914, supersede records published in previous water-supply papers.

MILLER CREEK AT MILLER RIVER, WASH.

LOCATION.—In SW. ¼ sec. 28, T. 26 N., R. 11 E., five-eighths mile south of Miller River (formerly called Berlin) and mouth of creek, in King County.

DRAINAGE AREA.—44.2 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 24, 1911, to June 30, 1919, when station was discontinued.

GAGE.—Inclined staff on left bank installed November 5, 1918, five-eighths mile above mouth; read by Ralph Smith and G. E. Sawyer. May 24, 1911, to August 26, 1914, vertical staff five-eighths mile upstream from present gage; August 27, 1914, to November 4, 1918, inclined staff 10 feet downstream from gage previously used. Datum unchanged.

DISCHARGE MEASUREMENTS.—Made from cable half a mile above later gage location or by wading.

CHANNEL AND CONTROL.—Bed composed of large boulders and gravel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 8.1 feet December 13 (discharge, 4,160 second-feet); minimum stage recorded, 1.03 feet October 2 (discharge, 30 second-feet).

1911–1919: Maximum stage occurred during flood of December 18, 1917, which destroyed gage; estimated by observer at 7 or 8 feet (discharge not estimated); minimum stage recorded, 0.07 foot August 31, 1915 (discharge, 24 second-feet).

ICE.—Stage-discharge relation not affected by ice.

REGULATION.—None.

DIVERSIONS.—None.

ACCURACY.—Stage-discharge relation changed during high water on October 27, 1918. Rating curves well defined below 1,000 second-feet. Gage read to hundredths three or four times a week. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

COOPERATION.—Gage-height record supplemented by occasional readings furnished by United States Forest Service.

Discharge measurements of Miller Creek at Miller River, Wash., during the year ending Sept. 30, 1919.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 5	T. G. Bedford	2.13	248	June 24	L. D. Carson	3.14	560
June 20	L. D. Carson	3.52	767	Sept. 19	do	1.12	47.5

Daily discharge, in second-feet, of Miller Creek at Miller River, Wash., for the period Oct. 1, 1918, to June 30, 1919.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	30		353	125		242	172	424	645
2	30		408	122		254	161	408	691
3	31	400	1,880	119		254	161	419	644
4	32		3,360	137	220	236	161	430	596
5	56	254	1,900	154		218	201	441	644
6	80	218	441	172		195	240	477	691
7	104	195	377	161	230	172	280	513	608
8	96	200	426	150	226	168	261	533	524
9	88	200	476	148	222	165	242	553	441
10	449	910	609	146	218	161	398	527	458
11	810	796	742	144	100	161	553	502	476
12	658	586	2,450	225	218	161	567	476	412
13	507	377	4,160	306	224	161	582	426	348
14	264	392	2,160	300	230	161	596	377	403
15	352	408	2,080	293	230	157	669	510	458
16	441	331	2,000	559	230	154	742	642	513
17	420	254	1,300	824	320	150	742	587	602
18	400	242	596	1,090	269	156	742	531	691
19	376	242	432	1,060	218	161	679	476	716
20	351	242	267	1,030	218	156	616	742	742
21	327	230	308	1,340	218	150	553	408	596
22	327	218	348	1,640	222	242	553	392	574
23	327	276	334	1,170	226	207	513	377	553
24	297	334	320	691	230	172	541	615	553
25	266	392	267	554	230	172	568	852	691
26	236	356	236	417	230	172	596	1,090	644
27	4,000	320	206	280	230	172	574	1,570	596
28		242	184	255	230	172	553	1,030	
29		242	161	230	.....	172	497	792	500
30	1,100	297	150	224	.....	178	441	553	
31		.....	362	218	.....	184	.....	599	.....

NOTE.—Discharge Oct. 1 estimated to be same as on Oct. 2. Discharge Oct. 27 to Nov. 4, Nov. 8, 9, Feb. 1–6, and June 28–30, estimated by comparison with records of flow of near-by streams. Discharge interpolated for other days when gage was not read. Discharge, Feb. 11, unusually low; gage readings may be in error.

Monthly discharge of Miller Creek at Miller River, Wash., for the period Oct. 1 to June 30, 1919.

[Drainage area, 44.2 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,000	30	508	11.5	13.26	31,200
November	910	195	345	7.81	8.71	20,500
December	4,160	150	945	21.4	24.67	58,100
January	1,640	119	461	10.4	11.99	28,300
February	320	100	225	5.09	5.30	12,500
March	254	150	182	4.12	4.75	11,200
April	742	161	472	10.7	11.94	28,100
May	1,570	377	589	13.3	15.33	36,200
June	742	348	567	12.8	14.28	33,700
The period						260,000

NORTH FORK OF SKYKOMISH RIVER AT INDEX, WASH.

LOCATION.—In SE. ¼ sec. 17, T. 27 N., R. 10 E., at Index, Snohomish County, 1¾ miles above mouth of river.

DRAINAGE AREA.—143 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 24, 1910, to September 30, 1920.

GAGE.—Vertical and inclined staff on right bank one-third mile above highway bridge at Index, installed November 4, 1918; read by G. B. Davidson and Mary E. Axtel. Previous gages as follows: August 24 to September 2, 1910, vertical staff on left bank 100 feet above tramway bridge; destroyed in course of improvements to channel. October 26, 1910, to November 26, 1911, vertical staff on right bank at lower end of wing dam and about 100 feet below site of present gage. November 27, 1911, to December 29, 1917, vertical staff on wing dam on right bank about 200 feet upstream from present site; destroyed by flood. January 13–31, 1918, readings from a reference point at present site. February 1 to September 27, 1918, vertical staff at present location and datum. October 31 to November 3, 1918, temporary gage same location.

DISCHARGE MEASUREMENTS.—Made from cable 200 feet above gage or by wading.

CHANNEL AND CONTROL.—Bed of stream composed of gravel and large boulders. Right bank high, protected by pile-and-timber wing dam, and not subject to overflow; left bank slopes back gradually. Stage of zero flow, according to measurements made September 21, 1918, gage height −1.3 feet ±0.2 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 7.5 feet at 2.10 a. m. December 14 (discharge, 11,900 second-feet); minimum stage recorded, 0.40 foot September 29–30 (discharge, 115 second-feet).

Maximum stage recorded during year ending September 30, 1920, 9.6 feet at 11 a. m. November 15 (discharge, 16,800 second-feet); minimum stage recorded 0.40 foot at 10 a. m. October 5 (discharge, 115 second-feet). Discharge may have been lower in December when stage-discharge relation was affected by ice.

1911–1920: Maximum stage recorded, 13.0 feet at 5 a. m. December 29, 1917 (discharge, 17,000 second-feet); minimum stage recorded, 0.45 foot at 1 p. m. September 29, 1915 (discharge, 97 second-feet).

ICE.—Stage-discharge relation affected by ice during severe winters. Determinations of flow based on observer's notes and weather records.

DIVERSIONS.—On May 2, 1918, a diversion of 2 second-feet as determined by measurement was made 400 feet above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed November 15, 1919; affected by ice December 5–15, 1919. Rating curve used prior to change well defined below 6,000 second-feet; curve used after the change well defined below 5,000 second-feet. Staff gage read once daily to quarter-tenths at low stages, to half-tenths at medium, and to tenths at high stages. During periods of rapidly changing stage gage read several times a day. Some diurnal fluctuation during the summer. Daily discharge ascertained by applying daily gage height to rating table. Records prior to middle of August, 1919, and after January 1, 1920, excellent except those for highest stages and for latter part of August, 1919, which are uncertain on account of difficulty in reading gage accurately; September to December, 1919, good.

Discharge measurements of North Fork of Skykomish River at Index, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 3	T. G. Bedford	2.01	1,170	Aug. 27	Parker and Kanters	0.46	180
8	.....do	1.49	707	27	.....do	.54	203
1919.				30	Bert Kanters	1.41	623
June 23	L. D. Carson	2.99	2,340	Sept. 1	.....do	.94	311
Sept. 16	.....do	.90	309	3	.....do	.76	258
				5	.....do	.64	225
1920.				7	.....do	.55	198
May 20	R. B. Kilgore	2.32	1,510	9	.....do	.53	185
July 13	Lee and Newton	1.64	810	11	.....do	3.80	3,470
14	.....do	1.89	1,000	15	McCombs and Kanters	3.34	2,860
Aug. 25	Parker and Kanters	.44	180	17	Bert Kanters	2.15	1,220
				22	.....do	3.03	2,220

Daily discharge, in second-feet, of North Fork of Skykomish River at Index, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	175	1,370	714	490	756	425	1,590	2,340	1,820	2,070	635	213
2	159	1,270	1,820	425	714	714	1,590	1,820	1,820	2,340	560	213
3	206	1,170	5,460	425	635	674	3,150	1,590	2,070	2,490	560	218
4	169	1,120	8,540	413	635	598	3,150	1,370	2,980	2,650	560	175
5	236	975	3,330	377	560	560	1,700	1,170	3,690	2,490	560	377
6	840	884	2,070	365	525	525	1,590	1,270	2,650	2,070	560	395
7	525	797	1,480	337	490	490	1,170	1,590	1,940	1,700	635	258
8	337	714	1,370	320	490	458	975	1,820	2,070	2,200	560	258
9	284	756	1,120	320	714	425	884	2,070	1,940	3,150	425	258
10	458	2,070	975	309	714	425	2,070	1,820	2,070	2,980	635	258
11	2,650	1,370	840	309	674	490	1,940	1,700	1,590	2,340	635	284
12	2,070	1,070	884	299	598	458	1,480	1,170	1,820	1,700	635	1,370
13	930	1,270	8,770	309	560	425	1,170	1,370	1,940	1,940	365	797
14	674	1,590	8,770	299	560	425	975	1,700	1,820	3,510		309
15	560	1,370	2,980	309	590	413	975	2,650	2,070	2,650		236
16	560	1,370	1,820	425	840	413	1,070	2,340	1,940	2,340		272
17	840	1,120	1,480	4,450	884	525	1,370	2,070	2,070	1,590	365	309
18	635	975	1,270	4,850	714	930	2,340	1,820	3,330	1,370		337
19	674	884	1,020	2,980	674	884	2,070	3,330	3,690	1,370		309
20	560	840	930	1,820	560	714	1,940	3,330	2,980	1,370		258
21	560	756	797	1,370	560	714	1,700	3,690	2,650	1,370		213
22	490	714	714	5,250	560	714	1,370	4,450	2,650	1,370	365	258
23	674	598	635	5,880	458	756	1,370	3,690	2,340	1,170	365	258
24	1,070	560	598	2,650	395	714	1,480	2,650	2,340	975	258	213
25	930	525	560	1,820	458	714	1,590	3,690	3,150	975	309	213
26	840	490	560	1,700	425	635	1,820	4,450	2,650	797	309	213
27	7,620	490	598	1,370	413	635	2,340	6,960	2,200	797	309	213
28		490	884	1,170	458	635	2,070	3,330	1,940	756	309	175
29	3,000	490	674	1,070	.....	598	2,490	3,330	1,590	714	258	115
30		674	598	975	.....	1,370	3,150	2,650	2,070	714	258	115
31	1,590	.....	490	884	.....	1,700	.....	1,820	.....	714	213	.....

Daily discharge, in second-feet, of North Fork of Skykomish River at Index, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20												
1	236	3,150	600	1,040	2,020	240	464	760	1,140	1,900	272	309
2	159	1,700	352	760	1,450	212	464	680	1,240	1,670	272	272
3	143	1,070	309	760	1,240	212	378	680	1,780	1,560	272	256
4	143	1,370	212	640	1,040	212	378	680	2,020	1,450	272	226
5	115	1,070		640	1,040	309	1,040	940	1,780	1,450	272	226
6	175	840		464	1,240	352	680	1,780	1,780	1,140	272	212
7	175	714		403	1,780	240	565	3,030	1,560	1,450	272	200
8	258	365		403	1,450	330	464	2,020	2,270	1,450	272	187
9	213	525		403	1,140	464	530	1,780	1,780	1,140	272	187
10	258	525	140	309	850	403	530	1,560	1,450	1,040	240	1,090
11	560	458		352	760	464	530	1,450	1,900	940	240	3,760
12	425	425		330	680	760	530	1,240	1,560	1,140	240	3,210
13	365	840		309	680	4,940	680	1,450	1,780	805	240	2,550
14	284	2,340		309	600	3,570	600	1,450	2,020	990	240	7,680
15	258	15,000		530	600	1,340	600	1,240	2,270	850	240	2,700
16	175	7,020	165	1,340	600	1,040	530	1,560	1,780	940	226	1,670
17	175	5,340	5,140	5,140	600	680	530	2,860	2,410	760	226	1,290
18	175	3,390	1,780	7,680	530	600	530	2,410	1,780	760	200	1,190
19	143	5,340	1,670	5,140	530	600	600	1,670	1,450	680	187	895
20	143	1,900	2,410	2,020	434	530	600	1,450	1,670	530	187	1,140
21	425	2,410	3,210	1,900	403	680	600	1,340	1,670	464	187	2,410
22	884	1,900	1,900	1,040	403	530	497	1,240	1,780	464	187	2,140
23	756	1,900	3,210	680	352	530	464	1,240	1,290	403	187	1,780
24	365	1,900	6,600	1,230	309	600	464	990	1,140	403	187	1,450
25	213	1,240	3,210	1,780	309	600	600	850	1,140	378	176	1,560
26	284	1,240	1,900	1,040	272	600	850	990	1,140	378	176	1,560
27	258	1,040	2,270	850	290	464	1,240	1,040	1,240	378	187	2,700
28	258	760	1,560	9,470	272	434	1,560	940	1,450	378	760	1,670
29	258	600	1,140	3,950	272	464	1,290	1,040	1,900	378	1,140	1,240
30	258	600	1,900	3,210	.....	532	1,090	940	1,900	352	680	1,090
31	258	.....	1,140	2,270	.....	600	.....	760	.....	309	352	.....

NOTE.—No gage-height record Oct. 28–30, 1918, and Feb. 15, 1919 (discharge estimated by comparison with record of South Fork of Snoqualmie River at North Bend, Wash.); Aug. 14–21, Sept. 16, 1919, and Jan. 24 and Mar. 30, 1920 (discharge interpolated). Braced figures show mean discharge for periods included.

Monthly discharge of North Fork of Skykomish River at Index, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 143 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	7,620	159	1,170	8.18	9.43	71,900
November	2,070	490	959	6.71	7.49	57,100
December	8,770	490	2,020	14.1	16.26	124,000
January	5,880	299	1,420	9.93	11.45	87,300
February	884	395	593	4.15	4.32	32,900
March	1,700	413	650	4.55	5.25	40,000
April	3,150	884	1,750	12.2	13.61	104,000
May	6,960	1,170	2,550	17.8	20.52	157,000
June	3,690	1,590	2,330	16.3	18.19	139,000
July	3,510	714	1,760	12.3	14.18	108,000
August	635	213	426	2.98	3.44	26,200
September	1,370	115	303	2.12	2.36	18,000
The year	8,770	115	1,330	9.30	126.50	965,000
1919-20.						
October	884	115	284	1.99	2.29	17,500
November	15,000	365	2,230	15.6	17.40	133,000
December	6,600	.....	1,360	9.51	10.96	83,600
January	9,470	309	1,820	12.7	14.64	112,000
February	2,020	272	764	5.34	5.76	43,900
March	4,940	212	759	5.31	6.12	46,700
April	1,560	378	663	4.64	5.18	39,500
May	3,030	680	1,360	9.51	10.96	83,600
June	2,410	1,140	1,670	11.7	13.05	99,400
July	1,900	309	869	6.08	7.01	53,400
August	1,140	176	295	2.06	2.38	18,100
September	7,680	187	1,560	10.9	12.16	92,800
The year	15,000	.....	1,130	7.90	107.91	824,000

SULTAN RIVER NEAR SULTAN, WASH.

LOCATION.—In sec. 8, T. 28 N., R. 8 E., at Horseshoe Bend, 4½ miles north of Sultan and mouth of river, Snohomish County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 18, 1911, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank a quarter of a mile above Horseshoe Bend; inspected by employees of city of Everett. Prior to October 29, 1915, Lietz water-stage recorder at Camp Habecker 1½ miles upstream.

DISCHARGE MEASUREMENTS.—Made from cable at gage or by wading.

CHANNEL AND CONTROL.—In canyon; control formed by large rocks, boulders, and heavy gravel. Not likely to change except at extremely high stages.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 12.6 feet at 9 a. m. December 4 (discharge, 13,200 second-feet); minimum stage recorded, 0.52 foot September 26 (discharge, 79 second-feet).

Maximum daily discharge during year ending September 30, 1920, 13,100 second-feet on November 15 (from curve showing relation between gage heights at this station and those at Camp Habecker, 1½ miles upstream); minimum stage from recorder, 0. 28 foot on August 24 (discharge, 54 second-feet).

1911–1920: Maximum stage recorded 16.6 feet at about 9 a. m. December 18, 1917, determined from high-water mark in well (discharge, 20,600 second-feet); minimum stage recorded August 24, 1920.

ICE.—Stage-discharge relation seldom affected by ice. Water in well freezes during very cold weather.

DIVERSIONS.—City of Everett diverted about 3 second-feet above station for municipal water supply from July 1, 1918, to July 1, 1919, and about 7½ second-feet thereafter (estimated at reservoir in Everett by the project engineer).

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water on December 4, 1918; not affected by ice. Rating curve used before the change well defined; curve used December 4, 1918, to September 30, 1919, fairly well defined below 1,200 second-feet; revised curve used October 1, 1919, to September 30, 1920, well defined. Operation of water-stage recorder very unsatisfactory owing to frequent stopping of clock. Daily discharge, except as noted in footnote to table of daily discharge, ascertained by applying to rating table the daily mean gage height determined, in a few instances, from one or more staff gage readings, but for the most part from the recorder graph by inspection; for days of considerable variation in stage, discharge was determined by averaging results obtained by applying mean gage heights for shorter intervals. Records for periods for which daily figures are not shown and from October, 1919, to January, 1920, and for June and September, 1920, are poor; February to May, 1920, fair; remainder of two-year period, good.

COOPERATION.—Gage-height record furnished by city of Everett, Wash.

Discharge measurements of Sultan River near Sultan, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Mar. 29	Carson and Paine.....	2.99	602	Feb. 26	Carson and Paine.....	1.32	169
June 23	McCombs and Paine...	3.45	878	May 18	Kilgore and Paine.....	4.32	1,200
Sept. 15	Carson and Paine.....	1.20	157	July 7	.....do.....	2.22	364
				8	.....do.....	2.29	380
				Aug. 24	Lasley Lee.....	.28	53.1

Daily discharge, in second-feet, of Sultan River near Sultan, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	85	1,120	740			1,070	1,300	1,330	872	492	220	102
2	82	1,300	3,060			1,360	1,330	1,210	942	568	211	91
3	93	1,120	6,920			796	1,410	898	979	652	203	85
4	97	1,400	8,450	300		698	2,920	722	1,090	746	194	83
5	178	1,120	2,750		600	645	1,670	609	1,150	722	192	103
6	1,070	764	1,790			592	1,180	609	952	675	190	111
7	718	631	1,240	224		539	925	746	722	588	188	136
8		478	898	212		486	722	952	698	568	187	122
9		610	771	199		433	836	1,010	796	568	185	100
10		2,710	609	195	979	380		872	746	568	183	93
11		1,620	529	192		510	1,500	941		568	181	
12		960	652	205		409		1,080	700	568	172	500
13	650	1,310		224		380		846		568	154	
14		1,820		240	1,000	366	722	914	898	568	136	
15		1,600		224		339	630	1,880	822	722	131	156
16		1,740	2,600	242		339	588	1,710	746	675	143	133
17		889		1,120		874	1,990	1,330		492	147	122
18	532	740		6,180	746	1,360	2,500	1,150		366	145	114
19	495	631		5,290	548	952	2,100	1,270		326	138	109
20	427	570		3,080	457	698	1,880	1,360	900	352	130	102
21	396	495		1,470	394	609	1,440	1,490		380	125	96
22	367	412		5,780	352	609		1,670		380	121	90
23	652	354		5,760	314	652	1,100	1,150	872	352	115	85
24	1,260	315		2,150	279	548		979	771	314	110	83
25	1,090	285	500		352	474		2,500	821	302	105	81
26	889	277			424	440	1,120	3,110	846	251	106	79
27		268			366	440	1,330	3,490	675	253	104	106
28	3,000	396		900	380	474	1,240	1,880	529	255	99	105
29		367			.....	675	1,300	1,400	457	246	100	80
30	1,300	752			.....	1,650	1,330	1,270	440	238	100	102
31	1,440	.....	.....		.....	1,750	.....	1,030	.....	229	101	.....
1919-20.												
1	164	4,000	373	856	1,220	126	370	680	532	641	97	140
2	146	2,500	336	721	880	126	339	585	622	585	94	122
3	86	955	268	532	700	174	292	532	809	532	90	110
4	106		251	404	604	224	585	532	930	464	88	108
5	112		230	360	549	192	1,770	660	832	414	85	93
6	82	1,600	214	309	930	189	832	1,000	764	366	83	96
7	78		201	292	1,220	235	641	1,430	955	382	84	84
8	57		176	241	786	336	532	1,400	1,600	379	83	81
9	99		139	222	641	480	447	1,130	1,130	360	82	110
10	131	700	124	210	532	388	401	856	955	318	81	1,160
11	218	1,000	139	187	464	379	398	680	1,160	276	79	5,340
12	721	700	139	214	430	2,640	532	622	856	281	77	3,440
13	287	660	130	201	388	6,360	930	641	832	304	75	2,640
14	203	3,570	130	268	348	2,060	680	622	1,060	306	73	7,620
15	162	13,100	130	721	321	1,080	567	622	1,160	281	70	1,970
16	191	4,920	139	3,310	289	786	641	660	856	265	69	1,060
17	192	3,000	7,460	3,570	255	585	549	1,490	1,000	241	67	700
18	196	1,520	1,890	8,980	235	480	464	1,430	809	222	65	585
19	168	2,820	1,740	3,960	216	414	742	930	641	201	63	464
20	108	1,970	2,540	1,560	203	430	764	786	641	176	61	930
21	401	1,460	1,890	1,030	192	567	622	832	700	164	60	1,660
22	1,100	1,250	1,340	721	186	497	532	700	680	149	58	1,560
23	786	1,190	2,190	585	181	480	480	764	497	138	56	1,160
24	1,000	1,490	4,640	480	170	641	464	660	430	131	54	980
25	856	1,000	2,330	1,740	164	549	532	549	382	122	55	1,080
26	721	764	1,430	880	153	447	786	497	385	114	56	1,520
27	198	532	1,660	1,490	142	404	1,030	604	464	113	199	2,190
28	414	480	1,190	11,500	140	392	1,190	604	497	112	464	1,060
29	497	430	764	3,310	132	514	1,080	585	585	111	809	700
30	742	430	1,740	2,640	.....	604	832	604	742	106	480	604
31	764	.....	1,130	1,930	.....	430	.....	532	.....	101	207	.....

NOTE.—Discharge, Nov. 1-2, 1919, and for all periods for which daily figures are not given, obtained from comparison with records of flow of nearby streams. Discharge Mar. 5-9, June 15, July 9-13, 27 and 29-31, Aug. 1-3, 5-10, and 29-31, 1919, and Aug. 18-23, 1920, interpolated; Oct. 3, 5, 8-12, 16-19, 23-26, 28-31, Nov. 11-16, 25-30, Dec. 2-8, 11-16, 19-25, 27-28, and 30-31, 1919, and Jan. 1-4, 6-7, 11-12, 14-18, 20-25, May 31, June 1-6, 12-13, 17-19, 25-26, 28-29, July 1-6, Aug. 27-31, and Sept. 1-3, 5, 7-12, 16-17, 19, 21-24, 26, and 28-30, 1920, obtained from curves showing relation between gage heights at this gaging station and at a station 1½ miles upstream maintained by the Sound Power Co. **Braced figures** show mean discharge for periods included.

Monthly discharge of Sultan River near Sultan, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	.....	82	850	52,900
November	2,710	268	902	53,700
December	8,450	.....	1,830	113,000
January	6,180	192	1,330	81,800
February	.....	279	643	35,700
March	1,750	339	695	42,700
April	2,920	588	1,360	80,900
May	3,490	609	1,340	82,400
June	.....	440	811	48,300
July	746	229	469	28,800
August	220	99	149	9,160
September	.....	79	156	9,280
The year	8,450	79	881	639,000
1919–20.				
October	1,100	57	354	21,800
November	13,100	430	2,000	119,000
December	7,460	124	1,200	73,800
January	11,500	187	1,720	106,000
February	1,220	132	437	25,100
March	6,360	126	749	46,100
April	1,770	292	667	39,700
May	1,490	497	781	48,000
June	1,600	382	784	46,700
July	641	101	270	16,600
August	809	54	131	8,060
September	7,620	81	1,310	78,000
The year	13,100	54	866	629,000

MIDDLE FORK OF SNOQUALMIE RIVER NEAR NORTH BEND, WASH.

LOCATION.—In NE. ¼ SE. ¼ sec. 10, T. 23 N., R. 8 E., 1 mile southeast of North Bend, King County, and 2¾ miles above junction with North Fork.

DRAINAGE AREA.—184 square miles (measured on topographic and county maps).

RECORDS AVAILABLE.—August 10, 1907, to February 29, 1908; August 25, 1908, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank; installed August 7, 1915; inspected by A. R. Neth, Prior to August 7, 1915, various gages at highway bridge 2¼ miles below present site were used.

DISCHARGE MEASUREMENTS.—Made by wading or from highway bridge at original station.

CHANNEL AND CONTROL.—Bed composed of large boulders. Channel slightly curved above and below station. Control shifts at extremely high water. Left bank high; right bank low and heavily wooded. Stage of zero flow, according to measurements made September 11, 1919, gage height −0.7 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 10.1 feet at 6 a. m. December 14 (discharge, 13,700 second-feet); stage may have been higher on January 23 when recorder was not operating; minimum stage, from recorder, 1.56 feet at 7 p. m. October 2 (discharge, 189 second-feet).

Maximum stage during year ending September 30, 1920, from water-stage recorder, 8.50 feet at 6.30 p. m. November 15 (discharge, 10,300 second-feet); minimum stage, from recorder, 1.54 feet at 11 a. m. October 7 (discharge, 184 second-feet).

1907–1920: Maximum stage, from recorder, 12.2 feet at 10 a. m. December 18, 1917 (discharge, 18,300 second-feet); discharge may have been greater during floods in November, 1909, and November, 1910; minimum stage from recorder, 1.50 feet at 1 p. m. September 30, 1915 (discharge, 146 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Stage-discharge relation changed December 14, 1918, during high water. Rating curves used before and after the change well defined below 7,000 second-feet. Water-stage recorder referred to outside gage which was rated because of partial clogging of intake to stilling well. Operation of recorder satisfactory except as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table the daily mean gage height determined from gage-height graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Partial clogging of intake pipe caused lag of stage in well behind that in river. This caused slight uncertainty in daily records for periods of rapidly changing stage but had little or no effect on monthly mean discharge. Records for period between high water in December, 1918, and in January, 1919, fair, for remainder of two-year period good.

COOPERATION.—Puget Sound Power & Light Co. furnished gage-height record and made some discharge measurements.

Discharge measurements of Middle Fork of Snoqualmie River near North Bend, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 22	Calkins and Neth	3.54	1,230	Feb. 25	Neth and Calkins	2.07	353
23	do	3.57	1,300	25	do	2.05	338
24	do	3.87	1,660	July 19	do	2.50	587
Sept. 11	D. J. F. Calkins	1.83	263	20	do	2.38	495
12	do	3.90	1,660	Sept. 15	R. B. Kilgore	3.93	1,750
				17	do	3.16	979

Daily discharge, in second-feet, of Middle Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	207	1,340	720	529	800	934	1,560	2,040	1,300	1,100	480	266
2	194	1,210	4,060	490	727	2,040	1,620	1,970	1,380	1,230	443	236
3	221	1,170	8,390	474	682	1,280	1,760	1,440	1,690	1,330	424	221
4	207	1,170	6,580	453	641	1,020	2,970	1,140	2,040	1,440	429	216
5	363	1,130	3,500	439	617	920	2,020	1,020	2,220	1,560	480	236
6	559	930	2,300	419	588	860	1,440	1,020	2,040	1,330	458	275
7	577	831	1,710	392	547	770	1,180	1,140	1,560	1,100	458	307
8	348	733	1,390	379	564	712	990	1,380	1,560	1,060	453	269
9	273	788	1,210	370	860	641	955	1,560	1,620	1,280	419	256
10	276	2,890	1,090	365	890	647	2,210	1,380	1,620	1,440	401	241
11	1,460	2,060	1,010	379	800	770	1,860	1,240	1,330	1,330	401	285
12	2,430	1,300	1,230	392	448	729	1,330	1,230	1,230	1,100	392	1,460
13	1,040	1,260	8,630	410	401	688	1,100	1,020	1,380	990	370	783
14	707	2,080	9,790		641	647	990	1,020	1,560	1,100	337	491
15	554	2,230	4,250		611	617	890	2,130	1,560	1,330	317	396
16	595	2,230	2,580		968	616	860	2,270	1,440	1,280	341	345
17	1,340	1,540	1,760	3,500	1,180	871	1,360	1,690	1,380	1,100	353	314
18	970	1,260	1,380		860	1,560	2,270	1,500	1,660	890	341	299
19	853	1,130	1,180		741	1,280	1,970	1,900	2,340	800	325	285
20	767	1,050	1,100		658	1,020	1,900	2,270	2,420	759	307	282
21	727	930	990		594	920	1,690	2,590	2,260	770	303	263
22	649	831	860		552	890	1,320	3,280	1,900	800	296	241
23	1,070	754	800		573	910	1,250	2,340	1,830	741	289	227
24	2,220	707	717	5,400	552	830	1,560	1,900	1,620	664	263	221
25	1,650	655	658		770	770	1,620	2,750	1,760	641	253	221
26	1,130	619	617		830	735	1,500	4,700	1,900	552	259	216
27	7,070	595	652	1,690	800	741	1,830	5,410	1,500	501	253	238
28	6,670	713	800	1,330	800	741	1,830	3,580	1,280	506	247	238
29	3,940	675	800	1,120	.....	892	1,900	2,660	1,060	518	241	214
30	2,230	662	652	1,020	.....	1,560	2,040	2,120	990	512	236	203
31	1,700	.....	623	890	.....	1,970	.....	1,620	.....	480	253	.....

Daily discharge, in second-feet, of Middle Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	241	4,110	770	1,100	1,950	296	694	1,060	860	1,440	307	434
2	272	2,820	652	955	1,440	292	641	955	1,130	1,230	299	357
3	247	1,690	588	830	1,140	285	582	890	1,500	1,100	289	317
4	219	2,940	564	755	1,020	317	1,020	830	1,970	1,020	292	296
5	206	1,690	535	688	920	405	2,610	955	1,760	955	282	285
6	196	1,140	485	617	1,080	374	1,420	1,330	1,500	890	282	282
7	188	1,020	456	558	1,420	329	1,760	2,470	1,560	860	275	263
8	235	800	432	518	1,030	345	1,060	2,980	2,200	860	275	253
9	289	707	407	490	890	526	860	2,420	1,830	830	272	269
10	236	712	383	458	800	518	800	1,830	1,560	800	272	680
11	705	830	372	434	741	485	770	1,380	1,900	735	272	1,980
12	945	682	361	434	688	1,170	942	1,280	1,560	799	269	4,300
13	629	936	351	439	641	5,570	1,310	1,330	1,500	878	259	2,900
14	480	2,660	340	476	599	3,250	1,020	1,380	2,100	735	253	4,200
15	383	7,400	329	1,100	570	1,760	890	1,330	2,620	712	247	2,080
16	333	6,870	400	4,030	541	1,180	830	1,440	1,900	712	236	1,280
17	365	4,470	4,500	6,920	518	955	770	2,680	1,970	658	230	955
18	383	2,900	2,740	7,240	495	830	694	1,870	1,690	617	224	818
19	333	3,570	1,700	5,850	485	729	895	1,440	1,440	564	206	712
20	292	2,340	2,300	3,100	453	712	920	1,280	1,330	501	196	692
21	390	2,150	2,740	2,020	415	782	830	1,180	1,500	464	201	1,800
22	1,160	2,120	2,270	1,390	392	770	800	990	1,690	424	206	2,420
23	862	1,760	3,080	1,060	383	706	735	990	1,230	410	211	1,830
24	629	1,760	5,620	920	361	741	706	920	990	396	214	1,560
25	501	1,280	3,720	3,520	345	741	782	830	955	370	214	1,380
26	439	990	2,200	2,580	337	652	1,060	800	920	349	206	1,830
27	383	860	1,900	3,340	321	728	1,500	920	955	341	229	2,120
28	507	800	1,480	6,980	303	709	1,690	990	1,060	345	486	1,500
29	890	800	1,180	4,160	292	890	1,500	920	1,180	353	694	1,060
30	694	800	1,900	3,320	.....	955	1,180	890	1,380	341	1,160	890
31	690	.....	1,500	2,900	.....	800	.....	800	.....	321	611	.....

NOTE.—Recorder not operating Jan. 14-26, 1919; discharge estimated by comparison with records of flow for stations in Snoqualmie and Skykomish river basins. Recorder not operating Dec. 8-21, 1919; discharge determined from readings of staff gage, Dec. 10, 15, 18, and 21; interpolated, Dec. 8, 9, and 11-14; and from comparison with records of flow of other streams Dec. 16, 17, 19, and 20. Braced figures show mean discharge for periods included.

Monthly discharge of Middle Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 184 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	7,070	194	1,390	7.55	8.70	85,500
November	2,890	595	1,180	6.41	7.15	70,200
December	9,790	617	2,320	12.6	14.53	143,000
January	.....	365	2,210	12.0	13.83	136,000
February	1,180	401	703	3.82	3.98	39,000
March	2,040	616	954	5.18	5.97	58,700
April	2,970	860	1,590	8.64	9.64	94,600
May	5,410	1,020	2,040	11.1	12.80	125,000
June	2,420	990	1,640	8.91	9.94	97,600
July	1,560	480	975	5.30	6.11	60,000
August	480	236	349	1.90	2.19	21,500
September	1,460	203	325	1.77	1.98	19,300
The year	9,790	194	1,310	7.12	96.82	950,000

Monthly discharge of Middle Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919-20.						
October	1,160	188	462	2.51	2.89	28,400
November	7,400	682	2,120	11.5	12.83	126,000
December	5,620	329	1,490	8.10	9.34	91,600
January	7,240	434	2,230	12.1	13.95	137,000
February	1,950	292	709	3.85	4.15	40,800
March	5,570	285	929	5.05	5.82	57,100
April	2,610	582	1,040	5.65	6.30	61,900
May	2,980	800	1,330	7.23	8.34	81,800
June	2,620	860	1,520	8.26	9.22	90,400
July	1,440	321	678	3.68	4.24	41,700
August	1,160	196	312	1.70	1.96	19,200
September	4,300	253	1,320	7.17	8.00	78,600
The year	7,400	188	1,180	6.41	87.04	854,000

NORTH FORK OF SNOQUALMIE RIVER NEAR NORTH BEND, WASH.

LOCATION.—In NE. ¼ sec. 26, T. 24 N., R. 8 E., at Gabriel ranch, 2 miles above mouth and 3½ miles northeast of North Bend, King County.

DRAINAGE AREA.—About 102 square miles (measured on topographic and county maps).

RECORDS AVAILABLE.—July 4, 1907, to September 30, 1920.

GAGE.—Friez water-stage recorder installed September 26, 1916, on right bank 200 yards southeast of ranch house; inspected by A. R. Neth. Previous gages as follows: July 21, 1907, to September 2, 1912, vertical staff at highway bridge one-eighth mile above mouth; September 2, 1912, to October 22, 1915, Fuller water-stage recorder at same site and datum; October 23, 1915, to September 26, 1916, Friez water-stage recorder at same site and datum.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 200 yards above mouth.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel; shifting at extremely high stages. Right bank not subject to overflow; left bank fairly high, not subject to overflow except at extremely high stages. Stage of zero flow, according to measurements made September 14, 1918, gage height −0.4 foot.

EXTREMES OF DISCHARGE.—Maximum mean daily discharge during year ending September 30, 1919, estimated at 5,700 second-feet on January 23; minimum stage recorded, 1.64 feet September 4 (discharge, 76 second-feet).

Maximum mean daily discharge during year ending September 30, 1920, estimated at 4,140 second-feet on November 15; minimum stage recorded, 1.61 feet August 25 (discharge, 71 second-feet).

1907–1920: Maximum stage, determined by leveling to high-water mark, 14.5 feet November 18, 1911 (discharge, 11,100 second-feet); water above gage November 18, 19, 23, 24, 29, and 30, 1909, and stage may have exceeded that reached in 1911. Minimum stage recorded, 1.0 foot September 26–28, 1910 (discharge, 56 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 3,000 second-feet. Operation of water-stage recorder excellent except as indicated in footnote to daily-discharge table. Daily discharge ascertained

by applying to rating table the daily mean gage height determined from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Recorder referred to the outside gage. Partial clogging of intake pipe caused lag of water stage in well behind that in river. This caused slight uncertainty in daily records for periods of rapidly changing stage, but had little or no effect on monthly determinations. Records good except for periods when no gage-height record is available.

COOPERATION.—Puget Sound Power & Light Co. furnished gage-height record and made some discharge measurements.

Discharge measurements of North Fork of Snoqualmie River near North Bend, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 24	Calkins and Neth	3.89	1,010	Feb. 24	Calkins and Neth	2.37	205
Sept. 13	D. J. F. Calkins	2.88	363	25	do	2.36	201
13	do	2.84	345	July 20	do	2.24	183
Dec. 13	A. R. Neth	2.28	210	Sept. 17	R. B. Kilgore	3.09	466

Daily discharge, in second-feet, of North Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	83	702	358	339	504	382	986	1,110	677	443	190	83
2	81	610	2,370	319	460	857	986	1,120	755	468	177	83
3	84	702	4,400	307	426	710	1,060	866	850	499	172	79
4	89	770	3,400	296	401	558	1,720	708	942	546	186	76
5	129	717	1,940	282	375	504	1,210	623	968	552	212	80
6	192	564	1,360	274	355	462	906	617	858	493	188	130
7	214	478	1,050	263	333	430	770	680	688	448	177	153
8	170	426	794	258	352	401	617	818	799	434	166	122
9	148	483	666	255	819	375	597	883	702	510	157	114
10	146	1,480	552	252	716	365	1,520	786	755	534	151	111
11	1,000	1,090	494	252	540	401	1,140	745	673	483	146	180
12	1,430	680	542	258	457	375	818	763	590	401	142	755
13	480	835		255	408	358	673	637	637	359	142	358
14	339	1,410		250	378	342	584	666	740	390	138	248
15	290	1,360		250	361	327	516	1,320	729	443	132	204
16	310	1,260	2,180	643	667	310	488	1,310	630	434	128	177
17	778	900			989	379	1,080	1,020	577	365	126	159
18	468	717			652	277	1,780	875	680	310	120	148
19	397	610			528	695	1,460	1,000	892	288	114	142
20	345	584	666	2,600	452	552	1,350	1,080	834	277	107	136
21	336	510	558		408	499	1,160	1,210	778	271	104	128
22	307	443	488		382	483	917	1,460	740	268	105	122
23	365	393	439		364	499	842	1,030	755	260	94	114
24	1,240	365	401		333	457	1,020	866	630	242	89	109
25	1,130	345	382	3,000	361	421	1,080	1,360	695	232	87	104
26	732	330	361		386	393	986	2,170	717	204	84	95
27	3,380	319	365	1,030	365	393	1,070	2,430	571	199	83	107
28	2,980	349	510	842	358	393	1,030	1,480	483	199	83	114
29	1,680	336	510	732	.....	478	1,060	1,160	420	195	81	109
30	1,010	342	408	644	.....	912	1,090	968	404	188	80	100
31	917	.....	361	571	.....	1,310	.....	794	.....	177	81	.....

Daily discharge, in second-feet, of North Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	122	2,090	417	748	1,080	177	364	702	501	568	119	177
2	157	1,380	386	619	875	177	338	639	501	501	113	150
3	142	766	355	528	710	173	311	574	866	442	110	132
4	124	1,720	324	465	606	182	508	557	1,000	407	106	121
5	114	1,090	304	419	540	202	1,490	626	908	371	105	117
6	109	776	282	379	648	199	942	858	810	338	101	112
7	104	635	278	349	895	188	748	1,410	908	328	96	110
8	131	528	263	328	594	206	626	1,660	1,160	314	95	103
9	170	460	249	311	501	304	517	1,310	995	298	95	108
10	148	483	234	292	442	282	470	1,030	850	273	94	448
11	344	558	216	276	403	267	442	802	1,030	251	90	1,810
12	540	452	199	267	375	624	522	710	858	275	86	
13		866	199	259	345	3,420	818	755	826	345	86	1,800
14		2,210		270	321	1,840	639	763	1,090	267	84	
15		4,140		681	304	1,020	562	710	1,210	251	82	
	300		700									
16		2,700		1,930	288	725	562	770	951	238	82	653
17		2,170			279	562	511	1,370	1,070	220	79	470
18		1,380	1,410		270	470	465	1,000	875	206	79	403
19	224	1,830	1,040		267	415	661	850	717	199	78	342
20	209	1,220	1,360		256	395	688	802	688	193	78	352
21		1,360	1,440	2,200	240	446	557	740	732	179	76	1,010
22		1,210	1,110		232	442	506	594	740	171	75	1,410
23	450	986	1,660		225	399	470	594	551	162	74	1,160
24		1,120			215	399	451	557	475	156	73	934
25		826			208	387	506	480	522	152	71	740
			2,200									
26	310	637			204	345	702	456	491	148	73	925
27	279	522			197	335	986	534	511	142	80	1,010
28	338	483	925	1,800	188	331	1,030	568	522	138	139	695
29	490	473	778		182	403	960	496	545	132	226	501
30	390	461	1,260		.....	465	802	511	600	128	427	424
31	398	.....	1,060		.....	403	.....	475	.....	123	228	.....

NOTE.—No gage-height record for following periods: Dec. 13–19, 1918, Jan. 17–26, Oct. 13–18, 21–25, Dec. 14–17, 24–27, 1919, Jan. 17–31, and Sept. 12–15, 1920 (discharge estimated by comparison with records of flow of near-by streams); Oct. 11, Dec. 2, 3, 8, 9, and 11, 1919 (discharge interpolated). Braced figures show mean discharge for periods included.

Monthly discharge of North Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 102 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	3,380	81	685	6.72	7.75	42,100
November	1,480	319	670	6.57	7.33	39,900
December	.....	358	1,250	12.3	14.18	76,900
January	.....	250	1,180	11.6	13.37	72,600
February	989	333	469	4.60	4.79	26,000
March	1,310	277	493	4.83	5.57	30,300
April	1,780	488	1,020	10.0	11.16	60,700
May	2,430	617	1,050	10.3	11.87	64,600
June	968	404	706	6.92	7.72	42,000
July	552	177	358	3.51	4.05	22,000
August	212	80	130	1.27	1.46	7,990
September	755	76	155	1.52	1.70	9,220
The year	.....	76	682	6.69	90.95	494,000

Monthly discharge of North Fork of Snoqualmie River near North Bend, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919-20.						
October	.....	104	287	2.81	3.24	17,600
November	4,140	452	1,180	11.6	12.94	70,200
December	.....	.....	882	8.65	9.97	54,200
January	.....	259	1,240	12.2	14.07	76,200
February	1,080	182	410	4.02	4.34	23,600
March	3,420	173	522	5.12	5.90	32,100
April	1,490	311	638	6.25	6.97	38,000
May	1,660	456	771	7.56	8.72	47,400
June	1,210	475	788	7.73	8.62	46,900
July	568	123	255	2.50	2.88	15,700
August	427	71	110	1.08	1.24	6,760
September	.....	103	721	7.07	7.89	42,900
The year	.....	71	650	6.37	86.78	472,000

SOUTH FORK OF SNOQUALMIE RIVER AT NORTH BEND, WASH.

LOCATION.—In SE. ¼ sec. 9, T. 23 N., R. 8 E., at Cooper ranch, half a mile south of North Bend, King County, and 3½ miles, by river, above mouth.

DRAINAGE AREA.—84 square miles (measured on topographic map).

RECORDS AVAILABLE.—July 21, 1907, to February 29, 1908, and June 26, 1908, to September 30, 1920.

GAGE.—Friez water-stage recorder installed October 2, 1916, on left bank at Cooper ranch; inspected by A. R. Neth. Previous gages as follows: July 6, 1907, to August 31, 1912, vertical staff at Northern Pacific Railway bridge, 2½ miles, by river, above mouth; September 1, 1912, to October 21, 1915, Fuller water-stage recorder at same site and datum; October 22, 1915, to October 1, 1916, Friez water-stage recorder at same site and datum.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 150 feet below gage.

CHANNEL AND CONTROL.—Bed composed of gravel; shifting at extremely high stages.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 10.2 feet at 11 a. m. December 14 (discharge, 4,970 second-feet); stage may have been higher on January 23 when recorder was not operating; minimum stage from recorder, 1.64 feet at 10 p. m. October 2 (discharge, 86 second-feet).

Maximum stage during year ending September 30, 1920, from water-stage recorder, 8.5 feet at 7 p. m. November 15 (discharge, 3,570 second-feet); minimum stage, from recorder, 1.66 feet from 10 a. m. to 4 p. m. October 7 (discharge, 91 second-feet).

1907–1920: Maximum stage recorded, "Water over gage," November 3, 4, 19, 23, and 29, 1909 (gage height and discharge not determined); minimum stage recorded, 0.70 foot October 10, 11, 1908 (discharge, 68 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 14, 1918, during high water. Rating curves well defined. Water-stage recorder was referred to outside gage which was rated because of partial clogging of intake to stilling well. Operation of recorder excellent except as noted in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table the daily mean gage

height determined from recorder graph by inspection or, for days of considerable variation in stage, by averaging determinations obtained by applying mean gage heights for shorter intervals. Partial clogging of intake pipe caused lag of water stage in well behind that in river. This caused slight uncertainty in daily records for periods of rapidly changing stage, but had little or no effect on monthly determinations. Records for period between high water in December, 1918, and in January, 1919, fair, for remainder of the two-year period good.

COOPERATION.—Puget Sound Power & Light Co. furnished gage-height record and made some discharge measurements.

Discharge measurements of South Fork of Snoqualmie River at North Bend, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 22	Calkins and Neth	3.75	734	Feb. 26	Neth and Calkins	3.03	439
23	do	3.65	677	July 19	do	2.20	180
Sept. 10	D. J. F. Calkins	1.78	107	21	do	2.14	173
11	do	1.81	117	Sept. 15	R. B. Kilgore	3.68	710
				17	do	2.90	390

Daily discharge, in second-feet, of South Fork of Snoqualmie River at North Bend, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	93	617	410	481	728	559	773	965	858	539	182	113
2	90	555	1,210	466	706	776	773	866	866	539	176	108
3	98	535	3,540	451	684	728	819	842	965	539	171	106
4	98	507	2,250	436	662	641	1,140	722	1,060	539	171	105
5	117	499	1,540	425	662	600	1,040	684	1,060	539	173	111
6	160	450	1,060	411	641	600	788	662	1,040	500	167	128
7	170	425	863	400	600	559	684	706	915	477	159	130
8	133	396	748	400	620	520	600	773	890	444	157	120
9	111	432	681	396	641	489	559	842	890	458	152	114
10	104	896	596	417	662	491	859	819	890	466	148	111
11	200	911	555	400	662	520	890	781	819	444	144	129
12	638	681	617	403	662	500	728	773	750	400	142	291
13	340	617	2,670	386	641	466	662	706	773	375	141	232
14	235	816	4,180	369	620	444	600	706	796	375	135	165
15	196	887	2,070	358	600	432	539	890	786	379	132	141
16	210	887	1,220	395	696	425	520	1,020	750	369	130	128
17	389	703	940	1,630	819	458	608	915	728	339	130	121
18	339	596	796	3,080	728	600	890	842	773	302	126	114
19	289	535	706	2,120	662	600	866	915	890	278	125	110
20	264	503	641	1,340	620	559	874	1,020	940	261	121	106
21	252	469	579	1,060	579	520	842	1,090	890	253	118	105
22	246	435	539	4,000	559	500	750	1,320	830	244	116	102
23	285	407	620	4,500	559	520	728	1,090	773	236	114	100
24	564	389	620	2,070	520	492	796	965	728	226	113	99
25	725	372	600	1,390	579	477	842	1,010	728	213	110	95
26	555	366	559	1,180	559	458	819	1,620	750	203	110	93
27	1,810	352	559	990	539	462	890	1,960	662	191	111	99
28	2,280	376	559	866	520	455	940	1,560	620	188	110	99
29	1,270	376	539	819	.....	492	940	1,240	555	186	110	96
30	887	379	520	796	.....	691	990	1,090	520	184	110	96
31	725	.....	492	750	.....	819	.....	940	.....	178	111	.....

Daily discharge, in second-feet, of South Fork of Snoqualmie River at North Bend, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	108	1,150	358	641	1,190	365	407	539	436	414	133	148
2	118	1,120	323	579	1,040	355	400	496	500	382	132	130
3	114	728	296	520	915	336	375	466	579	349	128	120
4	104	830	293	470	866	339	514	447	684	326	126	113
5	98	706	288	440	796	342	990	470	641	305	126	111
6	95	520	283	411	819	333	773	559	579	287	123	110
7	92	458	278	389	940	314	662	773	579	276	121	108
8	98	393	269	369	856	311	579	1,020	684	267	121	108
9	106	358	259	355	796	355	520	903	684	258	120	111
10	102	352	250	339	750	358	477	796	620	247	116	154
11	190	386	243	326	728	345	458	662	620	236	111	369
12	284	355	236	320	684	414	500	600	600	233	108	940
13	198	345	230	314	662	1,700	620	579	559	305	105	706
14	159	462	223	311	641	1,630	559	579	620	253	104	967
15	141	1,780		369	620	866	520	559	750	228	104	706
16	128	2,620	450	679	620	662	496	579	620	218	102	481
17	141	1,680		2,410	600	559	458	814	620	205	100	379
18	144	1,140	915	2,670	579	489	425	796	600	196	100	342
19	132	1,210	620	2,770	579	444	470	662	539	188	99	305
20	125	990	662	1,400	559	421	520	620	500	182	98	287
21	132	796	804	990	520	421	489	559	520	173	98	435
22	250	773	819	773	500	414	458	500	539	169	96	684
23	270	750	920	684	489	400	429	496	470	163	95	600
24	215	654	1,690	641	470	414	414	473	425	163	95	579
25	184	559	1,600	1,260	455	425	440	440	421	157	95	520
26	169	500	994	1,220	440	386	496	432	403	154	95	539
27	156	440	819	1,050	421	386	620	462	403	148	106	539
28	184	407	750	2,190	400	372	706	485	403	144	125	489
29	320	396	684	1,860	375	407	662	462	414	142	176	407
30	261	389	750	1,440	.....	447	600	447	421	139	318	362
31	254	.....	773	1,390	.....	429	.....	425	.....	135	192	.....

NOTE.—Recorder not operating Jan. 22, 10 a. m. to Jan. 23, midnight, 1919; discharge estimated by comparison with record of flow of North Fork of Skykomish River at Index. Recorder not operating Feb. 2, Nov. 24, and Dec. 4–18, 1919. Discharge Feb. 2, Nov. 24, Dec. 5, 6, 8, 9, and 11–13, 1919, determined by interpolation; Dec. 7, 10, 14, and 18, 1919, from readings of staff gage. Braced figures showing mean discharge for periods included were estimated by comparison with records of flow of near-by streams.

Monthly discharge of South Fork of Snoqualmie River at North Bend, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 84 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	2,280	90	448	5.33	6.14	27,500
November	911	352	546	6.50	7.25	32,500
December	4,180	410	1,080	12.9	14.87	66,400
January	4,500	358	1,070	12.7	14.64	65,800
February	819	520	633	7.54	7.85	35,200
March	819	425	544	6.48	7.47	33,400
April	1,140	520	792	9.43	10.52	47,100
May	1,960	662	979	11.7	13.49	60,200
June	1,060	520	816	9.71	10.83	48,600
July	539	178	350	4.17	4.81	21,500
August	182	110	136	1.62	1.87	8,360
September	291	93	122	1.45	1.62	7,260
The year	4,500	90	627	7.46	101.36	454,000

Monthly discharge of South Fork of Snoqualmie River at North Bend, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919–20.						
October	320	92	164	1.95	2.25	10,100
November	2,620	345	775	9.23	10.30	46,100
December	1,690	223	580	6.90	7.96	35,700
January	2,770	311	954	11.4	13.14	58,700
February	1,190	375	666	7.93	8.55	38,300
March	1,700	311	498	5.93	6.84	30,600
April	990	375	535	6.37	7.11	31,800
May	1,020	425	584	6.95	8.01	35,900
June	750	403	548	6.52	7.27	32,600
July	414	135	227	2.70	3.11	14,000
August	318	95	122	1.45	1.67	7,500
September	967	108	395	4.70	5.24	23,500
The year	2,770	92	502	5.98	81.45	365,000

STILAGUAMISH RIVER BASIN.

DEER CREEK AT OSO, WASH.

LOCATION.—In sec. 5, T. 32 N., R. 7 W., 1¼ miles above Oso and junction with North Fork of Stilaguamish River, Snohomish County.

DRAINAGE AREA.—84 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 11, 1917, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank about 250 feet below mouth of 3 mile canyon; inspected by W. A. Palmer and C. G. Bloxham.

DISCHARGE MEASUREMENTS.—Made by wading or from highway bridge at Oso.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel overlying bedrock. Banks high. One channel at all stages. Stage of zero flow, according to measurements made September 17, 1919, gage height 0.05 foot ± 0.1 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 9.7 feet at 8 a. m. December 4 (discharge, 7,850 second-feet); minimum stage, from recorder, 1.08 feet September 29-30 (discharge, 27 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 9.9 feet at 10 a.m. November 15 (discharge, 8,490 second-feet); minimum stage, from recorder, 0.34 foot on August 17 and 23 (discharge, 29 second-feet).

1918–1920: Maximum stage recorded, 10.05 feet December 18, 1917, from high-water mark in well (discharge, 9,300 second-feet); minimum stage recorded September 29 and 30, 1919.

ICE.—Stage-discharge relation affected by ice during severe winters; flow estimated from discharge measurements, observer's notes, and weather records.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed January 9 and 11, 1919, because of land slides; about January 25, November 1 and November 15, 1919, by high water; and on September 11, 1919, by drift lodging on control; affected by ice December 8–14, 1919.

Rating curves used to January 9, 1919, and after November 15, 1919, well defined below 3,000 second-feet. Rating curve used February 1 to November 14, 1919, well defined below 2,000 second-feet. Operation of water-stage recorder

satisfactory except January to April, 1920, when partially clogged intake pipe interfered with correct registering of low-water gage heights. Daily discharge, except as noted in footnote to table of daily discharge, ascertained by applying to rating table the daily mean gage heights determined from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records January, 1919, poor; December, 1919, to April, 1920, fair; other periods excellent.

COOPERATION.—Station maintained in cooperation with Western Power Co.

Discharge measurements of Deer Creek at Oso, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
1918.				1920.			
Oct. 13	Lasley Lee	2.11	265	Apr. 27	R. B. Kilgore	2.60	491
1919.				29	do	2.61	490
Jan. 15	D. J. F. Calkins	7.32	250	May 21	do	2.51	450
16	do	7.27	232	22	do	2.30	382
Feb. 6	R. B. Kilgore	2.19	188	July 23	Newton and Lee	.61	51.1
Mar. 28	L. D. Carson	2.49	270	25	Lee and Newton	.58	50.8
Apr. 5	do	3.95	953	Sept. 3	Lasley Lee	.56	43.6
June 10	John McCombs	3.08	488	23	do	3.78	1170
24	do	2.43	252	27	do	4.16	1520
Sept. 17	do	1.21	36.0				
Oct. 24	Lasley Lee	2.04	134				
Nov. 2	do	3.14	493				

Daily discharge, in second-feet, of Deer Creek at Oso, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	37	764	578	184	286	353	689	772	379	165	62	32
2	33	679	1,320	178	258	1,140	800	633	438	174	57	32
3	36	865	3,550	193	232	608	831	467	425	178	54	31
4	42	878	5,530	175	223	538	2,500	383	484	190	52	30
5	283	656	1,600	161	210	405	1,050	339	502	208	52	40
6	529	446	1,190	155	190	329	743	364	398	369	50	50
7	226	352	702	140	171	292	589	446	315	210	48	41
8	114	309	514	133	449	252	454	566	332	172	47	38
9	82	430	470		1,790	223	603	589	383	174	45	37
10	326	2,500	377		1,020	218	2,370	467	463	174	44	36
11	1,730	1,010	388		638	246	1,080	819	361	159	42	115
12	683	589	458	140	454	215	668	732	325	133	41	554
13	284	1,770	4,580		386	208	506	533	368	122	43	108
14	186	2,070	4,030		357	223	405	518	497	123	44	63
15	144	1,320	1,770		460	226	350	921	417	130	41	48
16	231	1,140	854		1,760	237	329	953	339	122	40	41
17	392	696	589		1,040	917	946	772	308	105	38	37
18	269	537	470		528	1,050	1,300	589	346	92	37	36
19	284	446	399		398	548	1,020	743	434	85	37	36
20	242	399	566	2,400	315	402	1,000	716	405	81	35	35
21	198	348	426		267	346	664	855	361	80	34	33
22	206	309	328		240	336	547	864	326	78	34	31
23	482	266	269		223	357	551	589	305	74	34	31
24	930	237	240		190	312	716	515	256	71	33	31
25	656	210	218		249	267	772	2,220	273	69	33	30
26	1,050	220	212		308	243	689	1,350	279	66	32	29
27	4,980	220	244	890	258	240	737	1,080	240	62	33	29
28	2,740	275	778		261	277	664	743	205	59	33	28
29	1,210	309	532		.....	404	689	614	174	58	32	27
30	684	751	293		.....	902	689	497	161	55	32	34
31	884	.....	215		.....	1,010	.....	398	.....	54	32	.....

Daily discharge, in second-feet, of Deer Creek at Oso, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	158	1,580	221	431	776		410	374	333	165	41	64
2	96	659	165	366	514		382	362	374	145	39	52
3	56	343	161	302	437		344	323	438	129	38	46
4	44	936	157	237	407	130	486	318	474	118	37	41
5	39	448	153		404		1,310	360	398	106	36	40
6	37	305	149		601		519	490	574	96	35	39
7	34	350	132		692		514	825	751	91	35	38
8	44	243			470	302	470	850	660	84	34	37
9	59	239			423	550	433	639	447	80	33	41
10	76	694		140	404	437	423	458	388	75	32	671
11	453	460	80		360	433	404	344	656	71	32	3,390
12	183	229			317	1,620	559	308	423	84	31	1,730
13	142	600			273	4,000	651	331	411	96	30	2,000
14	98	2,290			230	1,270	444	326	780	84	30	4,050
15	72	6,180	163	988	186	655	390	338	730	75	30	1,270
16	61	3,420	176	2,610	177	474	337	360	427	70	29	578
17	70	1,820	3,550	5,390	168	423	284	1,700	385	65	30	354
18	65	920	1,340	5,430	159	401	230	1,230	323	62	30	433
19	56	1,240	1,260	2,580	150	374	399	474	273	59	31	308
20	50	860	1,780	920	141	354	430	413	256	56	30	750
21	352	931	1,300	532	132	410	410	455	249	55	30	2,120
22	426	665	1,210	298	122	376	376	371	244	53	30	1,780
23	257	634	2,400	221	113	346	336	430	201	51	29	1,030
24	132	632	3,150	528	104	391	326	407	207	50	30	598
25	97	401	1,360	626	95	410	333	349	240	48	30	848
26	84	326	1,060	444	86	407	416	298	199	46	31	995
27	70	286	1,380	1,670	77	427	522	796	190	46	210	1,910
28	145	271	735	4,600	68	420	564	508	186	45	154	651
29	174	249	514	1,460	59	477	489	401	178	43	519	394
30	122	242	691	3,000	.....	893	391	394	180	42	224	308
31	174	.....	496	1,590	.....	451	.....	333	.....	41	91	.....

NOTE.—Stage-discharge relation uncertain for period Jan. 9-31, 1919, because control was covered by land slide and partially cleared again by flood before satisfactory rating could be made. Water-stage recorder not operating Dec. 3-5, 1919, Jan. 1-14, Feb. 11 to Mar. 7, and Apr. 15-18, 1920; discharge obtained by comparison with records of flow of adjacent streams. Braced figures show mean discharge for periods included. Daily discharge during period of faulty gage-height record obtained from occasional staff gage readings and by interpolation.

Monthly discharge of Deer Creek at Oso, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 84 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	4,980	33	651	7.75	8.94	40,000
November	2,500	210	700	8.33	9.29	41,700
December	5,530	212	1,090	13.0	14.99	67,000
January	.....	.....	850	10.1	11.64	52,300
February	1,790	174	470	5.60	5.83	26,100
March	1,140	208	430	5.12	5.90	26,400
April	2,500	329	832	9.90	11.04	49,500
May	2,220	339	711	8.46	9.75	43,700
June	502	161	350	4.17	4.65	20,800
July	369	54	126	1.50	1.73	7,750
August	62	32	41.0	.488	.56	2,520
September	554	27	58.1	.692	.77	3,460
The year	5,530	27	526	6.26	85.09	381,000

Monthly discharge of Deer Creek at Oso, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919-20.						
October	453	34	127	1.51	1.74	7,810
November	6,180	229	982	11.7	13.05	58,400
December	3,550	.....	783	9.32	10.74	48,100
January	5,430	.....	1,150	13.7	15.79	70,700
February	776	59	281	3.35	3.61	16,200
March	4,000	.....	555	6.61	7.62	34,100
April	1,310	230	453	5.39	6.01	27,000
May	1,700	298	502	5.98	6.89	30,900
June	780	178	386	4.60	5.13	23,000
July	165	41	75.2	.895	1.03	4,620
August	519	29	65.8	.783	.90	4,050
September	4,050	37	886	10.5	11.71	52,700
The year	6,180	29	529	6.19	84.22	378,000

SKAGIT RIVER BASIN.

SKAGIT RIVER BELOW RUBY CREEK, NEAR MARBLEMOUNT, WASH.

LOCATION.—Three-fourths mile below Ruby Creek, 5 miles above Reflector Bar, and 23 miles (28 miles by trail) northeast of Marblemount, in Whatcom County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 1, 1919, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank three-fourths mile below Ruby Creek, installed June 9, 1919; inspected by F. E. Davis and employees of city of Seattle.

DISCHARGE MEASUREMENTS.—Made from cable 40 feet below gage.

CHANNEL AND CONTROL.—Control is at head of rapids about 125 feet below gage; composed of boulders and perhaps some bedrock and gravel; may shift during floods. Banks high and wooded, not subject to overflow. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during period of record, from water-stage recorder, 19.0 feet at 4 a. m. June 20, 1919 (discharge, 15,300 second-feet); minimum stage, from recorder, 3.30 feet at 10 p. m. November 11, 1919 (discharge, 555 second-feet).

ICE.—Stage-discharge relation affected by ice. Flow estimated from study of weather records obtained at Davis ranch, observer's notes, and records of flow of nearby streams.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; affected by ice December 5–18, 1919. Operation of water-stage recorder satisfactory except as shown in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection or, for days when there was considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent.

COOPERATION.—Station maintained in cooperation with city of Seattle.

Discharge measurements of Skagit River below Ruby Creek near Marblemount, Wash., during the period Dec. 12, 1918, to Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Dec. 12	Moore and Hunt	4.95	2,060	Aug. 27	Hunt and Davis	4.96	1,970
14	do	6.91	5,250	Oct. 6	G. H. Moore	3.80	845
1919.				1920.			
May 7	do	6.97	5,960	Mar. 28	Moore and Davis	4.26	1,230
June 13	McCombs and Hunt	7.88	7,790	July 12	McCombs and Moore	7.71	7,250
14	do	7.98	8,100	15	do	7.40	6,520

Daily discharge, in second-feet, of Skagit River below Ruby Creek, near Marblemount, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1919.					1919.				
1		8,040	4,430	1,910	16	8,320	10,200	2,940	1,670
2		8,600	4,160	1,730	17	8,600	8,320	3,170	1,620
3		9,550	3,980	1,620	18	9,550	6,750	3,170	1,560
4		10,200	4,250	1,620	18	13,000	6,260	3,020	1,500
5	9,100	11,000	4,070	1,560	20	14,400	6,260	2,870	1,450
6		9,900	3,720	1,500	21	12,600	6,260	2,870	1,300
7		8,320	3,640	1,620	22	11,800	6,260		1,250
8		7,770	3,560	1,450	23	11,800	5,900		1,300
9	9,200	8,320	3,320	1,500	24	11,800	5,340	2,300	1,300
10	8,600	9,200	3,240	1,450	25	11,800	5,340		1,300
11	7,770	9,900	3,320	1,630	26	12,200	4,520	2,100	1,200
12	7,250	9,200	3,320	2,570	27	11,800	4,250	2,030	1,090
13	7,510	8,040	3,020	2,030	28	11,000	4,340	1,850	998
14	8,040	8,320	2,720	1,910	29	9,550	4,340	1,850	960
15	8,320	9,550	2,720	1,790	30	8,320	4,340	1,850	945
					31		4,340	2,160	

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	930	714	1,850	2,430	3,810	1,200	1,130	2,720	3,170	11,800	2,950	1,300
2	901	714	1,620	2,220	3,560	1,160	1,120	2,640	3,640	11,400	2,880	1,250
3	852	684	1,400	2,030	3,170	1,160	1,060	2,640	4,720	10,600	2,810	1,350
4	826	690	1,400	1,910	2,870	1,130	1,040	2,800	6,260	9,900	2,670	1,300
5	832	660		1,790	2,720	1,120	1,060	3,020	7,250	8,900	2,740	1,300
6	845	649		1,670	3,100	1,090	1,020	3,560	7,250	7,760	2,880	1,200
7	859	644	1,200	1,560	3,400	1,060	1,020	4,860	7,000	7,760	2,880	1,200
8	873	616		1,500	3,170	1,070	990	6,500	7,510	8,030	2,880	1,160
9	819	610		1,400	2,940	1,110	982	7,000	7,000	8,030	2,880	1,160
10	786	616		1,350	2,640	1,070		7,000	6,750	8,030	2,880	1,160
11	793	590		1,350	2,500	1,040		6,500	6,500	7,760	2,740	2,140
12	859	570		1,300	2,360	1,070		6,260	6,500	6,970	2,600	4,060
13	873	610		1,250	2,220	1,750	1,100	6,260	6,500	6,450	2,670	2,880
14	819	644		1,200	2,100	1,910		6,260	7,770	6,450	2,600	3,430
15	786	2,640	1,100	1,250	2,030	1,670		6,260	8,900	6,450	2,460	3,020
16	768	4,820		1,350	1,910	1,500		6,500	8,900	6,450	2,320	3,020
17	756	5,340		2,260	1,850	1,400	1,160	7,510	8,900	6,190	2,140	2,600
18	738	4,430		3,900	1,790	1,350	1,160	7,250	8,600	6,060	1,780	2,530
19	726	3,980	1,790	3,810	1,730	1,300	1,250	6,020	8,040	5,940	1,670	2,260
20	714	3,240	2,330	3,020	1,670	1,300	1,250	5,560	7,770	5,470	1,670	2,140
21	762	2,940	3,320	2,500	1,620	1,350	1,250	5,020	8,320	4,830	1,840	2,670
22	812	3,400	3,240	2,100	1,500	1,350	1,200	4,520	9,550	4,340	1,900	2,530
23	774	4,430	3,980	1,850	1,450	1,350	1,200	4,160	8,320	3,980	1,900	2,200
24	726	4,430	5,070	1,850	1,400	1,350	1,200	3,810	7,000	3,890	1,780	2,080
25	696	3,640	4,920	1,790	1,400	1,350	1,250	3,640	6,020	3,480	1,620	2,020
26	696	2,800	4,250	1,670	1,350	1,300	1,500	3,560	5,670	3,320	1,500	1,900
27	672	2,500	3,980	1,670	1,300	1,250	2,160	3,560	6,020	3,320	1,720	2,020
28	678	2,360	3,720	3,590	1,250	1,200	2,870	3,480	7,510	3,400	1,840	1,960
29	672	2,220	3,320	4,620	1,250	1,200	3,020	3,320	9,550	3,640	1,560	1,840
30	660	2,030	3,020	4,720	.....	1,200	2,940	3,170	11,000	3,560	1,500	1,840
31	654	.....	2,640	4,250	.....	1,160	.....	3,100	.....	3,180	1,350	.....

NOTE.—No gage-height record June 1–8, and Aug. 22–25, 1919, and Apr. 10–16, 1920; discharge estimated by comparison with records of flow of Skagit River at Reflector Bar; braced figures show mean discharge for periods included.

Monthly discharge of Skagit River below Ruby Creek, near Marblemount, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1919.				
June	14,400	7,250	9,870	587,000
July	11,000	4,250	7,380	454,000
August	4,430	1,850	2,990	184,000
September	2,570	945	1,510	89,800
The period				1,310,000
1919–20.				
October	930	654	779	47,900
November	5,340	570	2,140	127,000
December	5,070		2,190	135,000
January	4,720	1,200	2,230	137,000
February	3,810	1,250	2,210	127,000
March	1,910	1,040	1,270	78,100
April	3,020	982	1,350	80,300
May	7,510	2,640	4,790	295,000
June	11,000	3,170	7,260	432,000
July	11,800	3,180	6,370	392,000
August	2,950	1,350	2,250	138,000
September	4,080	1,160	2,050	122,000
The year	11,800	570	2,910	2,110,000

SKAGIT RIVER AT REFLECTOR BAR, NEAR MARBLEMOUNT, WASH.

LOCATION.—In sec. 8, T. 37 N., R. 13 E. (unsurveyed), in Whatcom County, at Reflector Bar ranger station, 75 feet below mouth of Canyon Diablo, three-fourths mile above Stetattle Creek, 1½ miles below Thunder Creek, and 19 miles northeast of Marblemount.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—December 6, 1913, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank, 75 feet below mouth of Canyon Diablo, installed April 13, 1914; inspected by F. E. Davis and employees of city of Seattle. Prior to April 13, 1914, inclined staff at same site but at datum 2 feet higher.

DISCHARGE MEASUREMENTS.—Made from cable 50 feet below gage.

CHANNEL AND CONTROL.—Control is section of stream bed from 100 to 600 feet below gage. Length and location of control vary with stage. Bed composed of large boulders near right bank, gravel in center, and sand and rock near left bank; shifts during floods. One channel at all stages. Banks not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, 9.0 feet on May 27, determined from study of probable gage height (discharge, 24,200 second-feet); minimum stage, from water-stage recorder, 1.97 feet at 5 p. m. March 12 (discharge, 904 second-feet).

Maximum stage during year ending September 30, 1920, from water-stage recorder, 7.0 feet at midnight July 1 (discharge, 15,600 second-feet); minimum stage, from recorder, 1.64 feet from 4 p. m. November 11 to 9 p. m. November 12 (discharge, 665 second-feet). Discharge may have been as low or lower on December 12 when stage-discharge relation was affected by ice.

1913–1920: Maximum stage, from recorder, 12.0 feet at 6.30 p. m. December 29, 1917 (discharge, 37,300 second-feet); minimum stage, recorded on November 11 and 12, 1919.

A field investigation and office study of flood data in Skagit River basin indicates that a great flood occurred some time prior to 1879. High-water marks and other evidence seem to prove that the river reached a stage of about 20 feet at Reflector Bar (discharge, about 100,000 second-feet). The flood of November 29–30, 1909, reached a stage of about 15.0 feet at Reflector Bar (discharge about 58,000 second-feet). The flood of November 18–19, 1897, was about the same as the flood of December 29–30, 1917. The Spring floods of 1862, 1880, and 1894 probably reached nearly to the stage of the floods of 1897 and 1917.

ICE.—Stage-discharge relation affected by ice only during extremely severe winters. Flow estimated from observer's notes and weather records obtained at Davis ranch.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water on May 27, 1919; affected by ice December 9–18, 1919. Rating curves well defined. Operation of water-stage recorder satisfactory except as shown in footnote to daily-discharge table. Gage-height record somewhat uncertain because of conditions which made elevation of water surface in stilling well not always true index of elevation of water surface in river. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection. Records good.

COOPERATION.—Gage-height record and part of discharge measurements furnished by city of Seattle.

Discharge measurements of Skagit River at Reflector Bar, near Marblemount, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 8	Parker and Hunt	2.41	1,400	June 12	McCombs and Hunt	5.18	7,500
12	Parker and Moore	4.12	4,760	14	do	5.47	9,230
13	Parker and Hunt	3.50	3,310	Sept. 29	G. H. Moore	2.29	1,270
1919.				1920.			
Feb. 28	Hunt and Davis	2.20	1,180	Mar. 25	do	2.55	1,640
				July 9	McCombs and Moore	5.64	9,900
				18	do	5.18	8,050

Daily discharge, in second-feet, of Skagit River at Reflector Bar, near Marblemount, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,970	2,600		1,620	1,920	1,060	3,220	9,060	10,200	9,600	6,360	3,060
2		2,360	4,000	1,600	1,810	1,070	3,990	8,440	10,200	10,600	5,900	2,760
3		2,230		1,580	1,740	1,050	4,340	7,280	10,600	11,400	5,760	2,660
4		2,140		1,560	1,720	1,050	4,930	6,600	11,400	12,700	5,900	2,460
5	1,980	2,020	6,730	1,530	1,630	1,020	5,060	5,940	13,100	13,100	5,610	2,460
6		1,890	4,930	1,490	1,580	990	4,690	5,680	13,100	12,200	5,330	2,280
7		1,780	4,100	1,440	1,490	971	4,340	5,940	11,400	9,800	5,330	2,460
8	1,420	1,680	3,650	1,430	1,480	961	3,990	6,860	10,600	9,200	5,200	2,170
9	1,290	1,700	3,220	1,380	1,530	931	3,990	7,560	11,000	10,200	4,930	2,320
10	1,630	2,380	2,900	1,380	1,560	941	4,570	7,560	10,000	11,400	4,930	2,240
11	6,360	2,420	2,600	1,360	1,490	971	4,570	7,000	9,000	12,200	5,200	2,660
12	5,790	2,180	2,510	1,340	1,440	931	4,340	6,460	8,220	11,400	4,930	3,940
13	3,320	2,250	3,540	1,310	1,400	922	4,100	5,940	8,800	10,000	4,540	2,960
14	2,510	2,800	6,460	1,270	1,360	941	3,760	5,680	9,400	10,200	4,050	2,860
15	2,060	2,600	5,560	1,250	1,340	951	3,540	6,730	9,600	12,200	4,170	2,760
16	1,890	2,400	4,570	1,290	1,360	951	3,430	7,560	9,800	13,100	4,540	2,760
17	1,780	2,210	4,010	1,970	1,360	1,040	3,990	7,290	10,200	11,400	5,060	2,560
18	1,650	2,060	3,540	3,990	1,310	1,260	5,430	6,860	11,400	8,410	4,930	2,460
19	1,700	1,940	3,220	3,650	1,310	1,250	5,560	7,850	14,300	7,520	4,670	2,560
20	1,700	1,860	2,900	3,110	1,260	1,250	5,680	10,000	17,700	7,690	4,420	2,210
21	1,690	1,780	2,600	2,700	1,250	1,240	5,300	11,300	17,300	8,220	4,290	1,930
22	1,470	1,690	2,380	3,000	1,220	1,260	4,930	14,100	16,900	8,410	3,940	1,880
23	1,380	1,600	2,250	3,320	1,200	1,300	4,810	13,700	16,000	7,860	3,490	2,050
24	1,340	1,510	2,110	3,220	1,110	1,360	5,430	12,200	14,300	7,180	3,380	2,170
25	1,260	1,510	2,000	2,900	1,200	1,380	5,810	14,200	13,900	7,010	3,600	2,150
26	1,420	1,480	1,970	2,800	1,150	1,390	6,460	20,100	14,800	5,900	3,600	1,980
27	3,650	1,440	1,940	2,600	1,130	1,430	7,850	24,200	13,900	5,760	3,170	1,630
28	4,810	1,420	1,950	2,450	1,140		8,750	21,100	12,700	5,900	2,860	1,390
29	3,650	1,360	1,890	2,360	.....	2,000	8,750	18,100	11,000	6,050	2,960	1,300
30	2,900	1,430	1,890	2,250	.....		8,750	14,800	9,600	6,050	3,170	1,260
31	3,000	.....	1,660	2,090	.....		.....	11,800	.....	6,200	3,710	.....

Daily discharge, in second-feet, of Skagit River at Reflector Bar, near Marblemount, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	1,230	904	2,240	2,960	5,060	1,440	1,420	3,170	3,710	15,200	4,540	2,030
2	1,170	904	1,950	2,760	4,420	1,420	1,400	3,060	4,170	14,300	4,540	2,210
3	1,090	841	1,730	2,460	3,940	1,390	1,350	3,060	5,330	13,500	4,290	2,330
4	1,060	858	1,670	2,330	3,600	1,390	1,340	3,280	7,350	12,700	4,170	2,300
5	1,100	824	1,640	2,210	3,380	1,330	1,360	3,490	8,600	11,000	4,540	2,140
6	1,180	798	1,600	2,030	3,820	1,300	1,330	4,050	8,410	9,800	4,800	1,980
7	1,230	798	1,570	1,930	4,290	1,290	1,330	5,610	8,220	9,800	4,800	1,910
8	1,330	766	1,400	1,840	3,940	1,300	1,290	7,690	9,000	10,200	4,930	1,980
9	1,100	758		1,740	3,600	1,330	1,260	8,040	8,040	10,600	4,930	1,880
10	1,020	758		1,660	3,280	1,330	1,260	8,040	7,690	10,600	4,930	1,900
11	1,060	695		1,600	3,060	1,280	1,290	7,180	7,690	9,800	4,540	3,760
12	1,150	665		1,570	2,860	1,310	1,400	7,010	7,520	9,000	4,540	6,200
13	1,160	734		1,500	2,660	2,170	1,480	7,010	7,520	8,220	4,540	4,050
14	1,080	816	1,300	1,480	2,560	2,460	1,480	7,180	9,000	8,600	4,290	4,930
15	1,020	4,420		1,550	2,370	2,100	1,470	7,180	10,600	8,600	4,170	4,170
16	990	7,180		1,660	2,320	1,900	1,470	7,350	10,600	9,000	3,940	4,420
17	960	7,350		2,960	2,240	1,780	1,440	8,800	11,000	8,600	3,380	3,820
18	932	5,610		5,200	2,170	1,670	1,440	8,040	10,600	8,410	2,660	4,420
19	894	5,060	2,260	4,800	2,120	1,600	1,530	7,010	10,000	8,220	2,560	3,280
20	884	4,050	3,940	3,820	2,030	1,570	1,590	6,200	9,600	7,520	2,760	3,170
21	1,030	3,940	4,050	3,170	1,910	1,630	1,530	5,760	10,600	6,520	3,280	4,050
22	1,050	4,540	3,940	2,560	1,800	1,660	1,510	5,200	12,200	5,900	3,490	3,600
23	990	5,610	4,800	2,300	1,740	1,660	1,480	4,800	10,600	5,610	3,490	3,170
24	932	5,470	6,200	2,260	1,690	1,670	1,470	4,420	8,410	5,470	3,060	2,960
25	866	4,420	6,050	2,210	1,640	1,640	1,560	4,170	7,180	4,800	2,560	2,760
26	866	3,490	4,930	1,990	1,590	1,590	1,820	4,050	6,680	4,670	2,460	2,560
27	832	3,060	4,930	1,960	1,550	1,560	2,560	4,050	7,180	4,930	2,860	2,960
28	841	2,960	4,540	4,930	1,480	1,500	3,380	4,050	9,200	5,200	2,860	2,660
29	832	2,660	4,050	6,050	1,460	1,460	3,490	3,820	11,800	5,610	2,370	2,660
30	816	2,460	3,710	5,900	.....	1,520	3,380	3,710	13,900	5,330	2,170	2,760
1	807	.....	3,280	5,760	.....	1,500	.....	3,490	.....	4,800	1,980	.....

NOTE.—Water-stage recorder not operating satisfactorily Oct. 2-7, Dec. 1-4, 1918, Mar. 28-31, May 27, 1919, and July 10, 1920: discharge interpolated or determined from partial gage-height record and study of probable gage-height graph. Braced figures show mean discharge for periods included.

Monthly discharge of Skagit River at Reflector Bar, near Marblemount, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	6,360	1,260	2,370	146,000
November	2,800	1,360	1,960	117,000
December	.....	1,660	3,330	205,000
January	3,990	1,250	2,100	129,000
February	1,920	1,110	1,410	78,300
March	.....	922	1,220	75,000
April	8,750	3,220	5,150	306,000
May	24,200	5,680	10,300	633,000
June	17,700	8,220	12,000	714,000
July	13,100	5,760	9,320	573,000
August	6,360	2,860	4,510	277,000
September	3,940	1,260	2,340	139,000
The year	24,200	922	4,680	3,390,000
1919–20.				
October	1,330	807	1,020	62,700
November	7,350	665	2,780	165,000
December	6,200	.....	2,690	165,000
January	6,050	1,480	2,810	173,000
February	5,060	1,460	2,710	156,000
March	2,460	1,280	1,570	96,500
April	3,490	1,260	1,670	99,400
May	8,800	3,060	5,480	337,000
June	13,900	3,710	8,750	521,000
July	15,200	4,670	8,470	521,000
August	4,930	1,980	3,690	227,000
September	6,200	1,880	3,100	184,000
The year	15,200	665	3,730	2,710,000

SKAGIT RIVER NEAR MARBLEMOUNT, WASH.

LOCATION.—In SE. ¼ sec. 21, T. 37 N., R. 12 E., in Whatcom County, 1 mile above Goodell Creek, 6½ miles below Stetattle Creek, and 16 miles above Marblemount.

DRAINAGE AREA.—1,150 square miles, revised; area in Canada, 390 square miles, authority Conservation Commission of Canada;[1] area in United States measured on Washington National Forest maps.

RECORDS AVAILABLE.—December 21, 1908, to May 23, 1914.

GAGE.—Vertical staff gage on right bank.

DISCHARGE MEASUREMENTS.—Made from cable at the gage.

CHANNEL AND CONTROL.—Bed of stream composed of boulders. Control for low water shifted twice during period of record.

EXTREMES OF DISCHARGE.—1909–1914: Maximum stage recorded, 22.0 feet during early morning of November 29, 1909, determined from flood marks (discharge estimated at 63,500 second-feet); minimum stage recorded 0.8 foot at about 8 a. m. February 6 and 8, 1913 (discharge, 820 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation for low water changed during high water on November 29, 1909, and June 3, 1913. Rating curves well defined up to 20,000 second-feet. Gage-height record prior to high water in 1911, good; excellent thereafter. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records prior to high water in 1911 good except for flood stages; excellent thereafter except for extremely high water.

COOPERATION.—Gage-height record and some discharge measurements furnished by Skagit Power Co.

Discharge measurements of Skagit River near Marblemount, Wash., during the years ending Sept. 30, 1909–1914.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
1909.				1913.			
June 21[a]	Stevens and Rogers	7.90	12,800	Aug. 15[c]	Parker and Chandler	3.08	3,050
1912.				1914.			
Oct. 23[b]	F. B. Storey	1.44	1,170	May 6[c]	Parker and Collier	5.76	7,280
1913.				7[c]	do	5.71	7,300
Aug. 15[c]	Parker and Chandler	3.08	3,100	14[c]	I. L. Collier	9.09	16,300

[a] Surface velocities reduced by coefficient 0.85 to obtain mean velocities.
[b] Not previously published.
[c] Velocities corrected for arrangement of meter and sounding weights.

NOTE.—These measurements revised since publication in previous water-supply papers.

[1] White, A. V., Conservation Commission of Canada, Water Powers of British Columbia, p. 483.

Daily discharge, in second-feet, of Skagit River near Marblemount, Wash., for the period Dec. 21, 1908, to May 23, 1914.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1908-9.												
1	.....	.....	.....	1,640	1,560	1,490	3,410	3,280	20,100	9,730	5,350	3,550
2	.....	.....	.....	1,720	1,640	1,420	3,150	3,830	25,100	9,490	4,710	3,830
3	.....	.....	.....	2,110	1,910	1,420	3,020	5,510	22,400	9,970	4,710	4,110
4	.....	.....	.....	1,910	1,810	1,420	2,780	7,940	18,400	11,500	4,710	4,410
5	.....	.....	.....	1,720	1,810	1,420	2,660	7,130	15,900	9,970	4,110	4,410
6	.....	.....	.....	1,640	1,720	1,420	2,430	6,020	14,100	12,600	3,830	4,260
7	.....	.....	.....	1,560	1,640	1,350	2,430	5,190	12,300	13,500	3,690	3,690
8	.....	.....	.....	1,560	1,640	1,350	2,320	4,870	12,900	11,200	3,830	3,280
9	.....	.....	.....	1,640	1,560	1,350	2,540	5,030	14,400	11,200	3,830	3,020
10	.....	.....	.....	1,560	1,560	1,290	2,660	4,870	17,200	10,500	3,970	3,690
11	.....	.....	.....	1,560	1,490	1,350	2,660	4,560	19,100	10,700	3,830	2,660
12	.....	.....	.....	1,560	1,420	1,350	2,900	4,560	19,800	9,260	3,970	2,430
13	.....	.....	.....	1,560	1,350	1,490	3,280	5,030	16,500	7,940	3,970	2,540
14	.....	.....	.....	1,640	1,350	1,560	3,280	5,850	14,700	7,730	4,260	2,320
15	.....	.....	.....	1,720	1,350	1,640	3,280	6,380	15,900	8,360	4,110	2,320
16	.....	.....	.....	1,810	1,560	1,720	3,020	6,380	15,000	8,150	3,550	2,540
17	.....	.....	.....	1,910	1,810	1,810	2,900	6,560	14,100	6,750	3,280	2,540
18	.....	.....	.....	2,110	1,810	1,810	2,780	6,940	12,900	6,020	3,550	2,010
19	.....	.....	.....	2,900	1,810	1,810	2,660	7,730	13,200	5,510	3,970	1,810
20	.....	.....	.....	4,260	1,720	1,720	2,780	7,330	12,600	5,680	3,970	2,780
21	.....	.....	1,640	3,280	1,640	1,720	2,780	6,380	12,300	5,850	3,280	2,320
22	.....	.....	1,640	2,900	1,560	1,640	2,900	6,020	11,000	6,940	2,900	2,110
23	.....	.....	1,560	2,430	1,490	1,640	3,020	6,380	9,730	7,130	2,780	2,010
24	.....	.....	1,560	2,210	1,490	1,720	3,280	8,360	9,030	6,750	2,660	2,110
25	.....	.....	1,750	2,110	1,490	1,910	3,550	10,700	8,580	6,020	2,430	2,320
26	.....	.....	1,940	2,010	1,490	2,110	3,830	13,500	9,260	5,510	9,260	2,110
27	.....	.....	2,130	1,810	1,490	2,320	3,830	13,500	9,970	5,680	4,870	1,810
28	.....	.....	2,320	1,720	1,420	2,430	3,690	12,600	8,580	5,680	3,690	2,110
29	.....	.....	2,110	1,640	.....	2,540	3,410	11,200	8,360	6,020	3,280	3,150
30	.....	.....	2,110	1,640	.....	2,660	3,280	9,970	9,260	6,020	3,150	2,430
31	.....	.....	1,810	1,560	.....	3,020	.....	11,800	.....	5,850	3,150	.....
1909-10.												
1	2,110	1,810	18,400	1,780	2,710	1,680	3,970	9,020	15,000	8,560	5,190	2,270
2	1,910	3,550	12,300	1,680	2,470	2,350	3,740	8,560	12,600	8,790	4,550	2,340
3	1,810	5,510	8,790	1,680	2,350	2,980	3,740	8,340	10,200	8,790	4,550	2,510
4	1,720	3,830	6,670	1,580	2,110	3,270	3,420	9,020	9,730	8,560	5,020	2,450
5	1,910	3,150	5,720	1,580	2,110	3,120	4,250	9,970	11,200	8,790	4,700	2,360
6	3,150	2,660	5,020	1,490	2,000	2,590	4,700	12,600	12,900	8,790	4,860	2,150
7	2,430	2,430	4,550	1,490	1,890	2,470	4,550	16,200	11,800	9,020	5,020	2,150
8	2,110	2,320	4,250	1,490	1,780	2,230	4,400	18,800	10,200	9,970	6,090	1,890
9	3,550	2,210	3,740	1,490	1,780	2,110	4,550	18,800	9,970	10,200	6,280	1,720
10	3,410	2,110	3,420	1,400	1,680	2,110	4,400	25,100	12,100	11,000	5,900	1,650
11	3,020	1,910	3,120	1,400	1,680	2,230	4,550	23,800	19,100	12,100	5,540	1,540
12	2,900	1,910	6,670	1,400	1,580	2,470	4,860	20,700	17,200	12,300	4,860	1,480
13	3,150	1,810	5,540	1,320	1,580	2,980	5,020	17,800	12,300	11,000	4,550	1,450
14	2,660	1,640	4,550	1,320	1,580	3,740	4,700	15,000	11,000	9,730	4,400	1,520
15	2,320	1,560	3,970	1,240	1,490	4,400	4,550	12,300	10,700	9,250	3,760	1,650
16	2,010	1,560	3,580	1,240	1,400	5,190	4,700	11,000	11,200	9,490	3,420	1,970
17	1,810	1,640	3,270	1,240	1,320	6,090	5,190	11,800	9,970	9,020	3,520	2,660
18	1,720	4,710	2,840	1,490	1,320	6,670	5,720	14,700	9,250	7,690	3,610	2,290
19	1,720	12,100	2,710	1,320	1,320	7,270	8,340	14,100	8,340	7,270	3,970	2,470
20	1,720	7,330	2,470	1,240	1,320	8,120	10,200	12,100	8,340	7,480	4,110	3,050
21	1,720	5,350	2,230	1,320	1,240	8,790	9,730	11,800	7,690	8,340	3,740	3,420
22	1,640	5,680	2,000	2,840	1,320	9,020	9,250	14,700	6,870	8,120	3,160	3,320
23	2,010	21,700	1,890	3,740	1,320	8,560	9,490	19,100	6,470	6,470	2,910	2,970
24	2,210	20,400	1,890	4,860	1,320	7,690	14,700	21,700	6,670	5,900	2,470	2,410
25	1,910	12,600	1,780	3,970	1,320	6,670	19,800	22,700	7,900	5,720	2,300	1,990
26	1,810	8,800	1,680	3,270	1,320	5,900	24,400	18,400	9,250	5,720	2,290	1,870
27	1,640	6,750	1,580	2,980	1,580	5,360	19,100	14,700	9,020	5,540	2,080	1,660
28	1,640	12,100	1,490	2,710	1,580	5,190	14,700	12,100	8,560	5,540	2,020	1,690
29	1,720	40,500	1,580	2,470	.....	4,550	11,500	11,200	7,900	5,900	1,940	2,100
30	1,560	36,700	2,000	3,270	.....	4,400	9,730	10,500	8,560	5,900	1,840	1,940
31	1,720	.....	2,000	3,120	.....	4,110	.....	11,800	.....	5,540	2,040	.....

Daily discharge, in second-feet, of Skagit River near Marblemount, Wash., for the period Dec. 21, 1908, to May 23, 1914—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1910–11.												
1	5,020	3,930	3,760	2,110	1,240	920	3,740	6,670	20,700	8,560	4,860	3,970
2	2,910	3,820	3,970	2,000	1,170	920	3,740	7,900	20,400	8,340	5,020	3,910
3	5,360	3,690	3,970	2,000	1,100	920	3,580	8,120	16,500	8,340	5,190	4,250
4	3,810	3,360	3,900	2,000	1,100	920	3,270	8,790	12,600	7,900	5,360	3,910
5	3,960	3,210	3,790	2,000	1,100	920	2,980	9,970	9,970	8,560	5,020	3,270
6	9,730	4,400	3,760	2,000	1,100	970	2,840	8,790	9,250	10,500	5,900	3,120
7	11,000	8,560	3,760	2,350	1,100	970	2,710	7,690	9,490	9,970	4,700	2,980
8	9,490	7,690	3,640	2,110	1,100	1,030	2,590	7,070	9,730	7,900	4,400	2,840
9	11,200	6,280	3,560	2,230	1,100	1,030	2,840	6,470	10,700	6,870	3,970	2,590
10	7,480	12,100	3,330	2,000	1,100	1,100	2,980	5,720	11,500	6,470	3,970	2,590
11	5,900	11,200	3,050	1,780	1,100	1,030	2,840	5,360	17,800	6,470	3,910	2,590
12	4,860	8,790	2,910	1,680	1,030	1,030	2,710	5,190	22,400	6,670	3,910	3,120
13	4,250	7,070	2,790	1,580	1,030	1,030	2,590	5,190	24,400	7,900	3,580	4,700
14	3,940	5,900	2,640	1,580	1,030	1,030	2,350	5,020	24,400	9,020	3,270	3,740
15	4,250	5,190	2,540	1,680	1,030	1,100	2,350	5,900	21,100	10,500	3,120	4,700
16	4,550	4,550	2,460	1,890	1,030	1,240	2,470	8,560	18,800	11,000	3,270	3,970
17	7,270	4,250	2,390	1,680	970	1,400	2,470	9,020	16,500	11,000	3,420	3,120
18	5,900	3,970	2,270	1,680	970	1,490	2,590	8,560	14,400	9,730	3,740	2,710
19	4,550	3,760	2,230	1,580	920	1,680	2,590	7,900	12,100	8,790	4,080	2,470
20	4,110	5,190	2,290	1,490	970	2,110	2,590	7,480	10,700	8,340	3,970	2,350
21	3,640	20,100	2,300	1,490	970	2,590	2,980	7,900	10,200	7,480	3,120	2,840
22	3,320	12,600	2,170	1,490	920	2,840	3,420	9,250	11,200	6,280	3,120	2,590
23	3,020	9,970	2,940	1,400	920	3,910	3,970	8,340	10,200	6,090	3,420	2,230
24	6,280	8,120	2,840	1,400	920	4,110	5,190	7,480	9,250	7,070	3,270	2,000
25	15,300	6,670	2,650	1,400	920	3,910	6,870	7,480	9,250	7,900	3,120	1,890
26	8,560	5,720	2,780	1,320	920	3,420	6,470	7,070	11,800	7,270	2,980	1,780
27	6,470	5,190	2,690	1,320	920	3,120	6,090	6,870	13,200	6,280	2,980	1,680
28	5,540	4,550	2,510	1,320	870	2,840	5,720	7,480	11,200	5,900	2,980	1,680
29	4,700	4,250	2,420	1,240	.....	2,710	5,720	8,560	9,250	6,090	2,980	1,580
30	4,250	3,970	2,430	1,240	.....	2,840	5,900	11,200	8,340	5,900	3,580	1,490
31	3,970	.....	2,290	1,240	.....	3,270	.....	16,500	.....	5,360	3,970	.....
1911–12.												
1	1,490	920	2,000	1,100	2,840	1,400	2,110	3,270	7,480	6,090	4,860	2,000
2	1,400	920	1,890	1,030	2,590	1,320	2,470	3,120	7,690	7,070	4,250	2,000
3	1,320	970	1,780	1,030	2,350	1,240	2,710	3,270	7,480	6,470	3,970	1,780
4	1,320	1,100	1,780	1,030	2,230	1,240	2,710	3,420	7,900	6,470	3,580	1,680
5	1,240	1,030	1,680	1,030	2,110	1,240	2,590	3,580	9,250	6,470	3,420	1,490
6	1,240	1,030	1,780	1,030	2,110	1,170	2,350	3,970	10,200	5,900	3,270	1,490
7	1,320	1,240	1,680	970	2,110	1,170	2,350	3,970	12,900	5,540	3,420	1,890
8	1,400	1,240	2,110	1,030	2,110	1,170	2,470	8,340	14,700	5,190	3,970	1,890
9	1,490	1,100	2,230	1,030	2,350	1,100	2,710	10,200	13,800	5,540	4,250	1,780
10	1,400	970	2,110	970	2,590	1,100	3,420	9,490	12,600	5,720	3,970	1,780
11	1,240	880	2,000	970	2,710	1,100	3,580	9,020	12,900	5,900	4,110	2,110
12	1,240	920	1,890	970	2,590	1,100	3,420	9,970	14,700	5,900	3,420	2,110
13	1,400	970	1,780	1,170	2,350	1,030	3,270	11,800	12,900	7,070	3,270	2,470
14	1,680	1,030	1,680	1,780	2,350	1,030	3,120	15,300	11,000	6,670	3,580	2,230
15	1,580	1,100	1,680	1,780	2,470	1,100	2,980	17,800	8,790	6,470	4,860	1,890
16	1,680	1,030	1,580	1,680	2,710	1,030	2,980	14,100	7,480	6,670	4,250	1,680
17	1,490	1,680	1,490	1,580	2,710	1,100	3,120	10,700	8,560	6,280	3,420	1,780
18	1,320	3,970	1,400	1,400	2,840	1,100	3,120	9,490	8,790	6,670	3,270	1,780
19	1,240	4,550	1,490	1,320	2,710	970	2,980	10,200	13,800	6,670	3,420	1,580
20	1,170	4,550	1,400	1,400	2,590	920	2,840	13,500	15,300	6,280	3,580	1,490
21	1,170	3,910	1,320	1,490	2,350	970	2,710	14,700	15,000	5,720	3,970	1,490
22	1,100	2,840	1,400	1,490	2,110	970	2,840	12,100	11,200	5,360	3,970	1,680
23	1,100	2,470	1,680	1,400	2,110	1,030	2,980	9,970	11,200	5,020	3,970	1,490
24	1,030	2,110	1,490	1,580	1,890	1,030	2,980	8,790	12,600	4,700	4,110	1,320
25	1,030	2,590	1,400	2,230	1,780	1,100	2,840	9,730	13,200	4,860	4,250	1,170
26	1,030	2,840	1,400	2,110	1,680	1,240	2,840	11,800	13,800	4,250	3,270	1,170
27	970	2,470	1,320	2,000	1,580	1,490	2,840	12,100	11,800	3,910	2,710	1,240
28	970	2,110	1,320	2,000	1,490	1,680	2,840	10,200	8,120	3,740	2,350	1,240
29	920	2,000	1,240	2,470	1,490	1,780	3,120	8,790	7,070	3,910	2,000	1,240
30	920	1,890	1,170	3,910	.....	1,680	3,420	7,900	6,280	3,970	1,890	1,320
31	920	.....	1,170	3,270	.....	1,780	.....	7,270	.....	4,550	2,000	.....

Daily discharge, in second-feet, of Skagit River near Marblemount, Wash., for the period Dec. 21, 1908, to May 23, 1914—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1912–13.												
1	1,400	1,030	1,780	1,320	1,030	1,320	1,320	4,110	21,100	12,300	7,270	2,660
2	1,170	1,030	1,780	1,400	1,030	1,320	1,320	3,910	24,400	10,500	7,270	2,320
3	1,680	1,030	2,230	1,400	1,030	1,320	1,320	3,740	25,800	8,790	7,070	2,660
4	1,680	1,030	2,110	1,320	970	1,240	1,320	3,420	24,100	8,340	6,470	14,100
5	1,320	1,100	2,000	1,170	920	1,320	1,320	3,270	19,800	9,250	6,670	8,340
6	1,170	1,100	1,780	1,170	820	1,320	1,400	3,580	17,800	10,700	5,900	5,360
7	1,100	1,170	1,580	1,170	920	1,490	1,400	4,700	17,800	12,300	5,190	4,110
8	1,170	1,240	1,680	1,170	870	1,680	1,400	7,270	18,400	10,200	6,280	3,680
9	1,100	1,320	1,490	1,170	920	1,780	1,400	11,200	18,400	9,970	5,360	3,540
10	1,030	1,240	1,490	1,100	870	1,890	1,680	11,200	17,200	11,200	5,190	3,020
11	1,030	1,320	1,400	1,100	870	1,780	2,590	11,000	16,500	9,970	5,190	2,900
12	970	1,400	1,400	1,030	870	1,780	3,970	10,500	16,500	8,790	5,190	2,900
13	970	3,740	1,400	1,030	870	1,680	4,550	9,250	18,100	7,480	4,110	3,150
14	920	2,710	1,490	1,030	920	1,680	4,860	8,560	15,900	6,280	3,680	2,660
15	970	2,230	1,400	1,030	1,400	1,580	5,360	7,900	13,500	5,900	3,020	2,320
16	1,240	1,890	1,400	970	2,470	1,580	4,860	7,270	11,500	5,900	2,780	2,660
17	2,110	1,890	1,400	970	3,970	1,890	4,700	7,070	10,500	6,090	3,410	3,020
18	1,580	3,420	1,580	970	3,420	2,000	5,020	6,870	10,500	6,670	3,020	4,110
19	1,490	5,900	1,490	920	2,710	1,780	6,470	7,070	15,900	8,790	2,660	8,020
20	1,320	4,400	1,490	920	2,350	1,580	6,870	7,900	16,500	10,700	2,660	2,660
21	1,240	3,740	1,400	920	2,110	1,490	8,560	8,340	14,400	11,800	2,780	3,150
22	1,170	3,270	1,320	920	1,890	1,490	7,690	9,970	13,500	12,600	3,540	3,020
23	1,170	3,120	1,400	920	1,780	1,490	6,470	13,200	13,500	11,500	4,550	2,430
24	1,100	2,840	1,400	920	1,680	1,400	5,540	15,900	12,900	10,700	4,110	2,210
25	1,170	2,590	1,320	1,170	1,580	1,320	5,190	16,200	12,300	9,490	3,820	2,100
26	1,240	2,350	1,240	1,170	1,490	1,240	5,360	17,500	11,500	8,790	3,970	1,990
27	1,170	2,230	1,400	1,100	1,400	1,240	5,540	19,100	12,300	7,690	3,410	2,100
28	1,100	2,110	1,320	1,030	1,320	1,240	5,020	16,800	11,800	7,270	3,410	2,430
29	1,100	2,000	1,400	1,100	.....	1,400	4,550	15,600	12,100	6,090	3,680	2,210
30	1,100	1,890	1,400	1,030	.....	1,400	4,250	15,300	12,300	5,190	3,820	1,990
31	1,030	.....	1,400	1,030	.....	1,320	.....	18,400	.....	6,090	3,410	.....
1913–14.												
1	1,890	2,210	3,150	1,240	1,790	2,430	2,540	5,900	.....	.....	.....	.....
2	1,990	1,990	2,900	1,240	1,590	2,540	2,430	9,020	.....	.....	.....	.....
3	1,790	1,890	2,660	1,240	1,500	2,320	2,660	11,800	.....	.....	.....	.....
4	1,590	1,890	2,540	2,210	1,500	2,210	3,410	9,970	.....	.....	.....	.....
5	1,500	1,990	2,430	6,670	1,410	1,990	4,550	8,340	.....	.....	.....	.....
6	1,410	2,430	2,320	18,100	1,320	1,890	5,190	7,480	.....	.....	.....	.....
7	1,410	2,210	2,320	15,300	1,410	1,890	5,720	7,270	.....	.....	.....	.....
8	1,320	2,210	2,210	11,000	1,410	1,890	6,090	7,070	.....	.....	.....	.....
9	1,320	2,320	2,100	7,900	1,320	1,990	6,470	7,690	.....	.....	.....	.....
10	1,410	2,430	1,990	6,090	1,320	1,890	6,870	8,120	.....	.....	.....	.....
11	5,720	2,320	1,990	4,860	1,320	1,890	7,270	8,120	.....	.....	.....	.....
12	5,720	2,100	1,990	4,400	1,320	1,990	7,070	9,020	.....	.....	.....	.....
13	7,070	1,990	1,890	3,970	1,320	2,430	7,480	10,500	.....	.....	.....	.....
14	4,860	1,890	1,890	3,540	1,240	3,680	7,690	15,000	.....	.....	.....	.....
15	4,110	1,990	1,890	3,280	1,240	3,680	8,790	17,200	.....	.....	.....	.....
16	3,410	6,470	1,790	3,280	1,240	3,680	7,900	15,600	.....	.....	.....	.....
17	3,020	4,860	1,790	2,900	1,240	3,970	6,870	13,200	.....	.....	.....	.....
18	2,900	3,820	1,690	2,780	1,240	4,110	6,090	12,100	.....	.....	.....	.....
19	3,020	3,410	1,690	2,540	1,240	4,110	8,560	11,200	.....	.....	.....	.....
20	3,020	2,900	1,590	2,430	1,240	4,250	8,790	11,200	.....	.....	.....	.....
21	2,900	2,660	1,500	2,320	1,320	4,550	7,480	11,500	.....	.....	.....	.....
22	2,780	2,660	1,410	2,210	1,410	4,550	6,670	12,900	.....	.....	.....	.....
23	3,020	2,540	1,410	2,100	1,410	4,400	6,090	14,100	.....	.....	.....	.....
24	3,680	6,090	1,410	1,990	1,500	5,020	5,540	.....	.....	.....	.....	.....
25	3,150	5,020	1,410	1,990	1,500	3,970	5,190	.....	.....	.....	.....	.....
26	2,900	4,550	1,320	1,990	1,500	3,540	5,020	.....	.....	.....	.....	.....
27	2,660	4,250	1,320	1,890	2,210	3,280	4,860	.....	.....	.....	.....	.....
28	2,430	3,820	1,320	1,790	1,990	3,020	4,700	.....	.....	.....	.....	.....
29	2,320	3,680	1,240	1,790	.....	2,900	4,400	.....	.....	.....	.....	.....
30	2,210	3,410	1,240	1,790	.....	2,780	4,550	.....	.....	.....	.....	.....
31	2,210	.....	1,240	1,790	.....	2,660	.....	.....	.....	.....	.....	.....

NOTE.—These determinations of discharge supersede those published in previous water-supply papers: Dec. 25–27, 1908, gage not read; discharge interpolated.

Monthly discharge of Skagit River near Marblemount, Wash., for the period Dec. 21, 1908, to May 23, 1914.

[Drainage area, 1,150 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1908–9.						
December 21–31	2,320	1,560	1,870	1.63	0.67	40,800
January	4,260	1,560	1,980	1.72	1.98	122,000
February	1,910	1,350	1,590	1.38	1.44	88,300
March	3,020	1,290	1,740	1.51	1.74	107,000
April	3,830	2,320	3,020	2.63	2.93	180,000
May	13,500	3,280	7,270	6.32	7.29	447,000
June	25,100	8,360	14,100	12.3	13.72	839,000
July	13,500	5,510	8,170	7.10	8.19	502,000
August	9,260	2,430	3,960	3.44	3.97	243,000
September	4,410	1,810	2,820	2.45	2.73	168,000
The period						2,740,000
1909–10.						
October	3,550	1,560	2,150	1.87	2.16	132,000
November	40,500	1,560	7,880	6.85	7.64	469,000
December	18,400	1,490	4,250	3.70	4.27	261,000
January	4,860	1,240	2,050	1.78	2.05	126,000
February	2,710	1,240	1,660	1.44	1.50	92,200
March	9,020	1,680	4,660	4.05	4.67	287,000
April	24,400	3,420	8,060	7.01	7.82	480,000
May	25,100	8,340	14,800	12.9	14.87	910,000
June	19,100	6,470	10,400	9.04	10.09	619,000
July	12,300	5,540	8,270	7.19	8.29	508,000
August	6,280	1,840	3,890	3.38	3.90	239,000
September	3,420	1,450	2,160	1.88	2.10	129,000
The year	40,500	1,240	5,870	5.10	69.36	4,250,000
1910–11.						
October	15,300	2,910	5,950	5.17	5.96	366,000
November	20,100	3,210	6,600	5.74	6.40	393,000
December	3,970	2,170	2,940	2.56	2.95	181,000
January	2,350	1,240	1,690	1.47	1.70	104,000
February	1,240	870	1,020	.887	.92	56,600
March	4,110	920	1,880	1.63	1.88	116,000
April	6,870	2,350	3,640	3.17	3.54	217,000
May	16,500	5,020	7,850	6.83	7.87	483,000
June	24,400	8,340	13,900	12.1	13.50	827,000
July	11,000	5,360	7,890	6.86	7.91	485,000
August	5,900	2,980	3,880	3.37	3.88	239,000
September	4,700	1,490	2,890	2.51	2.80	172,000
The year	24,400	870	5,030	4.37	59.31	3,640,000
1911–12.						
October	1,680	920	1,250	1.09	1.26	76,900
November	4,550	880	1,880	1.63	1.82	112,000
December	2,230	1,170	1,620	1.41	1.63	99,600
January	3,910	970	1,560	1.36	1.57	95,900
February	2,840	1,490	2,270	1.97	2.12	131,000
March	1,780	920	1,210	1.05	1.21	74,400
April	3,580	2,110	2,890	2.51	2.80	172,000
May	17,800	3,120	9,290	8.08	9.32	571,000
June	15,300	6,280	10,900	9.48	10.58	649,000
July	7,070	3,740	5,650	4.91	5.66	347,000
August	4,860	1,890	3,570	3.10	3.57	220,000
September	2,470	1,170	1,680	1.46	1.63	100,000
The year	17,800	880	3,650	3.17	43.17	2,650,000
1912–13.						
October	2,110	920	1,230	1.07	1.23	75,600
November	5,900	1,030	2,210	1.92	2.14	132,000
December	2,230	1,240	1,530	1.33	1.53	94,100
January	1,400	920	1,090	.948	1.09	67,000
February	3,970	820	1,520	1.32	1.38	84,400
March	2,000	1,240	1,520	1.32	1.52	93,500
April	8,560	1,320	4,040	3.51	3.92	240,000
May	19,100	3,270	9,870	8.58	9.89	607,000
June	25,800	10,500	15,900	13.8	15.40	946,000
July	12,600	5,190	8,950	7.78	8.97	550,000
August	7,270	2,660	4,480	3.90	4.50	275,000
September	14,100	1,990	3,430	2.98	3.32	204,000
The year	25,800	820	4,650	4.04	54.89	3,370,000

Monthly discharge of Skagit River near Marblemount, Wash., for the period Dec. 21, 1908, to May 23, 1914—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1913-14.						
October	7,070	1,320	2,860	2.49	2.87	176,000
November	6,470	1,890	3,070	2.67	2.98	183,000
December	3,150	1,240	1,860	1.62	1.87	114,000
January	18,100	1,240	4,080	3.55	4.09	251,000
February	2,210	1,240	1,430	1.24	1.29	79,400
March	5,020	1,890	3,080	2.68	3.09	189,000
April	8,790	2,430	5,900	5.13	5.72	351,000
May 1-23	17,200	5,900	10,600	9.22	7.89	484,000
The period						1,830,000

NOTE.—Figures in the above tables supersede those published in previous water-supply papers.

SKAGIT RIVER NEAR SEDRO WOOLLEY, WASH.

LOCATION.—In NW. ¼ sec. 36, T. 35 N., R. 4 E., at Northern Pacific Railway bridge three-fourths mile below intake of Beatty's slough, 1½ miles south of Sedro Woolley, Skagit County, 21 miles above mouth, and 32 miles below Baker River,

DRAINAGE AREA.—2,930 square miles (measured on General Land Office and British Columbia maps).

RECORDS AVAILABLE.—May 1, 1908, to September 30, 1919, when station was discontinued.

GAGE.—Chain gage on railway bridge, installed September 27, 1916; read by E. J. Woods. Prior to September 27, 1916, vertical staff on upstream draw guard of railway bridge and temporary vertical staff, installed September 25, 1915, used when stage was below 37 feet, on downstream side of group of piles, 50 feet above third concrete pier of railway bridge from left bank; at same datum. Zero of gage set at elevation of extreme low water in Puget Sound.

DISCHARGE MEASUREMENTS.—Made from highway bridge one-third mile above gage. Beatty's slough measured from highway bridge.

CHANNEL AND CONTROL.—Gravel; shifts at high stages. Banks not subject to overflow except during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 46.0 feet at 4 p. m. December 14 (discharge, 65,400 second-feet); minimum stage occurred during September, when gage was not read (stage and discharge not determined).

1908–1919: Maximum stage determined from high-water marks, 54.9 feet about 4.30 a. m. December 30, 1917 (discharge, 151,000 second-feet); discharge probably greater November 30, 1909, when rating curve was not well defined. Minimum stage recorded, 32.3 feet September 29–30 and October 10–11, 1915 (discharge, 2,740 second-feet).

ICE.—Stage-discharge relation seldom affected by ice.

DIVERSION.—Beatty's slough carries from 1.5 per cent of total flow at low stages to 8 per cent at high stages. Amount determined at each visit and added to flow measured on main channel. Flow in Beatty's slough is included with the flow in the main channel in the records of this station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed frequently during year. Rating curve used as a standard for computing discharge by shifting-control method, and as a basis for parallel curves is well defined. Gage read to hundredths once daily. Practically no diurnal fluctuation. Daily discharge ascertained by applying daily gage height to rating table; shifting-control method used February 8 to March 23 and June 18 to August 31. Records good up to August 31; mean discharge for September fair.

Discharge measurements of Skagit River near Sedro Woolley, Wash., during the year ending Sept. 30, 1919.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 5	R. B. Kilgore	34.45	7,620	Mar. 23	R. B. Kilgore	34.95	9,440
16	do	34.73	7,800	24			
Nov. 26	do	34.66	7,870	June 17	John McCombs	38.63	25,500
Dec. 10	do	36.47	14,000	18	do	38.92	26,000
Feb. 8	do	34.55	8,570	Sept. 19	do	34.58	8,330

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period Oct. 1, 1918, to Aug. 31, 1919.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	7,970	18,200	9,180	9,490	12,400	7,970	14,600	25,000	27,500	25,000	19,000
2	6,820	16,100	9,810	8,870	11,400	8,870	14,900	25,000	25,500	27,000	18,200
3	6,270	14,600	13,800	8,570	10,800	10,800	16,100	22,200	26,000	29,000	17,300
4	7,100	13,800	58,200	8,270	10,400	9,490	20,800	19,500	27,500	32,700	16,500
5	7,680	13,500	63,100	7,970	10,100	9,490	22,600	17,300	30,500	34,900	16,900
6	12,100	11,800	31,000	7,970	9,490	8,870	17,300	16,100	32,700	37,100	15,700
7	9,810	10,800	23,100	7,680	9,180	7,970	16,500	16,100	30,500	31,600	15,700
8	7,680	9,810	18,600	7,680	8,570	7,970	14,900	17,300	27,500	27,000	15,700
9	6,270	9,490	18,600	7,100	12,800	7,680	13,500	20,400	27,000	27,500	15,300
10	6,000	11,400	14,200	7,680	15,700	7,390	19,000	21,800	27,000	32,700	15,300
11	13,100	21,300	13,500	7,100	12,800	7,970	21,300	19,500	24,500	33,800	15,700
12	46,700	14,200	12,400	7,390	11,800	7,970	17,300	20,000	22,600	34,400	16,100
13	10,100	14,600	17,300	7,100	10,800	7,680	15,700	17,700	22,600	29,500	14,900
14	11,800	20,400	65,400	7,100	10,100	7,970	14,200	15,700	24,500	28,500	13,800
15	9,490	17,700	48,500	7,100	9,810	7,390	12,800	16,900	25,000	33,200	12,800
16	7,680	17,300	30,500	7,390	9,810	7,680	11,800	23,100	24,500	39,500	13,500
17	9,180	14,600	23,600	10,100	13,500	7,970	11,800	22,200	25,000	37,100	14,600
18	7,970	13,100	20,000	34,400	11,400	11,800	19,000	20,000	26,500	29,000	15,300
19	7,390	11,800	17,300	32,200	10,100	11,400	20,800	20,000	31,000	24,500	14,900
20	8,870	11,100	16,100	27,500	9,490	10,400	20,000	24,500	39,500	23,600	13,800
21	7,680	10,400	14,600	18,200	9,180	9,810	19,500	27,500	41,900	25,000	13,500
22	7,390	9,810	13,100	19,000	8,870	9,490	17,300	36,000	39,500	26,500	13,100
23	6,820	9,180	12,100	40,700	8,570	9,490	15,700	36,600	40,100	25,500	12,400
24	7,680	8,870	11,400	35,400	7,970	9,490	16,100	31,000	36,000	23,100	11,100
25	8,570	7,970	10,800	24,000	7,680	8,870	18,200	29,500	34,400	22,600	11,100
26	7,390	7,970	10,400	23,600	8,270	8,570	18,200	57,500	34,900	20,400	11,400
27	27,000	7,970	9,810	20,000	7,970	8,270	20,000	61,700	36,000	18,200	11,100
28	61,700	7,680	10,400	17,300	8,270	8,270	23,100	64,600	32,700	18,200	10,100
29	37,100	7,680	12,800	16,500	.....	8,570	24,000	55,400	29,500	19,000	9,490
30	23,100	7,680	10,800	14,900	.....	9,810	24,500	39,500	26,000	19,500	9,490
31	19,500	.....	10,100	13,800	.....	13,800	.....	32,200	.....	18,200	9,810

NOTE.—Stage-discharge relation changed at high water on Oct. 12, 28, Dec. 4, 14, and May 27, and changed gradually from Feb. 8 to Mar. 23, and June 18 to Aug. 31. Practically no gage-height record for September; daily discharge not determined.

Monthly discharge of Skagit River near Sedro Woolley, Wash., for the year ending Sept. 30, 1919.

[Drainage area, 2,930 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	61,700	6,000	13,700	4.68	5.40	842,000
November	21,300	7,680	12,400	4.23	4.72	738,000
December	65,400	9,180	21,000	7.17	8.27	1,290,000
January	40,700	7,100	15,200	5.19	5.98	935,000
February	15,700	7,680	10,300	3.52	3.66	572,000
March	13,800	7,390	9,010	3.08	3.55	554,000
April	24,500	11,800	17,700	6.04	6.74	1,050,000
May	64,600	15,700	28,100	9.59	11.06	1,730,000
June	41,900	22,600	29,900	10.2	11.38	1,780,000
July	39,500	18,200	27,500	9.39	10.83	1,690,000
August	19,000	9,490	14,000	4.78	5.51	861,000
September	.....	.....	7,700	2.63	2.93	458,000
The year	65,400	.....	17,300	5.90	80.03	12,500,000

NOTE.—Mean discharge for September estimated by percentage comparison of flow of Skagit River near Sedro Woolley with combined flow of Skagit River at Reflector Bar, Sauk River at Darrington, and Baker River below Anderson Creek from 1914 to 1919.

RUBY CREEK NEAR MARBLEMOUNT, WASH.

LOCATION.—Half a mile above junction with Skagit River, 23½ miles northeast of Marblemount, in Whatcom County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 1, 1919, to March 31, 1920, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder on right bank half a mile above mouth, installed June 15, 1919; inspected by employees of city of Seattle.

DISCHARGE MEASUREMENTS.—Made from cable a quarter of a mile above gage.

CHANNEL AND CONTROL.—Control is at head of rapids below gage. Shifts at high water. Bed composed of boulders and coarse gravel. Banks high, not subject to overflow. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during period of record, from water-stage recorder, 12.9 feet from 10 p. m. June 19 to 1 a. m. June 20, 1919 (discharge, 2,890 second-feet); minimum stage, from recorder, 7.01 feet from 6 to 8 p. m. November 8 and at 8 a. m. November 11, 1919 (discharge, 72 second-feet). Discharge may have been as low or lower on December 12 when stage-discharge relation was affected by ice.

ICE.—Stage-discharge relation affected by ice. Flow estimated from observer's notes, weather records obtained at Davis ranch and by comparison with nearby stream.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed on November 15; affected by ice December 15–19. Rating curves fairly well defined. Operation of water-stage recorder satisfactory except as noted in footnote to the table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection or, for days when there was considerable variation in stage by averaging results obtained by applying to rating table mean gage heights for shorter periods. Records good except for periods when recorder was not operating, for which they are fair.

COOPERATION.—Gage-height record and part of discharge measurements furnished by city of Seattle.

Discharge measurements of Ruby Creek near Marblemount, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 16	Moore and Hunt	8.87	609	Aug. 27	Hunt and Davis	8.41	394
1919.				29	do	8.20	343
Feb. 20	Hunt and Davis	7.32	166	Oct. 7	G. H. Moore	7.40	142
May 8	Hunt and Moore	10.68	1,590	1920.			
9	do	10.90	1,610	Mar. 27	Moore and Davis	7.84	206
				July 13	McCombs and Moore	10.72	1,370

Daily discharge, in second-feet, of Ruby Creek near Marblemount, Wash., for the period June 1, 1919, to Mar. 31, 1920.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1		1,800		363	169	140	294	289	548	187
2		1,920		323	172	130	219	273	457	185
3		1,980		312	159	109		256	424	183
4		2,120		320	148	113		248	393	176
5		2,120	840	326	148	109		238	378	174
6		1,920		316	148	101	170	212	474	166
7	1,800	1,680		352	144	101		212	510	168
8		1,680		312	157	87		198	440	170
9		1,860		337	142	103		196	393	170
10		1,980	685	304	136	100		185	366	161
11		1,980	727	387	144	92		181	346	157
12		1,860		640	157	95		178	332	170
13		1,740	610	446	161	95		168	313	361
14		1,800		390	150	124		172	299	343
15	1,740	1,980	548	366	140	694	140	185	291	273
16	1,800	1,980	605	352	134	955		198	286	243
17	1,860	1,740	644	332	136	1,000		335	281	226
18	1,980	1,350	624	312	132	746		510	278	219
19	2,470	1,290	567	307	126	606		408	268	212
20	2,680	1,380	530	282	122	474	335	299	256	217
21	2,540	1,410	512	249	136	457	358	248	241	241
22	2,470	1,410	478	234	144	529	343	176	229	243
23	2,330		430	239	126	726	393	159	224	243
24	2,190		414	244	113	646	587	153	214	238
25	2,260		430	239	100	510	510	157	214	226
26	2,330	1,000	430	232	114	378	440	143	212	214
27	2,190		393	210	96	372	440	143	203	205
28	2,050		360	189	116	393	408	505	189	201
29	1,800		354	178	111	358	372	746	189	
30	1,680		369	172	105	324	346	686	.....	200
31	.....		430	.....	103	.....	302	646	.....	

NOTE.—No gage-height record available June 1–14, July 23 to Aug. 9, Aug. 12–14; Nov. 12–13, 1919, and Mar. 29–31, 1920; discharge estimated by comparison with record of flow of Skagit River below Ruby Creek. No gage-height record available Dec. 3–14; stage-discharge relation affected by ice Dec. 15–19; discharge estimated by comparison with record of Skagit River below Ruby Creek. No gage-height record available Jan. 22–28; probable gage-height graph estimated by comparison with record of Skagit River below Ruby Creek. Braced figures show mean discharge for periods included.

Monthly discharge of Ruby Creek near Marblemount, Wash., for the period June 1, 1919, to Mar. 31, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June	2,680	.....	1,990	118,000
July	2,120	.....	1,550	95,300
August	.....	354	610	37,500
September	640	172	309	18,400
October	172	96	135	8,300
November	1,000	87	356	21,200
December	587	.....	257	15,800
January	746	143	281	17,300
February	548	189	319	18,300
March	361	157	212	13,000
The period	.....	.....	.....	363,000

NORTH FORK OF SAUK RIVER NEAR BARLOW PASS, WASH.

LOCATION.—In sec. 14, T. 30 N., R. 11 E., 500 feet below dam site, 2¼ miles above junction with South Fork, and 7 miles northeast of Barlow Pass, Snohomish County.

DRAINAGE AREA.—76 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1920.

GAGE.—Stevens continuous recorder installed October 8, 1918, on right bank 500 feet below dam site; inspected by N. and B. L. Aall. Previous gages as follows: October 1–8, 1917, and January 22 to September 1, 1918, vertical staff at site of present gage; October 9 to December 29, 1917, Stevens water-stage recorder at present site, destroyed by floods and record after December 22, lost. September 2 to October 6, 1918, vertical staff on left bank, opposite site of present gage. All gage-heights referred to same datum.

DISCHARGE MEASUREMENTS.—Made from cable one-third mile above gage or by wading near cable.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders; banks high; one channel at all stages. Principal control composed of boulders at head of rapids about 50 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 8.8 feet at 4 a. m. on December 14 (discharge, 2,830 second-feet); minimum stage from recorder, 1.20 feet at 11 a. m. September 30 (discharge, 97 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 9.3 feet at 6 p. m. November 15 (discharge, 3,190 second-feet); minimum stage, from recorder, 1.08 feet at 9 p. m. October 4 (discharge, 85 second-feet). Stage may have been lower in December when recorder was not operating and when stage-discharge relation may have been affected by ice.

1917–1920: Maximum stage recorded, 14.0 feet (determined by leveling to high-water mark) on December 29, 1917 (discharge, 11,000 second-feet); minimum stage recorded, 1.00 foot, probably on October 20, 1917, when recorder clock was stopped and stage but not time recorded (discharge, 75 second-feet). Stage may have been lower in December, 1919.

ICE.—Stage-discharge relation seriously affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed October 11 and December 14, 1918, May 27, October 11, and November 15, 1919. Rating curves used prior to December 14, 1918, well defined, those used after that date well defined below 1,000 second-feet; poorly defined above. October 1–6, 1918, staff gage read to hundredths twice daily. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying daily mean gage height to rating table. Records are good November, 1918, and January to May 20, 1919; otherwise fair except for periods for which discharge was obtained by comparison with records of flow at stations in Sauk River basin; records for such periods are poor.

COOPERATION.—Station maintained in cooperation with American Nitrogen Products Co.

Discharge measurements of North Fork of Sauk River near Barlow Pass, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 9	Lee and Twa	1.72	141	Sept. 18	Lasley Lee	2.08	200
Nov. 23	Nicolai Aall	2.61	241	Oct. 15	do	1.39	128
1919.				1920.			
Jan. 8	do	1.77	183	July 20	Newton and Lee	3.80	553
20	do	3.90	562	20	do	3.80	547
Feb. 20	do	1.84	186				

Daily discharge, in second-feet, of North Fork of Sauk River near Barlow Pass, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	127	558	196	234	322	155	386	890	861	980		
2	118	516	262	226	305	185	425	805	861	1,070		
3	147	496	651	219	288	166	455	676	950	1,140		
4	128	446	1,720	212	290	160	606	605	1,070	1,300		
5	196	393	965	205	256	152	538	549	1,180	1,420		
											500	230
6	354	363	703	198	248	147	475	538	1,140	1,260		
7	252	328	537	192	234	143	425	582	980	1,040		
8	151	311	466	185	234	136	385	676	950	980		
9	144	302	399	178	272	132	396	752	980	1,100		
10	275	545	354	172	256	132	496	676	890	1,340		
11	836	462	328	172	234	134	465	676	805	1,340		
12		381	320	172	219	126	415	628	778	1,260		
13		418	875	166	212	124	386	582	861	1,070		
14		526	2,160	160	198	122	368	605	890	1,160		
15		466	1,130	159	198	122	349	805	890	1,400		
	500										420	300
16		418	820	188	234	123	331	833	890	1,500		
17		372	652	557	234	152	436	752	920	1,300		
18		336	549	1,000	212	205	605	726	1,050	980		198
19		311	486	767	198	198	582	853	1,370	861		198
20	217	294	435	560	192	178	582	1,010	1,570	714		178
21	203	278	396	486	185	178	528	1,220	1,520	676		153
22	182	262	368	859	178	178	486	1,520	1,420	640		143
23	196	240	340	1,230	172	185	496	1,340	1,340	676		147
24	225	232	322	849	160	185	560	1,180	1,220			159
25	225	217	305	652	172	178	560	1,410	1,260			160
											300	147
26	238	210	288	560	160	178	628	1,980	1,340			
27	1,500	203	288	475	158	178	778	2,510	1,220	780		143
28	1,480	196	314	425	155	185	833	1,850	1,180			118
29	998	182	296	406	.....	212	862	1,470	1,010			105
30	701	203	264	377	.....	305	890	1,220	920			106
31	679	.....	241	349	.....	358	.....	980	.....			.....
1919–20.												
1	126	231		496		192	192	368	445	1,360	358	
2	122	306		475		185	185	358	480	1,260	358	
3	98	212	170	465	650	185	178	349	663	1,180	358	250
4	89	226		465		185	178	358	833	1,120	340	
5	88	212		465		185	219	406	861	1,010	358	
6	91	178		465		178	192	507	833	965	368	192
7	90	166		465		172	192	700	861	995	368	185
8	128	149	110	465	550	192	178	833	990	1,010	358	185
9	108	138		465		212	172	805	833	995	358	185
10	107	136		465		192	178	752	778	965	349	283
11	205	134				178	185	676	778	815	340	1,000
12	192	121				232	205	652	752	752	331	1,090
13	172	145	100			595	219	676	806	714	331	901
14	147	406			350	465	212	676	1,020	902	322	1,740
15	132	1,710		700		358	212	676	1,110	799	305	1,180
16	121	2,510				314	212	701	988	778	280	950
17	117	1,840				288	205	1,080	1,070	714		752
18	108	1,200	900		296	264	205	928	983	676		785
19	99	1,040		944	288	248	241	778	901	628		571
20	95	806		652	272	248	241	701	920	554	220	667
21	140	737		538	256	256	219	666	1,060	506		1,080
22	195	752		475	248	248	219	582	1,140	455		906
23	152	775	1,500	475	241	241	212	549	895	445		752
24	132	843		475	234	241	219	506	752	435		652
25	115	652	950	475	226	234	248	475	701	396		676
26	108		861	445	219	219	293	455	701	396		646
27	98		820	470	212	219	386	465	814	406	300	827
28	100	300	676		205	205	425	465	980	435		676
29	99		628	1,600	198	205	406	435	1,160	435		582
30	90		628		.....	219	386	415	1,360	406		571
31	89	.....	538		.....	198	.....	406	.....	368		.....

NOTE.—Discharge, Oct. 7, 1918, and Jan. 6 and 7, 1919, interpolated; Oct. 12–19, 1918, July 24 to Sept. 17, Nov. 26 to Dec. 24, 1919, Jan. 11–18, Jan. 28 to Feb. 17, and Aug. 17 to Sept. 5, 1920, estimated by percentage comparison with records of flow of South Fork of Sauk River and Sauk River above Whitechuck River. Braced figures show mean discharge for periods included.

Monthly discharge of North Fork of Sauk River near Barlow Pass, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 76 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	1,500	118	438	5.76	6.64	26,900
November	558	182	349	4.59	5.12	20,800
December	2,160	196	562	7.39	8.52	34,600
January	1,230	159	406	5.34	6.16	25,000
February	322	155	220	2.89	3.01	12,200
March	358	122	171	2.25	2.59	10,500
April	890	331	524	6.89	7.69	31,200
May	2,510	538	997	13.1	15.10	61,300
June	1,570	778	1,080	14.2	15.84	64,300
July	1,500	.....	1,010	13.3	15.33	62,100
August	.....	.....	403	5.30	6.11	24,800
September	.....	105	212	2.79	3.11	12,600
The year	2,510	105	534	7.03	95.22	386,000
1919-20.						
October	205	88	121	1.59	1.83	7,440
November	2,510	121	571	7.51	8.38	34,000
December	.....	.....	565	7.43	8.57	34,700
January	.....	445	698	9.18	10.58	42,900
February	.....	198	391	5.14	5.54	22,500
March	595	172	244	3.21	3.70	15,000
April	425	172	234	3.08	3.44	13,900
May	1,080	349	594	7.82	9.02	36,500
June	1,360	445	882	11.6	12.94	52,500
July	1,360	368	738	9.71	11.20	45,400
August	.....	.....	307	4.04	4.66	18,900
September	1,740	185	643	8.46	9.44	38,300
The year	2,510	88	499	6.57	89.30	362,000

SAUK RIVER ABOVE WHITECHUCK RIVER, NEAR DARRINGTON, WASH.

LOCATION.—In NW. ¼ sec. 24, T. 31 N., R. 10 E., half a mile above Whitechuck River and 9½ miles southeast of Darrington, Snohomish County.

DRAINAGE AREA.—152 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 29 to November 17, 1910 (fragmentary); October 1, 1917, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by N. and B. L. Aall. Gage used in 1910 was inclined staff on left bank one-eighth mile above Whitechuck River.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 75 feet below gage.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Banks high; not subject to overflow. Low-water control about 150 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 7.9 feet at 5 a. m. December 14 (discharge, 8,430 second-feet); minimum stage, from recorder, 2.19 feet September 30 (discharge, 205 second-feet).

Maximum stage during year ending Sepember 30, 1920, from range in stage shown by recorder, 9.0 feet on November 15, the date being determined by comparison with records for other stations (discharge, 10,800 second-feet); minimum stage, from recorder, 2.12 feet at 3 a. m. October 7 (discharge, 173 second-feet; may have been lower discharge in December when recorder was not operating and stage-discharge relation was affected by ice).

1918–1920: Maximum stage recorded, 13.3 feet at 8 a. m. December 29, 1917 (discharge, 21,000 second-feet); minimum stage recorded October 7, 1919.

ICE.—Stage-discharge relation affected by ice during severe winters; flow estimated from discharge measurements and weather records.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed October 11, 1918, and November 15, 1919, during high water. Rating curves used prior to November 15, 1919, well defined between 250 and 4,000 second-feet; curve used November 15, 1919, to September 30, 1920, fairly well defined between 250 and 600 second-feet and well defined between 600 and 4,000 second-feet. Operation of water-stage recorder satisfactory except as indicated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection, or for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent except for periods when gage did not operate, for which they are poor.

COOPERATION.—Station maintained in cooperation with American Nitrogen Products Co.

Discharge measurements of Sauk River above Whitechuck River, near Darrington, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 12	Lee and Twa...	4.39	2,120	Apr. 26	Nicolai Aall	3.74	1,340
Nov. 17	Nicolai Aall	3.50	1,040	Sept. 17	Lasley Lee	2.59	412
Dec. 5	do	4.83	2,780	1920.			
1919.				July 17	Newton and Lee	3.54	1,200
Feb. 7	do	2.75	498	17	do	3.54	1,250
Mar. 26	do	2.71	494	21	do	3.17	869
Apr. 8	do	3.32	923	Sept. 28	H. W. Newton	3.82	1,480

Daily discharge, in second-feet, of Sauk River above Whitechuck River, near Darrington, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	296	1,600	587	495	776	451	1,060	2,060	1,660	1,780	1,080	
2	262	1,500	1,000	470	714	803	1,110	1,720	1,660	1,990	997	
3	317	1,350	2,940	457	667	680	1,170	1,440	1,850	2,280	970	430
4	270	1,230	5,700	432	640	600	1,720	1,250	2,130	2,660	906	
5	483	1,120	3,050	420	593	547	1,560	1,080	2,430	2,810	938	
6	777	962	1,990	408	534	508	1,270	1,030	2,430	2,580	954	
7	621	861	1,520	385	519	482	1,060	1,100	1,990	2,060	962	
8	421	796	1,250	374	540	457	914	1,350	1,850	1,850	970	420
9	338	776	1,070	362	824	426	898	1,490	1,990	2,200	890	
10	483	1,740	914	362	817	426	1,380	1,450	1,780	2,730	883	
11	3,200	1,580	846	362	700	502	1,390	1,380	1,540	2,730	906	
12	2,320	1,100	861	362	640	457	1,150	1,380	1,470	2,430	906	
13	1,020	912	3,410	362	593	426	979	1,190	1,660	2,060	817	
14	755	1,580	6,380	351	540	414	883	1,170	1,660	2,280	748	520
15	606	1,370	3,210	357	528	414	810	1,720	1,720	2,890	700	
16	606	1,280	2,060	470	673	403	755	1,920	1,660	3,050	748	
17	728	1,080	1,570	2,180	748	613	1,040	1,600	1,720	2,500	810	414
18	620	930	1,280	3,890	646	832	1,660	1,490	1,920	1,780	817	385
19	560	846	1,090	2,580	600	734	1,600	1,720	2,730	1,590	776	368
20	547	803	954	1,600	547	646	1,580	2,130	3,380	1,660	734	335
21	514	741	854	1,280	508	593	1,370	2,430	3,050	1,780	700	308
22	476	687	771	2,860	476	580	1,170	3,210	2,810	1,850	687	273
23	502	640	707	4,500	457	573	1,130	2,730	2,730	1,720	660	263
24	593	606	667	2,660	414	545	1,280	2,360	2,430	1,500	606	268
25	653	567	613	1,920	488	516	1,270	2,700	2,580	1,500	580	283
26	593	554	580	1,720	482	488	1,350	4,410	2,730	1,220	580	278
27	4,540	521	573	1,370	445	495	1,600	5,130	2,430	1,080	547	298
28	4,980	521	694	1,140	439	521	1,720	4,060	2,200	1,130	521	258
29	3,050	488	673	1,050	.....	606	1,780	3,210	1,850	1,180	482	215
30	1,920	587	587	930	.....	883	1,850	2,580	1,660	1,190	476	210
31	1,920	.....	534	846	.....	1,110	.....	2,060	.....	1,090	514	.....

Daily discharge, in second-feet, of Sauk River above Whitechuck River, near Barrington, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	258	820		1,010	1,900	345	447	770	798	2,530	584	466
2	273	1,090		922	1,540	334	423	748	938	2,300	584	423
3	224	653		851	1,320	316	387	714	1,270	2,160	609	387
4	210	843	440	777	1,170	328	405	707	1,650	2,020	609	363
5	192	700		734	1,070	351	634	798	1,770	1,830	577	345
6	187	554		674	1,370	328	540	980	1,650	1,650	602	310
7	178	482		628	1,650	310	521	1,420	1,710	1,770	596	293
8	220	420		596	1,270	363	478	1,900	2,160	1,770	596	275
9	234	374		565	1,080	441	435	1,770	1,770	1,770	584	281
10	210			540	980	411	429	1,540	1,540	1,710	571	603
11	408		200	509	897	375	435	1,320	1,540	1,540	546	3,020
12	420			496	828	568	496	1,230	1,480		533	3,380
13	357			478	762	2,360	571	1,270	1,540		533	2,460
14	308			478	721	1,710	540	1,320	1,960	1,400	515	5,220
15	273	2,400	393	602	680	1,070	521	1,270	2,230		490	3,010
16	253		417	1,050	634	828	527	1,320	1,900		447	2,090
17	234		2,800	3,300	609	714	478	2,200	2,090	1,270	423	1,540
18	215		1,880	4,280	590	628	460	2,160	1,900	1,250	340	1,540
19			1,540	3,090	565	584	552	1,650	1,710	1,120	304	1,150
20	300		2,630	1,830	540	558	584	1,480	1,650	980	310	1,260
21			2,610	1,370	496	571	533	1,370	1,900	874	345	2,510
22			2,020	1,090	472	565	496	1,190	2,090	784	375	2,230
23	346		2,530	922	460	552	466	1,120	1,690	741	369	1,650
24	308		3,720	866	435	584	466	1,010	1,320	741	345	1,420
25	263	1,050	2,850	1,150	423	552	515	914	1,240	660	298	1,420
26	239		1,960	980	411	509	648	874	1,190	648	287	1,480
27	210	"	1,830	1,960	387	490	882	889	1,370	667	414	2,090
28	220		1,480	6,880	369	466	989	889	1,710	721	777	1,520
29	220		1,320	4,020	363	466	938	843	2,090	741	851	1,250
30	205		1,420	3,090	.....	540	843	798	2,460	680	791	1,130
31	205	.....	1,170	2,530	.....	490	.....	748	.....	615	552	.....

NOTE.—Recorder not operating Sept. 1–16, Oct. 19–22, and Nov. 10 to Dec. 14, 1919, and July 12–16, 1920; discharge estimated by percentage comparison with Sauk River at Darrington. Braced figures show mean discharge for periods included.

Monthly discharge of Sauk River above Whitechuck River, near Darrington, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	4,980	262	1,130	7.43	8.57	69,500
November	1,740	488	978	6.43	7.17	58,200
December	6,380	534	1,580	10.4	11.99	97,200
January	4,500	351	1,190	7.83	9.03	73,200
February	824	414	591	3.89	4.05	32,800
March	1,110	403	572	3.76	4.34	35,200
April	1,850	755	1,280	8.42	9.39	76,200
May	5,130	1,030	2,080	13.7	15.79	128,000
June	3,380	1,470	2,120	13.9	15.51	126,000
July	3,050	1,080	1,970	13.0	14.99	121,000
August	1,080	476	770	5.07	5.84	47,300
September	.....	210	384	2.53	2.82	22,800
The year	6,380	210	1,230	8.09	109.49	887,000
1919–20.						
October	.....	178	260	1.71	1.97	16,000
November	.....	.....	1,430	9.41	10.50	85,100
December	3,720	.....	1,200	7.89	9.10	73,800
January	6,880	478	1,560	10.3	11.87	95,900
February	1,900	363	827	5.44	5.87	47,600
March	2,360	310	603	3.97	4.58	37,100
April	989	387	555	3.65	4.07	33,000
May	2,200	707	1,200	7.89	9.10	73,800
June	2,460	798	1,680	11.1	12.38	100,000
July	2,530	615	1,310	8.62	9.94	80,600
August	851	287	508	3.34	3.85	31,200
September	5,220	275	1,500	9.87	11.01	89,300
The year	6,880	178	1,050	6.91	94.24	763,000

SAUK RIVER AT DARRINGTON, WASH.

LOCATION.—In SE. ¼ sec. 24, T. 32 N., R. 9 E., 700 feet above suspension footbridge, half a mile southeast of Darrington, in Snohomish County, 2½ miles below Clear Creek and 23 miles above mouth of river.

DRAINAGE AREA.—293 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 15, 1914, to September 30, 1920.

GAGE.—Vertical and inclined staff installed January 7, 1918, on left bank 700 feet above suspension footbridge; read by Paul Schmidt. From 1914 to 1918, vertical staff at same site and datum.

DISCHARGE MEASUREMENTS.—Made from private road bridge half a mile below gage, or by wading. Suspension footbridge formerly used when making measurements was abandoned in 1920 owing to unsafe condition.

CHANNEL AND CONTROL.—Bed composed of gravel and large boulders. Left bank at gage high and not subject to overflow; right bank flat and subject to overflow at extremely high stages. Stage of zero flow estimated at −1.2 feet on September 13, 1918.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 8.9 feet at 7 p. m. October 27 (discharge, 13,000 second-feet); minimum stage recorded, 1.60 feet October 4 (discharge, 489 second-feet).

Maximum stage recorded during year ending September 30, 1920, 10.5 feet at 2 p. m. November 15 (discharge, 17,200 second-feet); minimum stage recorded, 1.77 feet December 15 (discharge, 463 second-feet).

1914–1920: Maximum stage, 15.0 feet at 9 a. m. December 29, 1917, determined by levels to high-water mark (discharge, 36,000 second-feet); minimum stage recorded 0.78 foot September 28 and 29, 1915 (discharge, 340 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during June and July, 1919. Rating curve used October 1, 1918, to June 19, 1919, well defined below 10,000 second-feet; curve used July 17, 1919, to September 30, 1920, well defined between 500 and 10,000 second-feet; shifting-control method used June 20 to July 16, 1919. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good June and July, 1919; excellent for remainder of the two-year period.

COOPERATION.—Gage-height record furnished by United States Forest Service.

Discharge measurements of Sauk River at Darrington, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
June 19	John McCombs	5.42	5,040	Apr. 28	R. B. Kilgore	3.75	1,840
Sept. 16	McCombs and Lee	2.77	850	July 16	Newton and Lee	4.43	2,620
20	Lasley Lee	2.54	724	Sept. 28	Lasley Lee	4.33	2,520
Nov. 2	do	4.00	2,090				

Daily discharge, in second-feet, of Sauk River at Darrington, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	556	3,240	1,510	1,330	1,810	1,610	2,780	3,400	3,570	3,540	2,800	885
2	556	2,930	1,610	1,330	1,610	1,710	2,930	3,080	3,400	3,390	2,960	782
3	580	2,640	8,350	1,330	1,510	1,710	3,240	2,780	3,400	4,250	3,480	782
4	489	2,380	10,600	1,240	1,420	1,610	4,100	2,510	3,400	4,040	2,890	782
5	795	2,140	4,860	1,240	1,510	1,510	3,240	2,380	3,740	3,840	2,360	782
6	1,510	1,920	3,740	1,240	1,420	1,420	2,780	2,510	4,100	3,820	1,840	885
7	930		3,080	1,160	1,420	1,420	2,780	2,510	3,740	3,450	1,840	885
8	655		2,780	1,080	2,260	1,330	2,930	2,780	3,740	3,790	1,720	782
9	605		2,260	1,080	2,930	1,240	3,240	3,080	3,570	4,150	1,720	720
10	1,510	2,400	2,030	1,080	3,080	1,240	3,740	3,400	3,240	4,740	1,720	660
11	10,000		2,030	1,080	3,080	1,240	2,930	4,100	2,930	4,320	1,840	1,040
12	2,930	2,260	3,240	1,080	1,920	1,330	2,510	3,740	2,930	3,910	1,840	1,210
13	1,810	2,780	10,800	1,080	1,810	1,330	2,260	3,570	3,080	3,720	1,720	1,040
14	1,240	3,080	9,070	1,080	1,810	1,330	2,260	3,400	3,240	4,680	1,610	885
15	1,080	3,240	6,100	1,240	2,030	1,240	2,260	3,570	3,240	5,090	1,610	885
16	1,240	2,640	3,920	1,920	2,260	1,160	2,260	3,740	3,400	4,440	1,610	850
17	1,240	2,260	3,080	4,470	1,920	1,240	2,510	3,400	3,400	3,480	1,610	720
18	1,240	2,030	2,640	7,660	1,710	1,330	2,780	3,080	3,920	3,300	1,500	690
19	1,080	1,810	2,380	5,470	1,610	1,420	3,080	3,080	4,280	3,300	1,400	660
20	930	1,710	2,140	3,400	1,420	1,420	3,400	4,100	4,260	3,300	1,310	690
21	930	1,610	2,030	4,470	1,420	1,420	3,080	4,860	5,030	3,480	1,220	602
22	1,000	1,510	1,810	9,550	1,330	1,330	2,780	5,260	4,810	3,480	1,130	602
23	1,000	1,420	1,810	7,430	1,420	1,330	2,510	5,260	4,600	3,130	1,040	602
24	1,240	1,330	1,610	4,660	1,420	1,420	2,640	5,060	4,780	2,800	1,040	602
25	2,030	1,240	1,610	4,660	1,420	1,420	2,930	5,060	4,570	2,360	1,120	575
26	4,280	1,240	1,420	3,920	1,420	1,510	3,080	5,260	4,750	1,960	1,040	548
27	12,800	1,240	1,510	2,930	1,510	1,510	3,400	5,680	4,740	2,090	960	575
28	7,430	1,330	1,510	2,780	1,510	1,710	3,570	6,100	4,920	2,360	885	575
29	4,470	1,420	1,510	2,510	.....	1,810	3,740	5,260	3,940	2,220	885	548
30	4,100	1,610	1,510	2,260	.....	2,260	3,740	4,280	3,220	2,090	885	575
31	3,740	.....	1,420	2,030	.....	2,640	.....	3,570	.....	2,090	1,210	.....
1919–20.												
1	624	2,630	1,150	1,750	2,940	664	830	1,330	1,240	4,510	1,060	710
2	588	1,970	1,060	1,640	2,490	624	765	1,240	1,640	4,080	1,030	710
3	555	1,750	980	1,530	2,090	624	765	1,150	2,090	3,290	1,150	664
4	525	1,330	900	1,430	2,350	624	710	1,330	2,780	2,940	1,060	664
5	525	1,330	830	1,330	2,780	624	1,240	1,750	2,940	2,940	1,150	624
6	498	1,330	765	1,240	3,290	624	1,030	2,030	3,290	2,780	1,240	588
7	498	980	710	1,150	2,780	664	980	2,630	2,940	3,110	1,240	624
8	525	900	664	1,030	2,490	710	900	2,940	3,670	3,480	1,240	624
9	525	830	624	900	2,090	830	765	2,630	2,630	2,940	1,060	588
10	555	765	588	900	1,860	980	710	2,220	2,630	2,940	1,240	664
11	664	710	566	765	1,530	1,240	900	1,970	2,630	2,630	1,150	9,800
12	765	1,060	543	664	1,430	2,030	1,030	1,860	2,350	2,490	1,150	5,640
13	664	1,530	520	664	1,330	3,480	1,150	1,970	2,490	2,030	1,150	4,290
14	624	2,780	498	588	1,240	2,780	1,030	1,970	3,670	2,780	1,030	8,800
15	624	16,900	471	1,430	1,150	1,750	980	2,220	3,290	2,630	900	4,510
16	588	10,800	900	2,090	1,060	1,430	900	2,780	2,940	2,630	830	3,110
17	555	6,350	7,310	5,870	1,060	1,030	830	4,950	3,290	2,350	765	2,350
18	525	5,180	4,730	8,800	1,060	1,030	900	3,110	2,780	2,220	664	2,350
19	525	4,510	2,780	4,730	1,060	980	900	2,780	2,630	1,970	588	2,350
20	555	3,670	6,830	2,940	980	980	1,060	2,490	3,290	1,750	664	2,490
21	624	3,480	6,350	2,350	900	980	1,030	2,630	3,870	1,530	765	4,510
22	900	3,110	6,350	2,090	830	980	980	2,630	3,480	1,430	765	3,670
23	710	2,940	5,870	1,860	765	980	900	2,090	2,350	1,330	710	2,780
24	624	2,630	8,300	1,970	710	1,060	900	1,750	2,030	1,240	664	2,350
25	588	2,220	5,870	2,090	664	1,030	900	1,430	1,970	1,240	624	2,630
26	555	1,750	4,950	1,750	664	1,060	1,240	1,430	1,860	1,240	588	2,630
27	525	1,530	4,080	4,730	664	1,030	1,640	1,530	2,220	1,530	1,330	3,480
28	525	1,430	2,780	10,800	664	1,030	1,860	1,530	2,630	1,330	1,030	2,490
29	498	1,240	2,220	8,300	664	1,030	1,640	1,430	3,290	1,330	2,090	2,090
30	498	1,240	2,090	6,350	.....	1,030	1,430	1,330	4,080	1,240	1,060	1,970
31	498	.....	1,860	4,080	.....	900	.....	1,240	.....	1,030	900	.....

NOTE.—Gage not read during following periods: Nov. 7–11, 1918 (discharge determined by percentage comparison with records of flow of Sauk River above Whitechuck River); Aug. 20–22 and Dec. 11–13, 1919 (discharge interpolated). Braced figures show mean discharge for periods included.

Monthly discharge of Sauk River at Darrington, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 293 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	12,800	489	2,390	8.16	9.41	147,000
November	.....	1,240	2,100	7.17	8.00	125,000
December	10,800	1,420	3,350	11.4	13.14	206,000
January	9,550	1,080	2,830	9.66	11.14	174,000
February	3,080	1,330	1,790	6.11	6.36	99,400
March	2,640	1,160	1,490	5.09	5.87	91,600
April	4,100	2,260	2,980	10.2	11.38	177,000
May	6,100	2,380	3,870	13.2	15.22	238,000
June	5,030	2,930	3,860	13.2	14.73	230,000
July	5,090	1,960	3,450	11.8	13.60	212,000
August	3,480	885	1,640	5.60	6.46	101,000
September	1,210	548	747	2.55	2.84	44,400
The year	12,800	489	2,550	8.70	118.15	1,850,000
1919–20.						
October	900	498	582	1.99	2.29	35,800
November	16,900	710	2,960	10.1	11.27	176,000
December	8,300	471	2,710	9.25	10.66	167,000
January	10,800	588	2,830	9.66	11.14	174,000
February	3,290	664	1,500	5.12	5.52	86,300
March	3,480	624	1,130	3.86	4.45	69,500
April	1,860	710	1,030	3.52	3.93	61,300
May	4,950	1,150	2,080	7.10	8.19	128,000
June	4,080	1,240	2,770	9.45	10.54	165,000
July	4,510	1,060	2,290	7.82	9.02	141,000
August	2,090	588	999	3.41	3.93	61,400
September	9,800	588	2,690	9.18	10.24	160,000
The year	16,900	471	1,960	6.69	91.18	1,430,000

SOUTH FORK OF SAUK RIVER NEAR BARLOW PASS, WASH.

LOCATION.—In NE. ¼ sec. 27, T. 30 N., R. 11 E., 2¾ miles above junction with North Fork and 5 miles northeast of Barlow Pass, Snohomish County.

DRAINAGE AREA.—32.7 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by N. Aall and B. L. Aall.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 75 feet below gage.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel. One channel at all stages, principal control 100 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage, during year ending September 30, 1919, from water-stage recorder, 6.3 feet at 1 a. m. December 14 (discharge, 3,000 second-feet); minimum stage, from recorder, 1.95 feet September 30 (discharge, 49 second-feet).

Maximum stage, during year ending September 30, 1920, from recorder, 7.7 feet at noon November 15 (discharge, 4,400 second-feet); minimum stage, from recorder, 1.86 feet at 7 p. m. October 20 (discharge, 35 second-feet; may have been lower in December when recorder was not operating and stage-discharge relation may have been affected by ice);

1918-1920: Maximum stage recorded, 9.1 feet at 1.30 a. m. December 29, 1917 (discharge, 5,800 second-feet); minimum stage recorded on October 20, 1919.

ICE.—Stage-discharge relation not seriously affected by ice; open-channel rating curve assumed applicable.

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Stage-discharge relation changed December 14, 1918, January 23 and November 15, 1919, during high water. Rating curves used prior to change on November 15, 1919, well defined below 1,500 second-feet; rating curve used after change on November 15, 1919, fairly well defined between 100 and 2,000 second-feet; curves extended to extremely high stages by study of flood-peak discharge at all gaging stations on Sauk and Skagit rivers. Operation of water-stage recorder unsatisfactory during year ending September 30, 1919; very good during following year. Daily discharge ascertained for periods of actual gage-height record by applying to rating table the daily mean gage height determined from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Except as noted in footnote to table of daily discharge, flat estimates are results of percentage comparison with records of near-by streams. Records excellent over periods during which water-stage recorder was operating in October, 1918, to November 15, 1919; good January to September, 1920; poor for other periods, represented by flat estimates of discharge.

COOPERATION.—Station maintained in cooperation with American Nitrogen Products Co.

Discharge measurements of South Fork of Sauk River near Barlow Pass, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 9	Lee and Twa	2.26	112	May 2	Nicolai Aall	3.30	421
Nov. 6	Nicolai Aall	2.78	225	Sept. 19	Lasley Lee	2.27	105
Dec. 3	do	4.55	1,450	1920.			
1919.				July 19	Newton and Lee	3.03	284
Jan. 3	do	2.18	112	30	do	3.02	269
29	do	2.86	261				

Daily discharge, in second-feet, of South Fork of Sauk River near Barlow Pass, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	79	410	130	130	171	81		600	435		305	
2	70	400	200	122	153			435	492			
3	81	358	1,330	113	140			362	549			
4	72	319	1,500		131		260		606			
5	148	272	898		119					680		110
6	291	237	571		109	120					250	
7	218	217	415	105	102							
8	150	194	323		107							
9	120	192	265		190			470				
10	183		224		207		480		600	576		
11	1,340		206		169		397			570		
12	775		219	90	144		321			546		
13	366	330	1,550		127		277			455		
14	246		1,920		115		240			534		130
15	189		821		107		216			686	210	
16	189		548		156	120	204	512	402	721		
17	217	265	410		182		342			582		
18	178	228	327	570	151		536			426		
19	167	206	280		131		507	600		379		105
20	157	194	246		115		480			412		98
21	150	183	217		103		388			455		85
22	136	165	194		96	121	337	765		470		76
23	144	150	174		88				680	445		72
24	180	138	161		81			1,140		402		72
25	189	128	150	580	92					397	150	78
26	195	122	142		90	180	530			313		79
27	1,910	114	140		83			1,510		284		83
28	1,510	113	183		81			988		313		71
29	862	109	183	257	.....			735		321		57
30	525	124	157	225	.....			606		329		52
31	520	.....	140	196	.....		.....	570	.....	277		.....
1919-20.												
1	60	332	119	228	435	40	74	181	160	614	145	125
2	72	384	99	198	336	39	67	168	216	558	147	108
3	62	228	87	170	280	37	58	152	332	505	145	95
4	51	325	79	152	241	40	65	150	441	469	137	85
5	44	244	72	135	222	46	121	181	435	410	147	74
6	43	179	65	119	357	41	99	251	386	396	163	68
7	41	149	58	105	394	40	91	414	420	435	160	63
8	55	125	50	95	284	55	77	538	593	452	163	57
9	59	107	52	87	238	76	68	464	452	452	163	58
10	55	98	49	79	204	70	65	382	382	420	152	230
11	134	90		72	181	63	68	315	396	348	147	1,340
12	138	81		70	163	142	83	284	365	303	142	1,230
13	111	181	50	63	147	817	112	303	382		145	912
14	90	573		67	133	508	110	311	538		137	1,850
15	78	3,080		115	121	288	101	303	600	380	128	926
16	64	2,060		327	114	201	101	324	458		116	635
17	55	1,200		1,200	110	160	87	638	558		103	420
18	49	694		1,390	103	135	79	560	469		79	430
19	41	675	500	890	89	119	105	401	391	269	68	315
20	36	430		475	79	112	116	348	386	245	65	384
21	72	462		324	72	116	103	319	469	216	74	909
22	158	469		245	65	121	555	274	492	187	83	761
23	121	523		198	60	116	83	255	344	179	85	518
24	92	495		184	55	121	83	225	276	176	77	401
25	74	324	600	294	53	114	95	198	248	152	67	386
26	60	241		238	52	97	147	187	251	155	58	420
27	51	195		877	49	89	238	195	315	165	99	708
28	54	170		2,440	44	77	269	198	406	187	228	446
29	55	150	307	1,100	43	79	248	187	512	198	302	344
30	49	133	352	812	.....	103	210	173	614	179	256	303
31	47	.....	276	613	.....	87	.....	155	.....	160	157	.....

NOTE.—Discharge Nov. 30 to Dec. 4, 1918, ascertained from partial gage-height record and comparison, with records of flow of near-by streams. Discharge Jan. 4-28, 1919, ascertained from approximate gage-height record (gage-height graph contracted in regard to time, but not in regard to stage, on account of unsatisfactory operation of recorder was expanded by comparison with records of near-by streams). Discharge, May 23-26 and June 2-3, 1919, interpolated. Discharge for other periods included by braces estimated by percentage comparison with records of flow of near-by streams. Braced figures show mean discharge for periods included.

Monthly discharge of South Fork of Sauk River near Barlow Pass, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 32.7 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	1,910	70	373	11.4	13.14	22,900
November	410	109	238	7.28	8.12	14,200
December	1,920	130	459	14.0	16.14	28,200
January	.....	.....	313	9.57	11.03	19,200
February	207	81	126	3.85	4.01	7,000
March	.....	.....	136	4.16	4.80	8,360
April	.....	204	377	11.5	12.83	22,400
May	1,510	.....	654	20.0	23.06	40,200
June	.....	.....	620	19.0	21.20	36,900
July	721	277	517	15.8	18.22	31,800
August	305	.....	293	6.21	7.16	12,500
September	.....	52	102	3.12	3.48	6,070
The year	1,920	52	345	10.6	143.19	250,000
1919–20.						
October	158	36	70.0	2.14	2.47	4,300
November	3,080	81	480	14.7	16.40	28,600
December	.....	.....	291	8.90	10.26	17,900
January	2,440	63	431	13.2	15.22	26,500
February	435	43	163	4.98	5.37	9,380
March	817	37	134	4.10	4.73	8,240
April	555	58	126	3.85	4.30	7,500
May	638	150	291	8.90	10.26	17,900
June	614	160	410	12.5	13.95	24,400
July	614	152	326	9.97	11.49	20,000
August	302	58	133	4.07	4.69	8,180
September	1,850	57	487	14.9	16.62	29,000
The year	3,080	36	278	8.50	115.76	202,000

BAKER RIVER BELOW ANDERSON CREEK, NEAR CONCRETE, WASH.

LOCATION.—In SE. ¼ sec. 30, T. 37 N., R. 9 E., 350 feet below Anderson Creek, a quarter of a mile above Baker River ranger station, and 11 miles above Concrete, in Whatcom County.

DRAINAGE AREA.—184 square miles (measured on topographic maps).

RECORDS AVAILABLE.—September 10, 1910, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder; installed September 24, 1915, on left bank; inspected by D. C. Gilman. Previous gages as follows: September 10 to November 19, 1910, vertical staff at trail bridge one-eighth mile above Anderson Creek (readings reduced to datum of gage installed October 22, 1910, by means of relation curve); October 22, 1910, to September 4, 1913, vertical and inclined staff gage on left bank, 30 feet above present gage; September 30, 1913, to September 23, 1915, one inclined and two vertical sections at practically the same site as the gages previously used but at different datum.

DISCHARGE MEASUREMENTS.—Made from cable 300 feet above gage.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel over bedrock; not likely to shift except during extremely high water. Right bank high and rocky; left bank fairly high, wooded, subject to overflow at about 11-foot stage.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 9.7 feet at 11 a. m. December 4 (discharge, 18,700 second-feet); minimum stage, from recorder, 2.63 feet January 14 and 15 (discharge, 581 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 9.93 feet at 1 p. m. November 15 (discharge, 19,600 second-feet); minimum stage from recorder, 1.21 feet on December 15-16 (discharge, 219 second-feet).

1910–1920: Maximum stage recorded, 13.7 feet at 12.30 p. m. December 29, 1917 (discharge, 36,800 second-feet); minimum stage occurred on December 15–16, 1919.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 4, 1918, and November 15, 1919, during high water. Except for extremely low water, rating curves well defined up to 10,000 second-feet. Operation of water-stage recorder fairly satisfactory during year ending September 30, 1919, except as indicated in footnote to table of daily discharge; very unsatisfactory during year ending September 30, 1920, owing to carelessness of observer. Daily discharge ascertained by applying to rating table daily mean gage height determined from recorder graph by inspection or for a few days when range in stage was considerable, by averaging results obtained by applying mean gage height for shorter intervals. Records for year ending September 30, 1919, good except for periods represented by flat estimates of discharge, for which they are fair; records for year ending September 30, 1920, fair except for low stages and periods represented by flat estimates of discharge, for which they are poor.

COOPERATION.—Station maintained in cooperation with United States Forest Service.

Discharge measurements of Baker River below Anderson Creek, near Concrete, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 12	R. B. Kilgore	5.77	4,170	Apr. 1	L. D. Carson	4.16	1,790
15	do	3.46	1,190	3	do	4.36	1,980
Nov. 29	do	2.85	694	Sept. 20	John McCombs	3.32	972
30	do	3.20	928	20	do	3.28	966
Dec. 2	do	3.54	1,170	21	do	3.23	982
3	do	4.49	2,070				
5	do	6.39	5,330	1920.			
6	do	5.43	3,200	May 2	R. B. Kilgore	3.68	1,390
7	do	4.74	2,340	3	do	3.73	1,450
8	do	4.24	1,850	July 20	John McCombs	4.88	2,650
				20	do	4.85	2,660

Daily discharge, in second-feet, of Baker River below Anderson Creek, near Concrete, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1		2,160	927	912	1,040		1,760	2,770	2,130	2,700	2,400	1,430
2		1,800	1,170	842	934		1,880	2,520	2,290	3,180	2,240	1,250
3		1,870	2,410	781	869		1,990	2,080	2,400	3,670	2,080	1,170
4	1,500	1,750	14,800	749	842		2,940	1,790	2,770	4,060	1,980	1,010
5			6,440	709	794		2,460	1,610	3,260	4,280	1,980	1,000
6			3,280	676	736	650	1,980	1,610	3,110	4,060	2,030	942
7	1,130	1,500	2,340	642	688		1,700	1,840	2,580	3,110	2,130	980
8	982		1,840	626	770		1,520	2,180	2,460	3,040	2,080	934
9	920		1,660	615	1,570		1,520	2,340	2,580	3,670	2,030	1,010
10	1,730	2,640	1,430	610	1,610		2,520	2,130	2,290	4,280	2,130	1,010
11	9,320	2,000	1,300	610	2,400		2,180	2,030	1,980	4,280	2,240	1,250
12	5,110	1,610	1,210	610	1,210		1,790	1,840	1,930	3,670	2,180	2,130
13	2,210	2,010	3,860	610	1,050	615	1,560	1,610	2,240	3,260	1,880	1,610
14	1,520	2,450	7,190	591	972	648	1,340	1,610	2,400	3,860	1,700	1,480
15	1,130	2,000	4,000	616	949	637	1,210	2,520	2,520	5,060	1,840	1,380
16	1,130	1,730	2,620	664	1,100	626	1,130	2,770	2,400	5,360	2,180	1,380
17	1,090	1,480	1,980	1,640	1,250	855	1,560	2,340	2,400	3,960	2,340	1,250
18	980	1,250	1,700	3,580	1,090	1,050	2,240	2,030	2,900	2,900	2,290	1,130
19	1,380	1,130	1,430	2,840	987	949	2,240	2,460	4,060	2,770	2,130	1,130
20	1,300	1,090	1,340	2,010	898	884	2,180	3,040	4,520	3,060	1,980	1,040
21	1,170	1,010	1,170	1,660	821	835	1,980	3,330	4,170	3,410	1,930	942
22	980	964	1,050	2,330	768	814	1,740	3,860	3,860	3,490	1,700	972
23	1,010	898	972	3,650	736	835	1,700	3,180	3,960	3,180	1,560	1,090
24	1,130	821	884	2,780	670	808	1,930	2,770	3,410	2,840	1,560	1,170
25	1,050	768	821	2,180	663	788	1,980	7,340	3,580	2,640	1,610	1,170
26	1,560	762	781	1,930	656	775	2,030	9,350	3,760	2,080	1,520	1,050
27	8,580	756	934	1,560	649	768	2,400	8,360	3,410	2,180	1,380	855
28	8,870	730	1,520	1,480	642	814	2,400	5,360	3,040	2,460	1,250	706
29	4,510	706	1,330	1,480	.....	949	2,400	3,960	2,580	2,640	1,300	659
30	2,720	891	1,170	1,250	.....	1,340	2,580	3,040	2,340	2,460	1,380	664
31	2,710	.....	1,090	1,140	.....	1,700	.....	2,400	.....	2,340	1,560	.....

Daily discharge, in second-feet, of Baker River below Anderson Creek, near Concrete, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	712	910	390			605	820	1,460	1,640	5,160	1,840	1,230
2	626	808	358			605	794	1,460	2,210	4,800	1,840	1,230
3	567	682	331			595	861	1,460	2,960	4,580	1,790	1,280
4	572	920	311		2,400	605	854	1,460	3,040	4,370	1,790	1,230
5	654	788	292			605	854	1,540	3,180	3,880	1,940	1,150
6	712	700	280			590	794	1,860	3,880	3,690	2,160	1,070
7	730	670	266		3,040	575	788	2,690	4,070	3,970	2,210	1,070
8	712	605	259	1,000	2,210	676	794	3,270	3,270	4,170	2,260	998
9	610	577	253		1,790	827	814	3,040	2,820	4,170	2,210	998
10	577	670	246		1,540	875	794	2,620	2,820	3,970	2,100	1,570
11	632	615	237		1,320	896	782	2,160	2,560	3,430	2,040	5,940
12	743	563	230		1,250	1,100	889	1,940	2,560	2,890	2,040	7,350
13	808	840	222		1,180	2,640	1,010	2,040	3,040	2,690	2,100	5,550
14	700	2,530	220		1,100	2,160	942	2,040	3,850	3,350	1,990	7,120
15	632	16,000	220		1,030	1,590	896	2,100	4,580	3,520	1,890	5,030
16	577	15,200			990	1,280	861	2,160	3,600	3,780	1,740	3,800
17	538	10,200			966	1,070	820	3,400	3,690	3,600	1,540	2,660
18	519	5,030			942	966	801	2,820	3,430	3,350	1,230	2,620
19	494	4,480			882	966	990	2,210	2,960	3,110	1,150	1,890
20	485	3,110			827	896	990	1,890	2,820	2,760	1,320	3,330
21	730	2,560	3,800		782	1,050	903	1,790	3,350	2,380	1,500	5,990
22	775	2,560			751	1,010	854	1,540	3,780	2,160	1,590	5,660
23	682	2,560			721	974	827	1,460	2,890	2,040	1,540	3,700
24	577	2,080		3,500	693	982	854	1,410	2,320	2,040	1,460	2,620
25	526	1,150			671	966	998	1,280	2,100	1,840	1,230	2,440
26	482	721			671	889	1,280	1,190	2,100	1,840	1,150	2,430
27	448	560			671	834	1,690	1,460	2,520	1,990	1,480	3,690
28	458	490			638	801		1,500	3,600	2,210	1,840	2,820
29	461	435			616	840	1,800	1,410	4,250	2,380	2,000	2,320
30	461	408			.....	1,020		1,280	5,030	2,210	1,690	2,100
31	502	.....			.....	889	.....	1,360	.....	1,940	1,320	.....

NOTE.—Recorder not in operation Oct. 1–6, Nov. 5–9 and 26, 1918, Jan. 31, Feb. 1, 16, and 25–27, Mar. 1–12, and Dec. 16–31, 1919, and Jan. 1 to Feb. 6, Feb. 12–14, and Apr. 28–30, 1920. Flat estimates of discharge obtained from comparison with records of flow of Sauk and Upper Skagit rivers; discharge Nov. 26, 1918, Jan. 31, Feb. 1, 16, 25–27, 1919, and Feb. 12–14, 1920, interpolated. Braced figures show mean discharge for periods included.

Monthly discharge of Baker River below Anderson Creek, near Concrete, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 184 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile	Inches.	Acre-feet.
1918–19.						
October	9,320	920	2,360	12.8	14.76	145,000
November	2,640	706	1,430	7.77	8.67	85,100
December	14,800	781	2,410	13.1	15.10	148,000
January	3,650	591	1,370	7.45	8.59	84,200
February	2,400	642	977	5.31	5.53	54,300
March	1,700	.....	790	4.29	4.95	48,600
April	2,940	1,130	1,960	10.7	11.94	117,000
May	9,350	1,610	3,100	16.8	19.37	191,000
June	4,520	1,930	2,910	15.8	17.63	173,000
July	5,360	2,080	3,350	18.2	20.98	206,000
August	2,400	1,250	1,890	10.3	11.87	116,000
September	2,130	659	1,130	6.14	6.85	67,200
The year	14,800	591	1,980	10.8	146.24	1,440,000
1919–20.						
October	808	448	603	3.28	3.78	37,100
November	16,000	408	2,650	14.4	16.07	158,000
December	.....	220	2,090	11.4	13.14	129,000
January	.....	.....	2,290	12.4	14.30	141,000
February	.....	616	1,370	7.45	8.04	78,800
March	2,640	575	980	5.33	6.14	60,300
April	.....	782	998	5.42	6.05	59,400
May	3,400	1,190	1,910	10.4	11.99	117,000
June	5,030	1,640	3,160	17.2	19.19	188,000
July	5,160	1,840	3,170	17.2	19.83	195,000
August	2,260	1,150	1,740	9.46	10.91	107,000
September	7,350	998	3,030	16.5	18.41	180,000
The year	16,000	220	2,000	10.9	147.58	1,450,000

UPPER COLUMBIA RIVER BASIN.

MAIN STREAM.

COLUMBIA RIVER AT TRAIL, B. C.

LOCATION.—At highway bridge at Trail, 15 miles above international boundary and mouth of Clark Fork, or Pend Oreille River, and 18 miles below mouth of Kootenai River.

DRAINAGE AREA.—34,000 square miles (measured by Dominion Water Power Branch).

RECORDS AVAILABLE.—April 18, 1913, to September 30, 1920.

GAGE.—Chain gage installed on bridge in June, 1913; read by C. A. Broderick.

DISCHARGE MEASUREMENTS.—Made from bridge.

CHANNEL AND CONTROL.—Channel straight for a quarter of a mile above and below gage. Riffle control below gage; apparently permanent.

EXTREMES OF DISCHARGE.—Maximum daily mean stage recorded during year ending September 30, 1919, 34.4 feet June 29–30 (discharge, 229,000 second-feet); minimum daily mean stage recorded, 8.2 feet January 19 (discharge, 13,000 second-feet).

Maximum daily mean stage recorded during year ending September 30, 1920, 37.4 feet July 19 and 20 (discharge, 263,000 second-feet); minimum daily mean stage recorded, 7.75 feet March 11–14 (discharge, 11,000 second-feet).

1913–1920: Maximum stage recorded, 41.6 feet June 14–15, 1913 (discharge, 312,000 second-feet); minimum stage recorded, 7.40 feet March 28, 1917 (discharge, 9,600 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—A small amount of water is diverted above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below and fairly well defined above 150,000 second-feet. Gage read twice daily to hundredths. Daily discharge ascertained by applying daily mean gage height to rating table.

COOPERATION.—Complete record furnished by Dominion Water Power Branch, Department of the Interior, Canada.

Discharge measurements of Columbia River at Trail, B. C., during the years ending Sept. 30, 1919 and 1920.

[Made by engineer of Dominion Water Power Branch.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1918.	*Feet.*	*Sec.-ft.*	1919.	*Feet.*	*Sec.-ft.*	1920.	*Feet.*	*Sec.-ft.*
Oct. 13	15.52	52,900	July 28	26.00	147,000	June 30	30.74	195,000
			Oct. 7	13.50	43,300	July 27	34.86	251,000
1919.						Sept. 24	18.18	76,300
Feb. 5	10.25	23,200	1920.					
Mar. 25	8.88	16,000	Mar. 2	7.90	13,200			
Apr. 22	13.00	37,500	May 26	22.21	117,000			

Daily discharge, in second-feet, of Columbia River at Trail, B. C., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	66,200	42,200		24,700	24,100	15,500	19,000	64,800	206,000	226,000	138,000	96,000
2	65,200	41,600		24,100	24,100	17,000	20,500	68,400	207,000	220,000	137,000	94,000
3	64,100	41,000		23,600	23,800	17,000	22,000	71,300	206,000	216,000	136,000	92,000
4	63,400	40,400		23,100	23,600	16,500	23,100	74,400	203,000	211,000	135,000	90,400
5	62,000	39,800		22,000	23,400	16,200	23,600	76,800	201,000	208,000	134,000	88,800
6	61,200	39,200		21,500	23,100	16,000	24,700	78,400	199,000	204,000	133,000	86,400
7	59,800	38,300		20,500	23,100	15,500	25,200	79,200	196,000	200,000	132,000	84,800
8	59,100	37,400		20,000	22,500	15,500	26,100	80,000	193,000	198,000	131,000	83,200
9	58,100	36,900		19,200	22,500	15,500	26,900	80,000	188,000	195,000	130,000	80,800
10	57,000	36,300		18,500	22,000	15,500	27,400	80,800	186,000	190,000	129,000	79,200
11	56,100	35,700		18,000	22,000	15,500	28,500	81,600	183,000	187,000	128,000	77,600
12	55,000	35,700		17,000	21,500	15,500	29,500	82,000	179,000	185,000	127,000	76,000
13	54,400	35,100		16,500	21,500	15,500	29,500	83,200	176,000	184,000	126,000	74,400
14	53,700	34,500		15,700	21,000	15,200	30,100	84,000	173,000	182,000	125,000	73,600
15	53,700	34,500		15,000	21,000	15,200	30,600	85,600	170,000	181,000	123,000	72,000
16	53,000	34,000	25,800	14,500	20,500	15,200	31,700	86,400	168,000	179,000	119,000	70,600
17	52,400	34,000		13,500	20,500	15,500	32,600	88,000	167,000	179,000	118,000	69,100
18	51,700	33,400		13,000	20,000	15,500	33,400	89,600	168,000	177,000	116,000	67,600
19	51,700	32,800		13,500	20,000	15,500	34,500	92,000	170,000	174,000	115,000	66,900
20	51,000	32,300		15,000	20,000	15,500	35,400	96,000	173,000	171,000	113,000	65,500
21	50,400	31,700		16,200	19,500	16,000	38,300	103,000	179,000	168,000	112,000	64,100
22	49,700	31,200		18,000	19,500	16,000	38,000	110,000	189,000	165,000	110,000	62,700
23	49,100	30,600		20,000	19,500	16,000	33,800	119,000	200,000	162,000	109,000	62,000
24	48,400	30,300		21,500	19,000	16,500	42,800	123,000	210,000	159,000	109,000	60,500
25	47,200	30,100		23,100	18,700	16,500	45,900	140,000	218,000	156,000	107,000	59,100
26	46,500	29,500		24,400	18,700	17,000	48,400	151,000	223,000	152,000	105,000	58,400
27	45,900	29,500		25,200	18,500	17,000	51,700	162,000	227,000	149,000	104,000	57,000
28	45,200	29,000		25,800	18,000	17,500	55,000	176,000	228,000	146,000	103,000	55,700
29	44,600	28,500		25,200	.....	17,700	58,400	188,000	229,000	143,000	101,000	54,700
30	44,000	28,500		25,200	.....	18,000	61,200	198,000	229,000	141,000	99,200	53,300
31	43,100	.....		24,700	.....	18,500	.....	204,000	.....	139,000	97,600	.....
1919–20.												
1	50,600	25,600	18,000	16,600	14,200	11,800	13,000	21,500	98,200	198,000	199,000	90,800
2	49,000	25,300	17,700	16,600	14,200	11,600	13,000	22,200	98,000	210,000	194,000	88,000
3	47,500	25,000	17,500	16,600	14,200	11,500	13,000	23,600	98,400	220,000	189,000	85,200
4	45,900	24,700	17,200	16,700	14,200	11,400	13,200	25,300	99,600	226,000	184,000	82,000
5	44,300	24,500	16,900	16,800	14,200	11,300	13,300	27,400	102,000	232,000	178,000	79,200
6	43,100	24,200	16,700	16,500	14,300	11,300	13,400	30,200	104,000	235,000	173,000	76,000
7	41,900	23,800	16,400	16,200	14,200	11,200	13,400	34,100	108,000	237,000	166,000	73,200
8	40,800	23,600	16,000	15,900	14,200	11,200	13,500	38,900	111,000	238,000	166,000	70,600
9	39,400	23,400	15,800	15,600	14,200	11,100	13,600	44,100	115,000	240,000	162,000	68,400
10	38,400	23,100	15,500	15,300	14,100	11,100	13,600	49,700	118,000	243,000	158,000	64,900
11	37,100	22,900	15,300	15,000	13,900	11,000	13,600	55,700	112,000	248,000	156,000	63,400
12	36,100	22,500	15,000	14,900	13,800	11,000	13,800	62,100	125,000	251,000	154,000	60,200
13	35,200	22,200	14,700	14,800	13,800	11,000	14,400	69,400	130,000	254,000	152,000	59,400
14	34,400	22,000	14,500	14,800	13,600	11,000	14,000	78,800	135,000	257,000	149,000	59,400
15	33,700	21,800	14,300	14,900	13,600	11,100	14,200	86,800	141,000	260,000	147,000	60,200
16	32,800	21,600	14,200	14,900	13,500	11,200	14,300	91,600	147,000	261,000	145,000	61,600
17	32,200	21,300	14,400	15,000	13,300	11,300	14,800	94,400	153,000	262,000	143,000	64,100
18	31,400	21,100	14,300	15,000	13,200	11,400	15,000	101,000	159,000	262,000	142,000	59,800
19	30,600	20,900	14,400	15,000	13,000	11,500	15,400	98,800	165,000	263,000	140,000	70,400
20	30,100	20,600	14,500	15,000	12,800	11,600	15,800	102,000	171,000	263,000	136,000	72,800
21	29,500	20,300	14,700	14,900	12,600	11,700	16,200	104,000	177,000	262,000	131,000	73,600
22	29,100	20,000	15,000	14,800	12,600	11,800	16,600	106,000	184,000	259,000	125,000	73,600
23	28,700	19,700	15,300	14,800	12,400	12,000	17,200	107,000	189,000	254,000	120,000	73,200
24	28,100	19,500	15,500	14,600	12,400	12,200	17,600	107,000	192,000	249,000	116,000	73,200
25	27,600	19,400	15,700	14,600	12,200	12,300	18,000	106,000	193,000	243,000	114,000	73,600
26	27,200	19,300	15,900	14,400	12,200	12,400	18,500	104,000	193,000	237,000	110,000	73,600
27	26,900	19,100	16,100	14,400	12,000	12,600	19,000	104,000	190,000	228,000	107,000	73,400
28	26,600	18,800	16,200	14,400	12,000	12,600	19,700	102,000	188,000	220,000	104,000	72,800
29	26,400	18,500	16,300	14,400	11,900	12,800	20,400	101,000	186,000	212,000	102,000	71,600
30	26,000	18,300	16,500	14,400	.....	13,000	21,000	99,700	189,000	207,000	97,800	70,200
31	25,900	.....	16,500	14,300	.....	13,000	.....	98,700	.....	203,000	94,400	.....

Monthly discharge of Columbia River at Trail, B. C., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 34,000 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	66,200	43,100	53,600	1.58	1.82	3,300,000
November	42,200	28,500	34,500	1.01	1.13	2,050,000
December			25,800	.76	.88	1,590,000
January	25,800	13,000	19,900	.59	.68	1,220,000
February	24,100	18,000	21,100	.62	.65	1,170,000
March	18,500	15,200	16,200	.48	.55	996,000
April	61,200	19,000	34,400	1.01	1.13	2,050,000
May	204,000	64,800	107,000	3.15	3.63	6,580,000
June	229,000	167,000	195,000	5.74	6.40	11,600,000
July	226,000	139,000	179,000	5.27	6.08	11,000,000
August	138,000	97,600	119,000	3.50	4.04	7,320,000
September	96,000	53,300	72,500	2.13	2.38	4,310,000
The year	229,000	13,000	73,200	2.15	29.37	53,200,000
1919–20.						
October	50,600	25,900	34,700	1.02	1.18	2,130,000
November	25,600	18,300	21,800	.64	.71	1,300,000
December	18,000	14,200	15,700	.46	.53	965,000
January	16,800	14,300	15,200	.45	.52	935,000
February	14,300	11,900	13,300	.39	.42	765,000
March	13,000	11,000	11,700	.34	.39	719,000
April	21,000	13,000	15,400	.45	.50	916,000
May	107,000	21,500	74,100	2.18	2.51	4,560,000
June	193,000	98,000	146,000	4.29	4.79	8,690,000
July	263,000	198,000	240,000	7.06	8.14	14,800,000
August	199,000	94,400	144,000	4.23	4.88	8,850,000
September	90,800	59,400	71,300	2.10	2.34	4,240,000
The year	263,000	11,000	66,900	1.97	26.91	48,900,000

COLUMBIA RIVER AT VERNITA, WASH.

LOCATION.—In sec. 11, T. 13 N., R. 24 E., at Richmond ferry, half a mile north of Vernita and 6 miles below Priest Rapids, in Benton County.

DRAINAGE AREA.—95,500 square miles. Areas in United States measured on topographic maps and on maps issued by United States Geological Survey on scale 1:500,000. Areas in British Columbia measured on Department of the Interior Railway Belt maps, scale 1:500,000; Department of Mines, West Kootenay sheet, scale 1:253,440; and Department of Lands map, scale 1:1,125,000.

RECORDS AVAILABLE.—Flood heights only, at Wenatchee, 1894 to 1903; continuous gage-height record at Wenatchee, April 18, 1904, to December 31, 1916; at Beverly January 1–13, 1917; at Vernita, January 14, 1917, to September 30, 1920; daily discharge ascertained from May 1, 1913, to September 30, 1920. Gage-height record at Wenatchee published by United States Weather Bureau.

GAGE.—Since March 25, 1918, vertical staff gage in eight sections, on right bank at ferry; read by J. P. Richmond. Prior to January 1, 1916, staff gage, one inclined and six vertical sections reading from 0 to 64 feet, on right bank about a mile above highway bridge at Wenatchee; zero of gage 583 feet above sea level. January 1 to December 31, 1916, vertical staff reading from −2 to 61 feet on pier of highway bridge at Wenatchee; zero of gage 579.30 feet above sea level. January 1–13, 1917, vertical staff on pier of Chicago, Milwaukee & St. Paul Railway bridge at Beverly, supplemented by temporary low-water vertical section on left bank at same location. January 14 to July 11, 1917, vertical staff in four sections on left bank at ferry at Vernita. July 12 to October 25, 1917, temporary vertical staff in

six sections at present site on right bank. October 25, 1917, to March 24, 1918, five sections of present gage. All gage readings at Vernita refer to same datum, 388.7 feet above sea level. Gages at Wenatchee read by Weather Bureau observers.

DISCHARGE MEASUREMENTS.—Made from standard gaging car on ferry cable at Vernita or, when ice conditions are severe, from railroad bridge at Beverly.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. High-water control, Coyote Rapids 6 or 7 miles below gage; low-water control, riffle noticeable at low stages about three-fourths mile below gage; apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 26.4 feet on June 1 and 2 (discharge, 368,000 second-feet); minimum discharge, 32,600 second-feet (current-meter measurement) January 10, when stage-discharge relation was affected by ice.

Maximum stage recorded during year ending September 30, 1920, 26 feet July 15–18 (discharge, 359,000 second-feet); minimum discharge, 23,900 second-feet (current-meter measurement) December 14, when stage-discharge relation was affected by ice.

1913–1920: Maximum stage recorded, 45.7 feet at Wenatchee, June 15 and 16, 1913 (discharge, 528,000 second-feet); minimum discharge, 23,900 second-feet (current-meter measurements) January 31, 1917, and December 14, 1919, when stage-discharge relation was affected by ice.

Maximum stage recorded at Wenatchee by United States Weather Bureau and Great Northern Railway Co., 58.0 feet June 7, 1894 (discharge estimated, by extending rating curve, at 710,000 second-feet).

ICE.—Stage-discharge relation affected by ice except during mild winters. Flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Some water diverted for irrigation.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; affected by ice January 9–17, 1919, and December 9, 1919, to March 11, 1920. Rating curves well defined, curve used after September 30, 1919, drawn so as to average all measurements better and differs slightly from curve previously used below 66,000 second-feet. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage-height to rating table. Records excellent except for period when stage-discharge relation was affected by ice.

COOPERATION.—Maintained in cooperation with Washington Irrigation & Development Co.

Discharge measurements of Columbia River at Vernita, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec-ft.*	1919.		*Feet.*	*Sec-ft.*
Nov. 7–8	D. J. F. Calkins	4.97	56,500	Nov. 5	John McCombs	1.87	36,200
				Dec. 14	do	[a] 6.70	23,900
1919.							
Jan. 9–10	R. B. Kilgore	[a] 1.97	32,600	1920.			
28	do	4.92	56,900	Jan. 12	do	[a] 2.54	26,900
30	do	5.33	60,900	Feb. 2	do	[a] 1.42	32,500
Feb. 20	do	3.61	48,200	June 11	do	19.18	225,000
Mar. 6	do	2.85	42,900	Sept. 2	do	11.88	124,000

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Columbia River at Vernita, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	85,600	63,000	44,400	40,600	60,600	43,100	58,200	164,000	368,000	343,000	185,000	117,000
2	84,700	62,200	43,800	40,000	60,600	43,800	59,800	169,000	368,000	339,000	181,000	115,000
3	83,800	60,600	43,800	39,400	59,800	44,400	64,600	176,000	364,000	334,000	176,000	114,000
4	82,900	59,800	43,800	38,200	58,200	43,800	67,200	184,000	364,000	328,000	175,000	113,000
5	82,000	59,000	45,100	38,800	56,600	43,800	72,200	184,000	361,000	321,000	174,000	111,000
6	81,100	59,000	45,700	36,900	55,200	43,100	78,400	185,000	359,000	311,000	172,000	110,000
7	80,200	58,200	46,400	36,300	54,500	43,100	85,600	187,000	361,000	304,000	172, 00	108,000
8	79,300	53,600	45,700	35,100	53,100	43,100	89,200	187,000	359,000	298,000	171,000	106,000
9	79,300	55,900	44,400		52,400	42,500	91,100	187,000	352,000	290,000	171,000	104,000
10	76,600	55,200	43,800		51,700	41,900	91,100	188,000	345,000	286,000	169,000	102,000
11	76,600	54,500	43,800		51,700	41,900	89,200	190,000	339,000	282,000	169,000	99,700
12	74,800	53,800	43,100		51,700	41,900	89,200	190,000	332,000	274,000	168,000	97,800
13	74,800	53,800	43,100	32,900	51,700	41,300	90,200	190,000	321,000	270,000	165,000	94,900
14	74,000	53,800	44,400		51,000	40,600	92,000	188,000	315,000	265,000	162,000	93,000
15	73,100	53,100	48,400		50,300	39,400	93,000	187,000	311,000	259,000	161,000	91,100
16	72,200	53,100	47,000		49,700	39,400	93,000	185,000	304,000	255,000	157,000	89,200
17	73,100	53,100	46,400		49,000	38,800	93,000	187,000	302,000	252,000	153,000	87,400
18	72,200	53,800	46,400	33,200	49,700	42,500	94,000	190,000	300,000	250,000	150,000	85,600
19	71,400	53,100	46,400	36,300	49,700	43,800	94,900	196,000	298,000	246,000	147,000	83,800
20	71,400	53,100	47,700	37,500	48,400	44,400	97,800	200,000	300,000	243,000	143,000	82,900
21	69,700	51,700	48,400	38,800	47,700	49,000	103,000	205,000	304,000	250,000	140,000	81,100
22	68,800	51,000	47,700	39,400	46,400	52,400	107,000	219,000	315,000	236,000	139,000	80,200
23	68,000	51,000	47,000	40,600	45,100	53,100	109,000	238,000	323,000	231,000	138,000	79,300
24	67,200	50,300	46,400	45,100	44,400	53,100	111,000	255,000	328,000	224,000	137,000	78,400
25	66,300	49,700	45,700	45,700	43,100	52,400	113,000	272,000	332,000	218,000	136,000	77,500
26	64,600	48,400	45,700	50,300	43,100	52,400	117,000	284,000	337,000	211,000	133,000	76,600
27	63,800	47,700	43,800	54,500	41,900	51,700	124,000	300,000	348,000	205,000	131,000	74,800
28	63,000	47,000	43,100	57,400	42,500	51,700	132,000	319,000	350,000	200,000	128,000	73,100
29	63,000	45,700	43,100	59,800		53,800	142,000	339,000	350,000	196,000	126,000	71,400
30	63,800	45,100	41,900	60,600		56,600	156,000	350,000	345,000	191,000	124,000	69,700
31	63,000		41,300	61,400		57,400		366,000		188,000	120,000	
1919–20.												
1	68,800	37,500	35,100		31,000		37,500	64,600	199,000	315,000	274,000	126,000
2	67,200	37,500	34,500		32,500		38,100	68,800	197,000	317,000	265,000	123,000
3	64,600	37,500	33,900				37,500	70,600	196,000	321,000	259,000	119,000
4	62,900	36,900	34,500				36,900	72,200	194,000	328,000	254,000	115,000
5	62,100	36,900	33,900				36,300	74,800	196,000	332,000	248,000	110,000
6	61,300	36,900	32,700	26,000		28,000	33,900	78,400	197,000	341,000	241,000	106,000
7	58,900	36,900	30,000		32,000		36,300	80,200	200,000	345,000	232,000	103,000
8	53,500	36,300	28,300				36,900	83,800	202,000	348,000	226,000	101,000
9	55,000	35,300					35,900	89,200	205,000	348,000	218,000	98,700
10	53,400	35,700					36,300	94,000	214,000	348,000	211,000	96,800
11	52,000	35,100	25,000				35,700	104,000	222,000	345,000	205,000	94,900
12	50,500	34,500		26,900		27,200	35,100	113,000	226,000	348,000	202,000	94,000
13	49,800	34,500				27,200	37,500	120,000	231,000	354,000	199,000	93,000
14	49,800	34,500	23,900			27,800	37,500	131,000	234,000	352,000	194,000	92,000
15	48,400	33,900				28,800	40,000	140,000	238,000	359,000	191,000	94,900
16	47,800	33,900		29,000	31,000	28,300	45,200	150,000	246,000	359,000	187,000	94,900
17	47,100	37,500				35,100	45,200	160,000	259,000	359,000	182,000	94,900
18	45,800	37,500	26,000			41,200	47,100	171,000	267,000	359,000	179,000	93,000
19	45,200	36,900				36,900	48,400	182,000	274,000	357,000	178,000	92,000
20	43,800	36,900				35,100	49,100	194,000	284,000	354,000	175,000	91,100
21	43,200	37,500				33,900	49,800	199,000	290,000	352,000	172,000	91,100
22	42,600	36,900				33,900	51,200	203,000	296,000	352,000	168,000	92,000
23	42,600	36,300				33,900	52,000	208,000	302,000	350,000	162,000	93,000
24	42,600	36,300				36,900	52,700	210,000	315,000	345,000	156,000	94,900
25	41,900	36,900			30,000	36,300	54,200	211,000	323,000	339,000	152,000	96,800
26	41,200	37,500	28,000	28,000		37,500	55,000	211,000	319,000	332,000	147,000	96,800
27	41,200	37,500				38,100	55,700	211,000	317,000	323,000	143,000	97,800
28	39,300	36,900				37,500	56,500	210,000	317,000	315,000	138,000	96,800
29	38,700	36,300				37,500	57,300	208,000	317,000	304,000	134,000	96,800
30	38,100	35,100				36,900	60,500	208,000	315,000	294,000	132,000	95,800
31	37,500					37,500		205,000		282,000	128,000	

NOTE.—Braced figures show mean discharge for pericds included.

Monthly discharge of Columbia River at Vernita, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 95,500 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	85,600	63,000	73,200	0.766	0.88	4,500,000
November	63,000	45,100	53,700	.562	.63	3,200,000
December	48,400	41,300	45,100	.472	.54	2,770,000
January	61,400	.....	40,700	.426	.49	2,500,000
February	60,600	41,900	50,700	.531	.55	2,820,000
March	57,400	38,800	46,100	.483	.56	2,830,000
April	156,000	58,200	96,600	1.01	1.13	5,750,000
May	366,000	164,000	221,000	2.31	2.66	13,600,000
June	368,000	298,000	335,000	3.51	3.92	19,900,000
July	343,000	188,000	261,000	2.73	3.15	16,000,000
August	185,000	129,000	154,000	1.62	1.86	9,470,000
September	117,000	69,700	92,200	.965	1.08	5,490,000
The year	368,000	.....	123,000	1.29	17.45	88,800,000
1919–20.						
October	68,800	37,500	49,700	.520	.60	3,060,000
November	37,500	33,900	36,400	.381	.43	2,170,000
December	35,100	23,900	28,100	.294	.34	1,730,000
January	.....	.....	27,500	.288	.33	1,690,000
February	.....	.....	31,100	.326	.35	1,790,000
March	41,200	27,200	32,100	.336	.39	1,970,000
April	60,500	33,900	44,400	.465	.52	2,640,000
May	211,000	64,600	146,000	1.53	1.76	8,980,000
June	323,000	194,000	253,000	2.65	2.96	15,100,000
July	359,000	282,000	338,000	3.54	4.08	20,800,000
August	274,000	128,000	192,000	2.01	2.32	11,800,000
September	126,000	91,100	99,500	1.04	1.16	5,920,000
The year	359,000	23,900	107,000	1.12	15.24	77,600,000

KOOTENAI RIVER BASIN.

KOOTENAI RIVER AT LIBBY, MONT.

LOCATION.—In sec. 3, T. 30 N., R. 31 W., at highway bridge opposite Great Northern Railway station at Libby, Lincoln County.

DRAINAGE AREA.—11,000 square miles.

RECORDS AVAILABLE.—October 13, 1910, to September 30, 1919.

GAGE.—Chain gage on left span of highway bridge; prior to completion of bridge a temporary staff gage fastened to an old stump on the right bank at lower side of bridge. In February, 1913, gage datum lowered 2 feet; all readings prior to change reduced to new datum.

DISCHARGE MEASUREMENTS.—Made from highway bridge; prior to erection of bridge, from ferry cable.

CHANNEL AND CONTROL.—Channel broken by two piers. Bed of stream composed of small rocks; probably permanent; current fairly swift and uniformly distributed.

EXTREMES OF DISCHARGE.—Maximum stage reported during year ending September 30, 1919, 14.58 feet at 9.05 a. m. May 29 (discharge, 80,000 second-feet); minimum stage, 1.80 feet February 27 (discharge, 2,160 second-feet).

1910–1919: Maximum stage, 19.17 feet June 21, 1916 (discharge, 130,000 second-feet); minimum stage, 1.4 feet February 7, 1914 (discharge, 1,480 second-feet, revised).

ICE.—Stage-discharge relation slightly affected by ice; open-channel rating used throughout the winter.

DIVERSIONS.—None of importance.

ACCURACY.—Stage-discharge relation permanent except for slight ice effect during winter. Rating curve well defined between 3,400 and 25,000 second-feet and fairly well above 25,000 second-feet. Gage read twice daily to hundredths April to July and once daily to hundredths during remainder of year. Records good for open-channel flow; fair for winter when there may have been slight ice effect on stage-discharge relation.

COOPERATION.—Gage-height record furnished by United States Forest Service.

The following discharge measurement was made by W. A. Lamb:
March 24, 1919: Gage height, 2.70 feet; discharge, 3,800 second-feet.

Daily discharge, in second-feet, of Kootenai River at Libby, Mont., for the year ending Sept. 30, 1919.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June	July,	Aug.	Sept.
1	5,790	5,670	3,670	3,280	4,560	2,580	6,340	28,000	56,100	28,700	11,300	7,300
2	5,730	5,610	3,970	2,380	3,900	2,720	6,910	25,500	43,200	26,600	11,700	7,530
3	5,700	5,460	4,170	4,140	4,430	2,850	7,200	23,000	36,700	24,000	12,200	8,500
4	5,730	5,310	4,350	5,080	3,920	2,990	7,690	20,500	33,800	23,000	12,600	8,370
5	5,640	5,430	4,320	.....	3,460	3,120	8,920	18,100	34,300	22,400	12,800	7,690
6	5,560	5,220	4,300	.....	3,900	3,660	9,390	16,300	37,200	22,400	14,200	7,260
7	5,490	5,200	4,240	.....	3,600	3,550	8,710	15,200	41,100	22,400	16,800	7,200
8	5,670	5,020	4,120	.....	3,690	3,490	8,090	14,500	40,700	22,200	15,400	7,300
9	5,790	4,940	4,120	.....	3,700	3,430	7,660	14,300	36,000	19,500	14,100	7,100
10	5,760	4,910	4,040	.....	3,710	3,370	7,820	14,700	33,600	18,600	12,900	6,590
11	5,430	4,880	3,900	.....	3,830	3,510	8,500	15,700	32,200	18,800	12,600	6,470
12	5,520	5,310	3,880	.....	3,600	3,420	8,960	16,000	30,000	19,800	12,000	6,220
13	6,090	5,080	3,690	.....	3,600	3,370	8,470	16,300	27,400	20,000	11,300	6,030
14	6,030	4,860	3,880	.....	3,850	3,250	8,130	15,600	27,000	19,500	10,700	6,160
15	5,790	4,970	4,460	.....	3,530	3,220	7,820	15,600	28,600	18,700	10,300	6,160
16	8,470	5,170	5,050	.....	3,510	3,190	7,460	17,200	30,600	18,100	9,950	6,190
17	8,090	5,400	4,770	.....	3,600	3,160	7,300	19,500	31,400	17,700	9,500	6,030
18	8,130	5,080	4,430	.....	3,760	3,350	8,330	22,600	33,800	18,200	9,170	6,030
19	8,160	4,860	4,120	.....	3,570	3,480	10,100	24,400	35,300	18,200	9,170	6,030
20	7,590	4,750	3,900	.....	3,370	3,900	11,800	30,500	30,700	16,100	9,100	5,850
21	7,230	4,610	3,830	.....	3,330	3,760	12,400	40,900	42,700	14,400	9,210	5,760
22	7,130	4,480	3,140	.....	3,290	3,730	12,400	52,600	48,700	13,500	9,170	5,670
23	6,880	4,320	2,880	.....	2,840	3,830	12,500	62,800	51,000	13,100	8,990	5,640
24	6,690	4,140	3,200	9,540	2,400	3,950	12,900	71,400	49,600	13,500	8,850	5,490
25	6,470	3,440	3,110	9,210	2,320	4,120	14,000	67,900	53,600	13,100	8,500	5,340
26	6,280	3,120	3,020	8,740	2,240	4,120	17,600	64,900	39,800	13,100	8,230	5,250
27	6,160	3,220	2,920	6,280	2,160	4,040	21,100	65,300	37,500	13,200	8,030	5,140
28	6,030	3,080	3,290	5,580	2,450	4,020	25,200	72,300	38,200	12,800	7,890	5,200
29	6,090	3,040	4,140	5,340	.....	4,200	28,800	79,800	36,200	12,200	7,820	5,250
30	5,970	3,370	3,600	5,110	.....	4,720	30,400	78,300	32,300	11,400	7,760	5,170
31	5,820	.....	4,370	4,580	.....	5,490	.....	67,600	.....	11,200	7,630	.....

NOTE.—Discharge interpolated for following days when gage was not read: Oct. 6, 27, Dec. 1, 15, 25, Jan. 1, Feb. 9. 23, 25, 26, Mar. 1–4, 8, 9, 16, July 6, Sept. 21 and 28.

Monthly discharge of Kootenai River at Libby, Mont., for the year ending Sept. 30, 1919.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	8,470	5,430	6,350	390,000
November	5,670	3,040	4,660	277,000
December	5,050	2,880	3,900	240,000
February	4,560	2,160	3,430	190,000
March	5,490	2,580	3,600	221,000
April	30,400	6,340	11,800	702,000
May	79,800	14,300	35,700	2,200,000
June	56,100	27,000	37,600	2,240,000
July	28,700	11,200	17,900	1,100,000
August	16,800	7,630	10,600	652,000
September	8,500	5,140	6,330	377,000

MOYIE RIVER AT SNYDER, IDAHO.

LOCATION.—In sec. 23, T. 64 N., R. 2 E. Boise meridian, at Snyder ranger station, a quarter of a mile west of Snyder station on Spokane International Railway, Bonner County, 3½ miles below Round Prairie and 12 miles above mouth.

DRAINAGE AREA.—717 square miles (area in United States measured on map issued by United States Geological Survey on scale 1: 250,000; area in British Columbia measured on Cranbrook sheet, British Columbia map).

RECORDS AVAILABLE.—February 21, 1912, to September 30, 1916, and March 1, 1919, to September 30, 1920, at present site; March 10, 1911, to February 20, 1912, at railway bridge 1 mile downstream.

GAGE.—Vertical and inclined staff installed October 21, 1919, on left bank, 150 feet west of Snyder ranger station; read by W. O. Blackman. March 10, 1911, to February 20, 1912, vertical staff on left abutment of railway bridge 1 mile below present gage; February 21, 1912, to October 20, 1919, vertical and inclined staff 35 feet below present gage and at same datum.

DISCHARGE MEASUREMENTS.—Made by wading or from cable near gage. High-water measurements formerly made from highway bridge a quarter of a mile downstream.

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel; gradient steep. Channel straight above and below gage. Banks high and not subject to overflow. Riffle control 500 feet below gage; shifting at high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period March 1, 1919, to September 30, 1920, 9.0 feet May 23, 1919 (discharge, 7,230 second-feet); minimum stage recorded, 2.80 feet October 25–26, 1919 (discharge, 56 second-feet). Discharge may have been lower in December, 1919, when stage-discharge relation was affected by ice.

1911–1916; 1919–1920: Maximum stage recorded, 11 feet at 4 p. m. June 19, 1916 (discharge, 10,800 second-feet); minimum stage recorded October 25–26, 1919.

ICE.—Stage-discharge relation seriously affected by ice; flow estimated from observer's notes and weather records.

ACCURACY.—Stage-discharge relation changed May 23, 1919, and May 18, 1920; was affected by ice December 1–27, 1919, January 1–17, and 20–31, and February 1–13, 15–19, and 21–26, 1920. Rating curve used prior to May 23, 1919, well defined between 200 and 3,000 second-feet; curve used May 23, 1919, to May 17, 1920, well defined up to 3,000 second feet, and curve used subsequent to May 17, 1920, well defined between 100 and 3,000 second-feet. Gage read to hundredths once daily until June 30, 1919, after which it was read twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records poor for periods of ice effect, and July 14 to August 2, 1919, and March 7–20, 1920, when gage was not read; otherwise records are good.

COOPERATION.—Gage-height record furnished by the United States Forest Service.

Discharge measurements of Moyie River at Snyder, Idaho, during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Sept. 3	Parker and Paulsen	3.02	100	June 1	John McCombs	5.35	1,720
Oct. 22	John McCombs	2.95	86.8	2	do	5.28	1,630
1920.				Aug. 17	do	3.12	149
Apr. 29	do	4.64	1,040	17	do	3.12	148
30	do	4.58	1,010	Sept. 26	D. J. F. Calkins	3.48	275

Daily discharge, in second-feet, of Moyie River at Snyder, Idaho, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919.												
1	.....	.....	.....	.....	.....	191	558	4,150	3,960	930	233	103
2	.....	.....	.....	.....	.....	191	622	3,910	3,510	850	216	117
3	.....	.....	.....	.....	.....	191	688	3,680	3,230	780	198	103
4	.....	.....	.....	.....	.....	191	688	3,450	3,090	710	198	103
5	.....	.....	.....	.....	.....	191	950	3,320	3,230	670	198	103
6	.....	.....	.....	.....	.....	191	1,200	3,180	3,230	640	198	103
7	.....	.....	.....	.....	.....	191	1,480	3,040	3,230	640	198	103
8	.....	.....	.....	.....	.....	191	1,450	2,910	2,950	640	198	103
9	.....	.....	.....	.....	.....	191	1,420	2,790	2,950	640	164	103
10	.....	.....	.....	.....	.....	191	1,390	2,640	2,440	570	164	103
11	.....	.....	.....	.....	.....	191	1,350	2,500	2,440	570	164	103
12	.....	.....	.....	.....	.....	191	1,320	2,370	2,440	570	164	103
13	.....	.....	.....	.....	.....	191	1,290	2,250	2,440	570	164	103
14	.....	.....	.....	.....	.....	191	1,290	2,250	2,440	552	131	103
15	.....	.....	.....	.....	.....	191	1,200	2,630	2,320	534	131	103
16	.....	.....	.....	.....	.....	191	1,120	3,170	2,440	517	131	103
17	.....	.....	.....	.....	.....	191	1,200	3,170	2,440	499	131	81
18	.....	.....	.....	.....	.....	191	1,900	3,170	2,320	481	131	81
19	.....	.....	.....	.....	.....	191	2,370	3,750	2,200	464	131	81
20	.....	.....	.....	.....	.....	228	2,760	4,680	2,200	446	131	81
21	.....	.....	.....	.....	.....	228	2,370	5,530	2,440	428	103	81
22	.....	.....	.....	.....	.....	228	2,250	6,380	2,200	410	103	81
23	.....	.....	.....	.....	.....	265	2,250	7,230	1,970	393	103	81
24	.....	.....	.....	.....	.....	310	2,270	6,690	1,860	375	103	81
25	.....	.....	.....	.....	.....	310	3,170	6,510	1,750	357	103	81
26	.....	.....	.....	.....	.....	310	3,750	6,510	1,550	340	103	81
27	.....	.....	.....	.....	.....	310	4,360	6,690	1,450	322	103	81
28	.....	.....	.....	.....	.....	359	4,840	7,050	1,360	304	103	81
29	.....	.....	.....	.....	.....	412	4,610	6,260	1,360	286	103	81
30	.....	.....	.....	.....	.....	461	4,380	5,460	1,180	269	92	81
31	.....	.....	.....	.....	.....	509	.....	4,780	.....	251	81	.....
1919–20.												
1	81	83				105	183	890	1,650	1,650	252	118
2	81	81				97	161	815	1,650	1,550	235	116
3	81	79				90	154	815	1,650	1,550	232	116
4	81	81				86	141	780	1,970	1,450	216	114
5	81	81	90	80		83	147	815	2,080	1,360	209	112
6	81	79				81	161	930	2,440	1,180	202	112
7	81	79			90	87	168	1,180	2,560	1,140	192	110
8	81	79				94	161	1,750	2,950	1,050	188	110
9	81	79				100	147	2,320	3,370	1,050	185	105
10	81	79				106	141	2,950	3,230	970	182	114
11	81	70				113	183	3,230	3,230	930	185	122
12	81	70				119	416	3,090	3,230	930	188	137
13	81	74				125	538	3,510	3,250	815	175	164
14	81	74		90		132	570	3,300	3,370	780	164	209
15	81	86			86	138	475	3,090	3,510	745	158	224
16	81	111	80			144	475	3,230	3,660	670	152	224
17	81	111			90	151	475	3,810	3,510	605	147	224
18	81	111		100		157	505	4,120	3,510	605	142	224
19	81	111		100		163	640	3,510	3,510	570	139	220
20	81	108			86	170	745	3,090	2,950	538	137	220
21	79	97				176	670	2,950	2,950	505	134	239
22	86	97				223	605	2,650	2,950	474	132	256
23	79	97				298	605	2,690	2,820	416	130	277
24	60	119	150		80	308	570	2,450	2,690	416	127	277
25	56	141		80		298	605	2,210	2,200	360	125	277
26	56	163				223	640	1,970	1,970	334	122	277
27	65	185			81	207	850	1,970	1,860	329	122	282
28	83	207	111		95	190	1,180	1,970	1,650	315	127	310
29	83	211	111		147	183	1,050	1,970	1,650	300	127	305
30	81	147	108		.....	198	1,970	1,860	1,550	282	132	282
31	81	.....	92		.....	202	.....	1,750	.....	269	122	.....

NOTE.—Gage not read Mar. 30-31, Apr. 8-12, 29-30, May 1-3, 5-11, 21-22, 29, July 14-31, Aug. 1-2, Oct. 7-8, and Nov. 24-27, 1919, and Mar. 7-20, May 24-25, Aug. 11, and Sept. 25, 1920; discharge interpolated. Braced figures show mean discharge for periods included.

Monthly discharge of Moyie River at Snyder, Idaho, for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 717 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919.						
March	509	191	244	0.340	0.39	15,000
April	4,840	558	2,020	2.82	3.15	120,000
May	7,230	2,250	4,260	5.94	6.85	262,000
June	3,960	1,180	2,420	3.38	3.77	144,000
July	930	251	516	.720	.83	31,700
August	233	81	144	.201	.23	8,850
September	117	81	93.2	.130	.14	5,550
The period						587,000
1919–20.						
October	86	56	78.4	.109	.13	4,820
November	211	70	106	148	.17	6,310
December			102	.142	.17	6,270
January	100		83.9	.117	.13	5,160
February	147		89.5	.125	.13	5,150
March	308	81	156	.218	.25	9,590
April	1,180	141	478	.667	.74	28,400
May	4,120	780	2,310	3.22	3.71	142,000
June	3,660	1,550	2,650	3.70	4.13	158,000
July	1,650	269	779	1.09	1.26	47,900
August	252	122	164	.229	.26	10,100
September	310	105	196	.273	.30	11,700
The year	4,120	56	600	.837	11.38	435,000

CLARK FORK BASIN.

CLARK FORK AT ST. REGIS, MONT.

LOCATION.—In sec. 19, T. 18 N., R. 27 W., at McLeod's ferry at St. Regis, Mineral County, half a mile below mouth of St. Regis River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 26, 1910, to September 30, 1920.

GAGE.—Vertical staff in four sections on left bank at old ferry landing; read by Archie McLeod.

DISCHARGE MEASUREMENTS.—Made from highway bridge above mouth of St. Regis River since 1918. Flow of St. Regis River added to obtain total flow passing the gage.

CHANNEL AND CONTROL.—Bed is permanent both above and below the station. Banks are high and not subject to overflow. Control is not sharply defined, being formed by the bed of the stream for a distance of several hundred feet below the gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 13.0 feet May 31 (discharge, 29,300 second-feet); minimum stage 3.4 feet September 7 (discharge, 1,680 second-feet).

Maximum stage recorded during the year ending September 30, 1920, 13.6 feet May 18 and June 17 (discharge, 32,100 second-feet); minimum stage 3.0 feet February 29 and March 1 (discharge, 1,330 second-feet).

1910–1920: Maximum stage recorded, 19.1 feet May 30–31, 1913 (discharge, 62,800 second-feet); minimum stage 3.0 feet February 29 and March 1, 1920 (discharge, 1,330 second-feet).

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—Water diverted from several of the tributaries to irrigate land in the Bitterroot Valley and in the vicinity of Missoula.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation permanent except as affected by ice. Rating curve well defined between 2,000 and 60,000 second feet. Gage read to tenths once daily. Daily discharge ascertained by applying gage height to rating table. Records fair

The following discharge measurement was made by W. A. Lamb:

August 17, 1919: Gage height, 3.76 feet; discharge, 2,060 second-feet (includes 166 second-feet the measured flow of St. Regis River).

Daily discharge, in second-feet, of Clark Fork at St. Regis, Mont., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	4,230	4,230	3,490	.....	3,160	2,720	7,960	18,400	23,000	4,620	2,220	1,880
2	4,420	4,230	3,490	.....	3,010	2,860	8,200	17,300	20,000	4,420	2,220	1,780
3	4,420	4,230	3,670	.....	2,720	2,720	8,200	16,600	17,000	4,230	2,460	1,880
4	4,230	4,040	3,850	.....	2,860	3,010	7,960	14,500	15,600	4,040	2,460	1,780
5	4,230	4,230	3,850	.....	2,720	3,010	8,450	13,200	15,200	3,850	2,590	1,780
6	4,420	4,230	3,670	.....	2,860	3,010	7,960	12,300	15,200	4,040	2,460	1,780
7	5,240	4,230	3,670	.....	3,010	2,860	7,480	11,700	14,500	3,850	2,460	1,680
8	4,620	4,230	3,670	.....	2,860	2,860	7,000	11,100	13,800	3,490	2,340	1,780
9	4,620	4,230	3,490	.....	3,160	2,860	7,240	11,100	12,000	3,320	2,340	1,780
10	4,620	4,230	3,490	.....	3,010	2,720	7,240	10,800	11,700	3,320	2,340	1,780
11	4,620	4,230	3,320	.....	3,010	2,720	7,240	10,800	11,100	3,160	2,220	1,880
12	4,420	4,230	3,010	.....	3,160	2,860	6,780	10,500	10,500	3,010	2,340	1,880
13	4,230	4,040	3,160	.....	3,160	2,860	6,780	9,970	9,970	3,010	2,220	1,880
14	4,620	4,230	3,320	.....	3,010	2,860	6,560	9,700	9,700	2,860	2,220	1,880
15	4,230	4,040	3,670	.....	3,010	3,010	6,340	10,500	9,450	2,720	2,100	1,880
16	4,230	4,040	3,490	.....	2,860	2,860	6,340	10,200	9,200	2,720	2,100	1,880
17	4,230	4,230	3,670	.....	2,860	3,010	6,560	11,400	9,200	2,590	2,100	1,880
18	4,420	4,040	3,320	.....	3,010	3,010	6,780	12,600	8,950	2,460	2,220	1,880
19	4,230	3,850	3,160	.....	3,010	3,160	7,240	13,200	8,700	2,460	1,990	1,880
20	4,230	3,850	3,010	.....	2,860	3,320	8,200	15,200	8,450	2,460	1,990	1,880
21	4,230	3,850	3,010	.....	2,860	3,490	7,960	19,200	8,200	2,460	1,990	1,780
22	4,230	3,850	2,860	.....	2,860	3,670	8,700	23,400	7,480	2,460	1,990	1,880
23	4,040	3,490	2,590	.....	2,860	3,850	8,700	27,200	7,720	2,460	1,880	1,780
24	4,040	2,860	2,460	.....	2,720	4,620	9,700	28,000	7,240	2,340	1,880	1,880
25	4,040	2,590	2,340	.....	2,590	4,620	11,400	27,200	6,780	2,340	1,990	1,780
26	4,040	2,720	2,340	.....	2,590	4,820	12,900	26,300	6,340	2,340	1,880	1,880
27	4,040	2,720	2,340	.....	2,720	5,030	15,200	25,400	6,120	2,340	1,880	1,780
28	4,230	2,720	2,340	.....	2,860	5,030	17,300	25,900	5,900	2,340	1,780	1,880
29	4,230	3,010	2,220	.....	.....	5,030	18,800	27,200	5,460	2,220	1,780	1,780
30	4,420	3,320	2,100	.....	.....	6,340	18,800	28,400	5,240	2,220	1,780	1,880
31	4,230	.....	1,990	.....	.....	7,000	.....	29,300	.....	2,220	1,880	.....

Daily discharge, in second-feet, of Clark Fork at St. Regis, Mont., for the year ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	1,880	2,590	2,220	.....	.....	1,330	4,230	9,700	21,400	15,600	4,230	3,320
2	1,880	2,590	2,220	.....	.....	2,340	4,230	9,970	19,900	16,600	4,420	3,320
3	1,990	2,720	1,990	.....	.....	2,340	3,670	9,700	18,400	16,200	4,420	3,160
4	1,990	2,590	.....	.....	.....	2,460	3,490	9,970	19,500	15,600	4,040	3,160
5	1,990	2,720	.....	.....	.....	2,460	3,160	9,700	19,500	15,200	3,850	3,010
6	2,100	2,860	.....	.....	.....	2,340	3,320	10,200	21,400	13,800	3,670	3,490
7	2,100	2,720	.....	.....	.....	2,220	3,490	11,400	24,200	12,900	3,670	3,010
8	2,100	2,860	.....	.....	.....	2,100	3,850	13,500	25,900	11,400	3,670	3,010
9	2,220	2,720	.....	.....	.....	2,100	4,420	17,000	28,400	10,800	3,490	2,460
10	2,100	2,590	.....	.....	.....	2,220	5,680	20,600	29,300	10,500	3,670	2,720
11	2,220	2,460	.....	.....	.....	2,590	8,450	25,400	28,900	9,700	3,670	2,720
12	2,220	2,460	.....	.....	.....	2,590	7,960	27,600	28,400	8,700	3,320	3,010
13	2,340	2,220	.....	.....	.....	2,720	7,960	28,900	28,000	8,950	2,720	3,010
14	2,220	2,220	.....	.....	.....	4,420	8,950	28,400	28,000	8,700	4,230	3,160
15	2,220	2,220	.....	.....	.....	5,030	9,450	28,000	29,800	8,700	4,040	3,490
16	2,340	2,460	.....	.....	.....	4,820	8,950	28,900	31,600	8,450	3,850	4,230
17	2,340	2,720	.....	.....	.....	4,230	8,700	31,200	32,100	7,960	3,670	4,420
18	2,340	2,860	.....	.....	.....	3,490	8,200	32,100	31,600	7,720	3,670	4,230
19	2,220	2,860	.....	.....	.....	3,320	7,960	31,600	29,800	7,480	3,670	4,040
20	2,340	2,720	.....	.....	.....	3,160	7,960	30,200	28,000	7,480	3,670	3,850
21	2,460	2,720	.....	.....	.....	3,320	8,200	29,300	25,900	7,240	3,490	3,850
22	2,460	2,720	.....	.....	.....	4,040	8,700	28,000	24,600	7,000	3,490	3,670
23	2,590	2,720	.....	.....	.....	4,420	8,200	27,600	24,200	7,000	3,160	3,670
24	2,590	2,590	.....	.....	.....	5,240	7,480	27,200	24,200	6,340	3,320	3,670
25	2,590	2,720	.....	.....	.....	5,460	7,000	25,900	22,600	6,120	3,010	3,850
26	2,590	2,720	.....	.....	.....	5,030	6,780	24,600	20,300	5,680	3,160	4,040
27	2,220	2,220	.....	.....	.....	4,420	7,960	22,600	18,400	5,460	3,010	4,230
28	2,340	2,220	.....	.....	.....	3,850	8,700	21,400	16,200	5,240	3,010	5,460
29	2,460	2,100	.....	.....	.....	3,490	8,950	22,200	15,600	4,420	3,320	4,230
30	2,590	2,220	.....	.....	.....	3,670	9,700	23,400	15,200	4,620	3,160	4,230
31	2,590	.....	.....	.....	.....	3,850	.....	23,000	.....	4,420	3,320	.....

NOTE.—Discharge, Dec. 27–31, 1918, estimated because of ice. Stage-discharge relation also affected by ice Jan. 1–31, 1919, and Dec. 4, 1919, to Feb. 28, 1920; data inadequate for determination of discharge. Discharge, June 2, 1919, interpolated because of erroneous gage reading.

Monthly discharge of Clark Fork at St. Regis, Mont., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918-19.				
October	5,240	4,040	4,330	266,000
November	4,230	2,590	3,800	226,000
December	3,850	1,990	3,100	191,000
February	3,160	2,590	2,910	162,000
March	7,000	2,720	3,610	222,000
April	18,800	6,340	9,200	547,000
May	29,300	9,700	17,400	1,070,000
June	23,000	5,240	10,700	637,000
July	4,620	2,220	2,980	183,000
August	2,590	1,780	2,130	131,000
September	1,880	1,680	1,830	109,000
1919-20.				
October	2,590	1,880	2,280	140,000
November	2,860	2,100	2,570	153,000
March	5,460	1,330	3,390	208,000
April	9,700	3,160	6,860	408,000
May	32,100	9,700	22,200	1,360,000
June	32,100	15,200	24,400	1,450,000
July	16,600	4,420	9,230	568,000
August	4,420	2,720	3,580	220,000
September	5,460	2,460	3,590	214,000

CLARK FORK NEAR PLAINS, MONT.

LOCATION.—On lot 7, sec. 1, T. 19 N., R. 26 W., at Cooper's ferry, 3 miles above Plains, Sanders County, and 7 miles below mouth of Flathead River.

DRAINAGE AREA.—19,900 square miles.

RECORDS AVAILABLE.—October 28, 1910, to September 30, 1920.

GAGE.—Barrett & Lawrence water-stage recorder installed November 28, 1911, on right bank, 50 feet below an overhanging chain gage, 150 feet below site of old ferry; datum same as that of chain gage which was read prior to the installation of the water-stage recorder. Gage inspected by A. L. Steiner.

DISCHARGE MEASUREMENTS.—Made from cable installed April 26, 1917, at site of old ferry cable used prior to July 29, 1913. July 29, 1913, to April 25, 1917, measurements were made from the highway bridge at Plains, 3 miles below.

CHANNEL AND CONTROL.—The river is deep and the current is only moderately swift even at flood stages. The banks are high and not subject to overflow. The bed is practically permanent. Control not well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, from water-stage recorder, 13.8 feet May 31 (discharge, 73,800 second-feet); minimum stage, 3.75 feet September 30 (discharge, 5,090 second-feet).

Maximum stage recorded during the year ending September 30, 1920, from water-stage recorder, 13.8 feet at noon June 18 (discharge, 73,800 second-feet); minimum stage recorded 3.7 feet several times during October and November (discharge, 4,890 second-feet); lower flow probably occurred during the ice period.

1910–1920: Maximum stage recorded, 17.9 feet June 5, 1913, and July 2, 1916 (discharge, 115,000 second-feet); minimum stage, 3.7 feet several times during October and November, 1919 (discharge 4,890 second-feet); lower flow probably occurred during the winter of 1919–20.

ICE.—Stage-discharge relation seriously affected by ice.

DIVERSIONS.—Numerous diversions for irrigation from the headwaters of Clark Fork and tributaries to Flathead River.

REGULATION.—Flathead Lake furnishes a natural but uncontrolled regulation for part of flow.

ACCURACY.—Stage-discharge relation permanent except for period affected by ice. Rating curve well defined below 60,000 second-feet. Gage heights obtained from graph of water-stage recorder by inspection. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

The following discharge measurement was made by W. A. Lamb:

March 12, 1919: Gage height, 3.98 feet; discharge, 5,690 second-feet.

Daily discharge, in second-feet, of Clark Fork near Plains, Mont., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	8,800	8,400	6,890	.....	6,190	5,850	10,500	35,800	71,000	28,900	11,400	6,890
2	8,800	8,400	7,250	.....	6,190	5,520	10,900	35,800	67,200	28,200	10,900	6,890
3	8,800	8,400	7,250	.....	6,190	6,190	10,900	36,600	63,500	27,500	11,400	6,890
4	8,800	8,800	7,250	.....	6,540	6,540	10,900	35,800	61,600	26,200	11,400	6,890
5	8,800	8,800	7,620	.....	6,540	6,540	11,800	35,800	59,800	25,500	11,400	6,890
6	8,800	8,800	7,250	.....	6,540	6,190	11,800	34,200	58,900	24,200	10,900	6,540
7	8,800	8,800	7,620	.....	6,540	6,190	11,800	33,400	57,100	23,000	10,900	6,540
8	8,800	8,400	7,250	.....	6,540	6,190	11,800	32,600	56,200	22,400	10,500	6,190
9	8,800	8,400	7,250	.....	6,540	5,850	11,400	32,600	54,300	21,800	10,500	6,190
10	8,800	8,400	7,250	.....	6,540	5,850	11,400	31,800	52,500	20,700	10,100	6,190
11	8,800	8,000	6,890	.....	6,540	5,850	11,400	31,800	50,800	20,200	10,100	6,190
12	8,800	8,000	6,890	.....	6,540	5,850	11,400	31,100	49,000	19,600	9,630	6,190
13	8,800	8,400	6,540	.....	6,540	5,850	11,400	30,400	48,100	18,600	9,630	6,190
14	9,210	8,400	6,540	.....	6,540	5,850	11,800	30,400	46,400	18,600	9,210	5,850
15	8,800	8,000	6,890	.....	6,540	6,190	11,800	29,600	44,700	18,100	9,210	5,850
16	8,800	8,000	7,250	.....	6,190	6,190	11,800	30,400	43,800	17,600	9,210	5,850
17	8,800	8,000	7,250	.....	6,190	5,850	11,800	31,800	43,000	16,600	8,800	5,850
18	8,800	8,400	7,250	.....	6,540	5,850	12,300	32,600	42,200	15,600	8,800	5,850
19	8,800	8,000	6,890	.....	6,540	6,190	12,800	34,200	41,400	15,600	8,800	5,850
20	8,400	8,000	6,540	.....	6,190	6,540	13,700	36,600	39,800	15,100	8,400	5,850
21	8,400	8,000	6,540	.....	6,190	6,890	14,600	41,400	39,800	15,100	8,000	5,520
22	8,400	8,000	6,540	.....	6,190	6,890	15,600	48,100	38,200	14,600	8,000	5,520
23	8,400	7,620	6,190	.....	6,190	6,890	16,600	53,400	37,400	14,200	8,000	5,520
24	8,400	7,250	6,540	.....	6,190	7,250	17,600	57,100	36,600	13,700	7,620	5,520
25	8,400	6,890	6,190	.....	5,850	7,250	19,100	59,800	35,800	13,700	7,620	5,520
26	8,400	7,250	6,190	.....	5,850	7,620	21,800	60,700	35,000	13,200	7,620	5,520
27	8,400	6,890	6,540	.....	5,850	7,620	24,800	61,600	33,400	12,800	7,620	5,520
28	8,400	6,540	6,540	.....	5,850	7,620	28,200	63,500	32,600	12,800	7,250	5,520
29	8,400	6,890	6,540	.....	.....	8,000	30,400	66,300	31,800	12,300	7,250	5,520
30	8,400	6,890	6,890	.....	.....	8,800	32,600	71,000	30,400	11,800	7,250	5,200
31	8,400	.....	6,540	.....	.....	10,100	.....	73,800	.....	11,800	6,890	.....
1919-20.												
1	5,200	5,200	.....	.....	.....	.....	6,720	17,600	51,600	56,200	19,600	10,500
2	5,200	5,200	.....	.....	.....	.....	7,070	18,100	49,900	56,200	19,100	10,500
3	5,200	5,200	.....	.....	.....	.....	7,070	19,100	48,100	56,200	18,600	10,500
4	5,200	5,520	.....	.....	.....	.....	6,890	20,200	47,200	55,200	17,600	10,500
5	5,200	5,520	.....	.....	.....	.....	6,890	21,200	48,100	54,300	17,100	10,100
6	5,200	5,520	.....	.....	.....	.....	6,720	23,000	49,700	53,400	17,100	10,100
7	5,200	5,520	.....	.....	.....	.....	6,540	24,800	53,400	50,800	16,100	10,100
8	5,200	5,520	.....	.....	.....	.....	6,540	26,200	55,200	48,100	16,100	9,630
9	4,890	5,520	.....	.....	.....	5,360	6,890	28,200	58,900	46,400	15,100	9,420
10	5,200	5,520	.....	.....	.....	5,200	7,810	31,800	62,600	44,700	15,100	9,210
11	4,890	5,200	.....	.....	.....	5,200	9,630	39,800	62,600	43,000	15,100	9,000
12	4,890	4,890	.....	.....	.....	5,200	10,900	43,800	64,400	41,400	15,100	8,800
13	4,890	5,200	.....	.....	.....	5,360	10,500	46,400	64,400	39,800	15,100	8,800
14	4,890	5,200	.....	.....	.....	5,520	11,400	48,100	65,400	39,000	15,100	8,800
15	5,200	4,890	.....	.....	.....	6,020	11,800	49,000	68,200	38,200	14,600	8,800
16	5,200	4,890	.....	.....	.....	6,890	12,300	49,900	70,000	35,800	14,200	9,210
17	5,200	4,890	.....	.....	.....	7,440	12,300	52,500	71,900	35,000	13,700	9,630
18	5,200	5,200	.....	.....	.....	7,250	11,800	55,200	72,900	33,400	12,800	9,630
19	5,200	5,200	.....	.....	.....	6,720	11,400	57,100	72,900	32,600	12,300	9,630
20	5,200	5,200	.....	.....	.....	6,540	11,400	57,100	71,900	31,100	12,800	9,630
21	4,890	5,200	.....	.....	.....	6,360	12,300	57,100	70,000	30,400	12,300	9,630
22	5,200	5,200	.....	.....	.....	6,190	13,200	57,100	69,100	28,900	12,300	9,630
23	5,200	5,200	.....	.....	.....	6,540	13,200	58,000	68,200	28,200	11,800	9,420
24	5,200	5,200	.....	.....	.....	7,440	13,200	57,100	68,200	27,500	11,400	9,420
25	5,200	5,200	.....	.....	.....	8,200	12,800	57,100	67,200	26,200	11,400	9,420
26	5,200	5,200	.....	.....	.....	8,000	13,200	56,200	64,400	24,800	10,900	9,420
27	4,890	5,200	.....	.....	.....	7,810	13,700	54,300	62,600	24,200	10,500	9,420
28	4,890	4,890	.....	.....	.....	7,440	14,200	51,600	59,800	23,600	10,900	9,630
29	4,890	4,890	.....	.....	.....	7,250	16,100	52,500	57,100	21,800	10,500	9,630
30	4,890	4,890	.....	.....	.....	6,890	17,100	53,400	56,200	21,200	10,500	9,630
31	5,200	.....	.....	.....	.....	6,720	.....	53,400	.....	20,700	10,500	.....

NOTE.—Discharge, Feb. 1 and 2, 1919, estimated. No gage-height record Jan. 1-31 and Dec. 16-31, 1919, owing to ice in well, and record Jan. 1 to Mar. 8, 1920, subject to error for same reason; data inadequate for determination of discharge.

Monthly discharge of Clark Fork near Plains, Mont., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	9,210	8,400	8,660	532,000
November	8,800	6,540	7,970	474,000
December	7,620	6,190	6,870	422,000
February	6,540	5,850	6,320	351,000
March	10,100	5,520	6,650	409,000
April	32,600	10,500	15,200	904,000
May	73,800	29,600	42,600	2,620,000
June	71,000	30,400	46,700	2,780,000
July	28,900	11,800	18,400	1,130,000
August	11,400	6,890	9,170	564,000
September	6,890	5,200	6,020	358,000
1919–20.				
October	5,200	4,890	5,100	314,000
November	5,520	4,890	5,200	309,000
March 9–31	8,200	5,200	6,590	301,000
April	17,100	6,540	10,700	637,000
May	58,000	17,600	43,100	2,650,000
June	72,900	47,200	61,700	3,670,000
July	56,200	20,700	37,700	2,320,000
August	19,600	10,500	14,000	861,000
September	10,500	8,800	9,590	571,000

PEND OREILLE LAKE AT SANDPOINT, IDAHO.

LOCATION.—In sec. 23, T. 57 N., R. 2 W. Boise meridian, on west side of lake, at municipal wharf at Sandpoint, Bonner County.

DRAINAGE AREA.—22,900 square miles. Areas in United States measured on maps issued by United States Geological Survey on scale 1:500,000; area of Flathead River basin in British Columbia measured on Department of Lands map, scale 1:1,125,000.

RECORDS AVAILABLE.—March 18, 1914, to September 30, 1920.

GAGE.—Vertical staff in two sections on pile at municipal wharf; read to tenths, occasionally to hundredths, by A. B. Howard, M. Wilson, W. W. Schwartz, and A. Sund.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 18.2 feet June 5; minimum stage recorded, 4.8 feet January 13.

Maximum stage recorded during the year ending September 30, 1920, 18.3 feet June 26; minimum stage recorded, 4.43 feet December 13.

1914–1920: Maximum stage recorded, 26.0 feet July 6, 1916; minimum stage recorded December 13, 1919.

ICE.—During winter ice at gage renders observations difficult.

DIVERSIONS.—Considerable water diverted from tributaries of Clark Fork for irrigation.

REGULATION.—None.

COOPERATION.—Record furnished by United States Forest Service.

Daily gage height, in feet, of Pend Oreille Lake at Sandpoint, Idaho, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	5.8					5.5				13.2		
2		5.8	5.8				6.9		17.0		7.4	
3								12.0		12.8		5.6
4		5.8					7.0				7.3	
5	5.8					5.5			18.2			
6												
7	5.8		6.8	4.9	6.2			12.1	18.1	11.8		
8		5.8									6.9	
9												
10			5.8					13.0				
11						5.6			17.4			
12		5.8			6.0		8.0			10.1		
13				4.8				13.0				5.5
14	5.8		5.8				8.0		16.8		6.6	
15		5.8										
16										9.4		
17			5.8									5.5
18		5.8							15.7			
19	5.8						8.5	13.0				
20				5.0		5.8						
21					5.8				15.2	9.0	5.9	
22	5.8											
23		5.8					9.0		15.0			
24				6.5		5.9		14.6		8.5		
25												
26	5.8	5.8					9.5	14.7				5.5
27						6.1			14.5		5.8	
28	5.8		5.8				9.7					
29				6.7		6.2		16.8		7.8		
30		5.8					10.0					5.5
31						6.4						
1919-20.												
1								7.60				
2					5.35							
3	5.50			4.90			5.45			17.10		
4												6.80
5									15.60			
6		4.69	4.60									
7	4.90				5.40	4.70					9.50	
8								8.60				
9							5.45					
10				4.70						15.70		
11												6.40
12												
13			4.43			4.85						
14					5.25						8.40	
15								12.10				
16												
17				4.70						14.00		6.40
18	4.70						6.45					
19									17.90			
20			4.45									
21					5.05						7.70	
22	4.70					5.25		15.10				
23					5.00							
24				4.75			6.90			12.20		
25												6.50
26									18.30			
27			4.80			5.45						
28											7.20	
29	4.70				4.85			16.00				
30												
31										10.50		

CLARK FORK AT METALINE FALLS, WASH.

LOCATION.—In SE. ¼ sec. 21, T. 39 N., R. 43 E., three-eighths mile above Metaline Falls, opposite town of Metaline Falls, Pend Oreille County, 11 miles south of international boundary.

DRAINAGE AREA.—25,100 square miles. Areas in United States measured on maps issued by United States Geological Survey on scale 1:500,000; area of Flathead River basin in British Columbia measured on Department of Lands map, scale 1:1,125,000; area of Priest River basin in British Columbia measured on Nelson sheet, British Columbia map.

RECORDS AVAILABLE.—November 4, 1908, to September 4, 1910 (gage heights only; data insufficient for determination of discharge); October 1, 1912, to September 30, 1920.

GAGE.—Vertical and inclined staff, in five sections, graduated from 0 to 55 feet, on right bank, three-eighths mile above the falls; installed December 10, 1916; read by C. N. West. For history of previous gages see Water-Supply Paper 462.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths mile above the falls. Flow of Sullivan Creek added to flow measured at cable.

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Sensitive and practically permanent control formed by Metaline Falls, where water surface drops 20 feet in a distance of 1,200 feet. Elevation of water surface at medium low stage, 1,970 feet above sea level.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 27.4 feet June 5 and 6 (discharge, 79,100 second-feet); minimum stage recorded, 2.15 feet September 30 (discharge, 7,200 second-feet).

Maximum stage recorded during year ending September 30, 1920, 28.0 feet at 9.15 a. m. June 25 (discharge, 82,600 second-feet); minimum stage recorded, −2.4 feet at 9.45 a. m. December 12 (discharge, 2,500 second-feet).

1912–1920: Maximum stage recorded, 41.2 feet June 16, 1913 (discharge, 139,000 second-feet, revised); minimum stage recorded on December 12, 1919.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Numerous small diversions from upper tributaries for irrigation.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curves well defined above 5,000 second-feet and extended below 5,000 second-feet by plotting to logarithmic scale. The rating curves used for the years ending September 30, 1919 and 1920, were revised slightly so as to average the current-meter measurements better. Gage read to half-tenths once daily. No diurnal fluctuation. Daily discharge ascertained by applying daily gage height to rating table. Records excellent except for few days in December, 1919, when stage was below zero on gage and for September 12–30, 1920.

COOPERATION.—Station maintained in cooperation with Dominion Water Power Branch, Department of the Interior, Canada. Gage-height record furnished by Hugh L. Cooper Co.

Discharge measurements of Clark Fork at Metaline Falls, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 22	D. J. F. Calkins	4.15	10,000	Apr. 27	John McCombs	7.21	16,700
23	do	4.11	10,000	28	do	7.35	17,500
1919.				May 21	do	21.70	55,300
Apr. 22	R. B. Kilgore	11.98	26,300	Aug. 8	do	12.05	27,200
24	do	12.68	27,800				
Oct. 26	John McCombs	1.64	6,500				

Daily discharge, in second-feet, of Clark Fork at Metaline Falls, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	10,800	10,100	9,350	8,600	15,300	11,100	14,900	38,100	74,500	49,000	18,400	9,800
2	10,800	10,100	9,200	7,740	15,300	11,400	15,500	40,500	76,800	77,700	18,000	9,500
3	10,800	10,100	9,500	8,450	15,100	11,600	16,000	42,300	77,700	46,700	17,600	9,500
4	10,800	10,400	9,500	7,880	14,700	11,400	17,200	43,800	78,600	45,400	17,000	9,500
5	10,800	10,300	9,650	7,740	14,400	11,200	18,400	45,400	79,100	44,200	16,600	9,350
6	10,800	10,100	9,800	7,600	14,200	11,100	19,300	46,400	79,100	42,900	16,400	9,500
7	10,400	10,100	9,800	7,600	13,600	11,100	20,000	47,000	78,200	41,100	16,000	9,200
8	10,400	10,100	9,800	7,460	13,600	11,100	20,600	47,400	78,200	39,600	15,700	9,050
9	10,400	10,100	9,800	7,460	13,600	10,900	21,100	47,700	77,700	38,400	15,300	8,900
10	10,400	10,400	9,800	7,460	13,800	10,800	21,500	47,400	76,800	37,300	15,100	8,900
11	10,400	10,600	9,650	8,020	13,800	10,800	22,000	47,400	75,400	36,100	14,900	8,600
12	10,400	10,600	9,800	7,740	13,600	10,800	22,200	47,700	74,100	35,000	14,500	8,600
13	10,400	10,800	9,800	7,740	13,500	10,800	22,900	47,400	72,700	33,900	14,200	8,450
14	10,400	10,800	9,800	7,740	13,100	11,100	23,200	47,700	71,800	32,500	13,800	8,300
15	10,400	10,800	9,960	7,600	13,100	10,900	22,900	48,000	69,600	31,400	13,500	8,300
16	10,400	11,100	10,100	7,740	12,900	10,800	23,400	47,700	68,300	30,400	13,300	8,300
17	10,400	11,100	10,400	7,880	12,900	10,600	23,600	47,700	67,000	29,300	13,100	8,160
18	10,400	11,100	10,400	8,900	12,800	10,800	24,100	47,400	65,800	27,800	12,900	8,020
19	10,400	11,100	10,400	10,100	12,800	11,700	24,400	47,700	64,900	26,600	12,600	8,020
20	10,400	10,900	10,400	10,900	12,800	12,200	25,300	48,000	63,200	25,800	12,200	7,740
21	10,300	10,800	10,400	11,100	12,600	12,400	25,100	49,400	61,900	25,300	12,100	7,600
22	10,100	10,800	10,400	11,400	12,400	12,400	25,800	50,700	61,100	25,100	11,700	7,460
23	9,960	10,600	10,100	12,400	12,200	12,600	25,800	52,200	59,900	24,100	11,400	7,460
24	9,800	10,400	9,960	13,100	11,900	12,400	27,600	53,600	57,800	23,400	11,200	7,460
25	9,800	10,300	9,800	13,100	11,700	12,800	28,300	56,300	56,700	22,900	11,100	7,600
26	9,800	10,100	9,650	15,300	11,700	12,800	29,100	59,900	55,900	22,200	10,900	7,460
27	9,960	9,960	9,500	15,700	11,900	13,100	30,400	62,800	54,000	21,100	10,800	7,460
28	10,300	9,800	9,200	16,000	11,700	13,300	32,000	64,900	53,200	20,200	10,400	7,460
29	10,300	9,500	9,200	16,000	.....	13,500	33,600	67,500	51,400	19,700	10,300	7,460
30	10,300	9,500	9,200	15,800	.....	13,800	35,600	70,100	50,400	19,300	10,100	7,200
31	10,100	.....	8,900	15,700	.....	14,500	.....	72,300	.....	18,900	9,800	.....
1919–20.												
1	7,140	6,720	7,140	7,430	8,810	7,580	8,970	18,600	64,300	75,800	33,900	15,400
2	7,140	6,720	7,430	7,280	8,970	7,430	9,770	19,400	63,900	75,800	32,900	15,200
3	7,140	7,000	4,420	7,140	9,130	7,140	9,930	19,800	63,900	75,300	31,400	15,000
4	7,000	7,140	3,300	7,140	9,130	7,000	9,770	20,200	63,100	72,200	30,400	14,600
5	7,000	7,140	3,470	7,140	9,290	7,000	9,770	20,800	63,100	69,500	29,500	14,400
6	7,000	7,140	4,320	7,140	8,810	7,140	9,770	21,500	62,200	68,200	28,500	14,400
7	6,860	7,000	5,310	7,140	8,970	7,280	9,770	22,200	61,800	66,900	27,600	14,400
8	6,860	7,000	5,310	6,860	8,970	7,430	9,770	22,800	62,200	64,800	26,700	14,000
9	6,580	7,000	5,430	6,860	8,970	7,280	9,930	23,700	62,200	63,500	26,000	13,600
10	6,720	7,000	4,850	6,580	9,130	7,140	9,930	24,600	62,600	63,100	24,900	13,200
11	6,860	7,000	3,470	6,440	8,970	7,140	10,100	26,700	62,600	61,000	23,900	12,800
12	6,860	6,860	2,500	6,580	8,970	7,140	10,200	28,800	64,800	60,600	22,800	
13	6,720	6,860	3,140	6,720	8,970	7,280	10,400	31,400	64,800	58,900	21,700	
14	6,860	7,000	3,470	6,860	8,970	7,580	10,800	34,400	66,900	58,100	21,300	
15	6,720	7,140	3,830	6,860	8,970	8,030	11,500	37,300	69,100	57,300	21,300	13,000
16	6,580	7,140	4,220	6,860	8,650	8,330	12,600	40,600	70,000	56,400	20,800	
17	6,580	7,280	4,630	6,860	8,650	8,490	13,000	43,000	70,400	55,600	20,400	
18	6,580	7,280	5,190	6,860	8,490	8,650	13,200	45,200	70,400	52,800	20,000	
19	6,580	7,280	5,430	6,860	8,490	8,650	13,200	48,800	73,500	50,200	19,600	
20	6,580	7,280	5,670	6,720	8,330	8,650	14,600	52,100	75,300	48,800	19,200	
21	6,580	7,140	6,050	6,440	8,970	8,810	14,800	54,800	76,200	47,000	19,000	13,000
22	6,440	7,140	6,310	5,190	8,490	8,970	15,200	56,900	78,000	45,600	18,600	
23	6,580	7,140	6,580	5,430	8,180	9,130	15,400	59,300	80,300	44,200	18,200	
24	7,140	7,140	6,860	5,430	8,030	9,290	16,200	61,000	81,700	43,300	17,800	
25	6,860	7,140	7,000	5,670	7,880	9,290	16,000	62,200	82,600	41,500	17,200	
26	6,580	7,140	7,140	5,790	7,880	9,130	16,400	63,500	80,800	40,600	16,800	
27	6,580	7,580	7,280	6,180	7,730	9,290	16,400	64,800	78,500	39,800	16,400	13,000
28	6,580	7,430	7,430	7,000	8,030	9,450	16,800	64,800	78,500	38,700	15,800	
29	6,580	6,860	7,430	8,030	7,730	9,610	17,200	64,800	77,100	37,300	15,400	
30	6,580	7,000	7,430	8,490	.....	9,770	18,000	64,800	76,600	36,000	15,400	
31	6,720	.....	7,430	8,810	.....	9,130	.....	64,300	.....	35,200	15,400	

NOTE.—Extremely low flow in December, 1919, probably caused by ice jam in Pend Oreille Lake. Gage-height record Sept. 12–30, 1920, unreliable: discharge estimated from study of daily gage-height record of Clark Fork at Newport, Wash., obtained by U. S. Weather Bureau.

Monthly discharge of Clark Fork at Metaline Falls, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 25,100 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	10,800	9,800	10,400	0.414	0.48	640,000
November	11,100	9,500	10,400	.414	.46	619,000
December	10,400	8,900	9,780	.390	.45	601,000
January	16,000	7,460	10,300	.410	.47	633,000
February	15,300	11,700	13,200	.526	.55	733,000
March	14,500	10,600	11,800	.470	.54	726,000
April	35,600	14,900	23,700	.944	1.05	1,410,000
May	72,300	38,100	51,000	2.03	2.34	3,140,000
June	79,100	50,400	67,700	2.70	3.01	4,030,000
July	49,000	18,900	31,700	1.26	1.45	1,950,000
August	18,400	9,800	13,600	.542	.62	836,000
September	9,800	7,200	8,340	.332	.37	496,000
The year	79,100	7,200	21,800	.869	11.79	15,800,000
1919–20.						
October	7,140	6,440	6,760	.269	.31	416,000
November	7,580	6,720	7,090	.292	.31	422,000
December	7,430	2,500	5,470	.218	.25	336,000
January	8,810	5,190	6,800	.271	.31	418,000
February	9,290	7,730	8,640	.344	.37	497,000
March	9,770	7,000	8,200	327	.38	504,000
April	18,000	8,970	12,600	.502	.56	750,000
May	64,800	18,600	41,400	1.65	1.90	2,550,000
June	82,600	61,800	70,200	2.80	3.12	4,180,000
July	75,800	35,200	55,000	2.19	2.52	3,380,000
August	33,900	15,400	22,200	.884	1.02	1,360,000
September	.....	.....	13,500	.538	.60	803,000
The year	82,600	2,500	21,500	.857	11.65	15,600,000

SKALKAHO CREEK NEAR HAMILTON, MONT.

LOCATION.—At farm bridge 1,000 feet south of ranch buildings on J. A. Brennan's ranch, 9 miles southeast of Hamilton, Ravalli County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 20 to September 30, 1920.

GAGE.—Vertical staff with enamel face graduated from 0 to 6.7 feet on downstream end of left abutment of bridge; read by J. A. Brennan.

DISCHARGE MEASUREMENTS.—Made by wading near gage or from a farm bridge about half a mile below.

CHANNEL AND CONTROL.—Bed composed of boulders and cobblestones for several hundred feet above and below the gage; rough but permanent. Control is same for all stages. One channel at all stages. Banks high and not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded 3.10 feet at 8 p. m. June 22 (discharge, 636 second-feet); minimum stage, 1.30 feet April 21–25 (discharge, 27 second-feet).

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 15 and 400 second-feet. Gage read twice daily to half-tenths. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

Discharge measurements of Skalkaho Creek near Hamilton, Mont., during the year ending Sept. 30, 1920.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 20	1.36	29.9	June 8	2.65	342	Sept. 28	1.57	44.5
May 8	1.64	49.9	July 5	2.60	318			

Daily discharge, in second-feet, of Skalkaho Creek, near Hamilton, Mont., for the year ending Sept. 30, 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	32	138	464	70	46	16	.....	99	552	138	52	44
2	.....	30	125	401	70	44	17	.....	114	510	130	52	42
3	.....	31	130	401	67	44	18	.....	121	531	125	46	42
4	.....	31	168	344	64	44	19	.....	121	483	121	46	38
5	.....	31	222	316	60	44	20	30	121	483	107	46	38
6	.....	35	222	266	60	40	21	27	121	496	103	46	38
7	.....	38	306	231	57	38	22	27	125	566	99	46	38
8	.....	47	371	222	57	38	23	27	138	531	94	46	38
9	.....	55	383	203	57	38	24	27	138	483	94	44	42
10	.....	89	383	184	64	38	25	27	138	371	94	42	42
11	.....	89	419	184	64	38	26	28	138	344	89	44	42
12	.....	85	431	184	64	38	27	30	138	344	82	52	42
13	.....	82	483	178	60	48	28	30	168	344	78	55	42
14	.....	89	531	158	55	70	29	30	168	371	78	55	42
15	.....	89	510	147	52	48	30	31	168	401	70	55	42
							31	.....	152	.....	70	48	.....

Monthly discharge of Skalkaho Creek near Hamilton, Mont., for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
April 20–30	31	27	28.5	622
May	168	30	97.5	6,000
June	566	125	388	23,100
July	464	70	176	10,800
August	70	42	54.7	3,360
September	70	38	42.3	2,520
The period	.....	.....	.....	46,400

WILLOW CREEK NEAR CORVALLIS, MONT.

LOCATION.—In sec. 8, T. 6 N., R. 19 W., at Willey ranch, 6 miles southeast of Corvallis, Ravalli County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 20 to September 30, 1920.

GAGE.—Vertical staff with enamel face graduated from 0 to 3.3 feet on right bank about 150 feet upstream from the Willey ranch house; read by Mrs. Bray Willey.

DISCHARGE MEASUREMENTS.—Made at ford about 50 feet below the gage.

CHANNEL AND CONTROL.—Bed of stream is composed of boulders and cobblestones; permanent but rough. One channel at all stages. Banks high and not subject to overflow. Control is practically the same at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.50 feet, at 7 p. m. June 22 (discharge, 60 second-feet); minimum stage, 0.58 foot, September 10–11 (discharge, 7.1 second-feet).

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 6 and 50 second-feet. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Willow Creek near Corvallis, Mont., during the year ending Sept. 30, 1920.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 20	0.65	8.1	June 8	1.18	28.6	Sept. 28	0.69	9.2
May 8	.86	12.5	July 5	1.36	44.9			

Daily discharge, in second-feet, of Willow Creek near Corvallis, Mont., for the year ending Sept. 30, 1920.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	8.8	14	53	12	9.4	16	.....	21	51	22	10	7.8
2	.....	8.5	15	58	12	9.2	17	.....	21	47	22	10	8.5
3	.....	8.3	15	53	11	8.8	18	.....	21	50	19	9.9	8.5
4	.....	8.8	16	48	11	8.1	19	.....	19	46	18	9.9	8.1
5	.....	8.3	17	46	11	8.1	20	8.5	18	46	17	9.9	8.7
6	.....	10	19	40	11	7.8	21	8.3	16	47	17	9.7	8.5
7	.....	11	26	32	11	7.8	22	7.9	16	53	17	9.7	8.3
8	.....	12	29	29	11	7.6	23	7.9	16	49	17	9.7	7.9
9	.....	15	29	29	11	7.4	24	7.8	16	46	16	9.7	8.5
10	.....	25	30	29	11	7.1	25	7.8	15	46	16	9.7	8.1
11	.....	20	30	28	11	7.1	26	8.1	15	45	16	9.6	8.1
12	.....	20	30	27	11	7.6	27	8.5	15	41	15	9.6	8.5
13	.....	18	34	27	10	9.2	28	8.5	17	39	14	9.6	8.8
14	.....	17	38	26	10	9.2	29	8.8	17	35	13	9.6	8.5
15	.....	19	45	24	9.9	8.5	30	8.8	16	48	12	9.6	8.3
							31	.....	14	.....	12	9.4	.....

Monthly discharge of Willow Creek near Corvallis, Mont., for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
April 20–30	8.8	7.8	8.26	180
May	25	8.3	15.6	959
June	53	14	35.9	2,140
July	58	12	26.2	1,610
August	12	9.4	10.3	633
September	9.4	7.1	8.27	492
The period	.....	.....	.....	6,010

BURNT FORK CREEK NEAR STEVENSVILLE, MONT.

LOCATION.—In SW. ¼ sec. 11, T. 8 N., R. 19 W., at highway bridge at John Buck's ranch, 9 miles southeast of Stevensville, Ravalli County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 8 to September 30, 1920.

GAGE.—Staff gage with enamel face graduated from 0 to 3.3 feet on downstream end of left abutment of highway bridge; read by Mrs. John Buck.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading below the gage.

CHANNEL AND CONTROL.—Bed is composed of cobblestones and gravel; fairly smooth and not subject to shift. One channel at all stages. Banks not subject to overflow. Channel is straight for 50 feet above and below the gage. The control is a gravel and cobblestone bar at point where stream forks about 100 feet below gage; fairly permanent. Stage-discharge relation may be affected by driftwood collecting at this point.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 2.16 feet, at 8.25 a. m. June 16 (discharge, 347 second-feet); minimum stage, 0.58 foot, at 8 a. m. August 16 (discharge, 25 second-feet).

ICE.—Station not operated during winter.

DIVERSIONS.—One or two small diversions above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 40 and 300 second-feet. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurments of Burnt Fork Creek near Stevensville, Mont., during the year ending Sept. 30, 1920.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 8	1.24	89	July 5	1.36	123
June 8	1.98	293	Sept. 28	.80	39.8

Daily discharge, in second-feet, of Burnt Fork Creek near Stevensville, Mont., for the year ending Sept. 30, 1920.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	.....	146	164	38	31	16	259	334	64	26	40
2	.....	143	164	32	31	17	262	301	60	27	40
3	.....	148	172	31	31	18	248	283	58	27	40
4	.....	175	161	29	30	19	219	262	68	27	40
5	.....	219	128	29	30	20	217	289	70	34	38
6	.....	231	123	30	28	21	228	286	68	37	37
7	.....	251	113	30	27	22	214	268	62	36	37
8	89	295	100	29	27	23	214	254	56	35	44
9	111	298	86	29	26	24	178	222	50	35	42
10	133	292	78	29	27	25	175	203	49	34	43
11	155	295	72	30	27	26	151	178	44	33	41
12	177	274	75	29	28	27	159	172	40	32	40
13	200	292	80	27	44	28	208	164	42	32	40
14	208	310	69	27	84	29	205	164	41	32	40
15	236	319	68	26	40	30	170	178	42	31	40
						31	151	.....	39	32	.....

NOTE.—Discharge May 8, from discharge measurement; May 9-12 and Aug. 24-27, interpolated because gage was not read.

Monthly discharge of Burnt Fork Creek near Stevensville, Mont., for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
May	262	89	190	9,040
June	334	143	242	14,400
July	172	39	80.8	4,970
August	38	26	30.8	1,890
September	84	26	37.1	2,210
The year				32,500

FLATHEAD LAKE AT POLSON, MONT.

LOCATION.—In SE. ¼ sec. 4, T. 22 N., R. 20 W., at steamboat dock at south end of lake at Polson, Flathead County.

RECORDS AVAILABLE.—August 23, 1908, to September 30, 1920.

GAGE.—Vertical staff attached to a pile at end of pier; datum 2,803 feet above sea level. Prior to 1917 this datum was given as 2,800 feet.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 88.8 feet June 1; minimum stage 78.9 feet January 20 and 21.

Maximum stage recorded during year ending September 30, 1920, 88.3 feet June 21–25; minimum stage, 78.7 feet December 14–24 and January 23–26.

1908–1920: Maximum stage recorded, 92.7 feet July 1, 2, and 4, 1916; minimum stage, 78.5 feet February 16–22, 1913.

COOPERATION.—Records furnished by United States Reclamation Service.

Daily gage height, in feet, of Flathead Lake at Polson, Mont., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	79.8	79.6	79.4	79.2	79.3	79.2	79.3	83.0	88.8	84.9	81.1	80.0
2	79.8	79.6	79.4	79.2	79.3	79.2	79.3	83.4	86.7	84.8	81.0	80.0
3	79.8	79.6	79.4	79.2	79.4	79.2	79.3	83.8	88.6	84.7	81.0	80.0
4	79.8	79.6	79.4	79.2	79.4	79.2	79.4	84.1	88.5	84.6	81.0	79.9
5	79.7	79.6	79.4	79.2	79.4	79.1	79.4	84.2	88.3	84.5	80.9	79.9
6	79.7	79.6	79.4	79.2	79.4	79.1	79.4	84.3	88.1	84.3	80.9	79.9
7	79.7	79.5	79.4	79.2	79.4	79.1	79.5	84.3	87.9	84.1	80.9	79.8
8	79.7	79.5	79.4	79.2	79.3	79.1	79.6	84.2	87.7	83.9	80.8	79.8
9	79.7	79.5	79.4	79.1	79.3	79.1	79.7	84.2	87.6	83.7	80.8	79.8
10	79.7	79.5	79.4	79.1	79.3	79.1	79.8	84.1	87.5	83.5	80.8	79.7
11	79.7	79.5	79.4	79.1	79.3	79.1	79.9	84.1	87.4	83.3	80.7	79.7
12	79.7	79.5	79.4	79.1	79.3	79.1	80.0	84.0	87.2	83.1	80.7	79.7
13	79.7	79.5	79.4	79.1	79.3	79.1	80.1	84.0	87.0	82.9	80.7	79.6
14	79.7	79.5	79.3	79.1	79.3	79.1	80.15	83.9	86.8	82.7	80.6	79.6
15	79.7	79.5	79.3	79.1	79.3	79.1	80.2	83.9	86.6	82.6	80.6	79.6
16	79.7	79.5	79.3	79.0	79.3	79.1	80.25	83.9	86.4	82.5	80.6	79.5
17	79.7	79.5	79.3	79.0	79.3	79.1	80.3	83.9	86.3	82.4	80.5	79.5
18	79.7	79.5	79.3	79.0	79.3	79.1	80.35	83.95	86.2	82.3	80.5	79.5
19	79.7	79.5	79.3	79.0	79.3	79.1	80.4	84.0	86.1	82.2	80.5	79.4
20	79.7	79.5	79.3	78.9	79.3	79.1	80.5	84.2	86.0	82.1	80.4	79.4
21	79.6	79.5	79.3	78.9	79.3	79.1	80.6	84.6	85.9	82.0	80.4	79.4
22	79.6	79.5	79.3	79.0	79.3	79.1	80.8	85.1	85.8	81.9	80.4	79.3
23	79.6	79.5	79.3	79.0	79.3	79.1	81.0	85.6	85.7	81.8	80.3	79.3
24	79.6	79.5	79.3	79.1	79.3	79.1	81.2	85.9	85.6	81.7	80.3	79.3
25	79.6	79.5	79.3	79.1	79.2	79.1	81.4	86.4	85.5	81.6	80.3	79.3
26	79.6	79.5	79.3	79.2	79.2	79.1	81.6	86.7	85.4	81.5	80.2	79.3
27	79.6	79.4	79.3	79.2	79.2	79.1	81.8	87.3	85.3	81.4	80.2	79.2
28	79.6	79.4	79.3	79.2	79.2	79.15	82.0	87.9	85.2	81.3	80.2	79.2
29	79.2	79.4	79.3	79.3	.....	79.15	82.3	87.9	85.1	81.2	80.1	79.2
30	79.6	79.4	79.3	79.3	.....	79.2	82.6	88.3	85.0	81.2	80.1	79.2
31	79.6	.....	79.3	79.3	.....	79.2	.....	88.7	.....	81.1	80.1	.....

Daily gage height, in feet, of Flathead Lake at Polson, Mont., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	79.2	78.8	78.9	78.8	78.9	78.9	78.9	80.9	85.55	87.3	82.9	80.6
2	79.2	78.8	78.9	78.8	78.9	78.9	78.9	81.0	85.5	87.3	82.8	80.5
3	79.2	78.8	78.9	78.8	78.9	78.9	79.0	81.0	85.4	87.3	82.7	80.5
4	79.1	78.8	78.9	78.8	78.9	78.9	79.0	81.1	85.3	87.15	82.6	80.5
5	79.1	78.8	78.8	78.8	78.9	78.9	79.0	81.1	85.25	87.0	82.5	80.4
6	79.1	78.8	78.8	78.8	79.0	78.9	79.0	81.2	85.3	86.9	82.4	80.4
7	79.1	78.8	78.8	78.9	79.0	78.9	79.0	81.3	85.4	86.8	82.3	80.4
8	79.1	78.8	78.8	78.9	79.0	78.9	79.0	81.45	85.6	86.7	82.2	80.3
9	79.1	78.8	78.8	78.9	79.0	78.9	79.1	81.6	85.85	86.5	82.1	80.3
10	79.0	78.8	78.8	78.9	79.0	78.8	79.1	82.0	86.1	86.3	82.0	80.8
11	79.0	78.8	78.8	78.9	79.0	78.8	79.1	82.4	86.4	86.1	81.9	80.2
12	79.0	78.8	78.8	78.9	79.0	78.8	79.2	82.6	86.7	85.9	81.8	80.2
13	79.0	78.8	78.8	78.9	79.0	78.8	79.2	82.9	86.8	85.8	81.7	80.2
14	79.0	78.8	78.7	78.9	79.0	78.8	79.3	83.2	86.9	85.6	81.6	80.2
15	79.0	78.8	78.7	78.8	79.0	78.8	79.3	83.4	87.1	85.4	81.5	80.2
16	79.0	78.8	78.7	78.8	79.0	78.8	79.4	83.6	87.4	85.2	81.4	80.1
17	78.9	78.8	78.7	78.8	79.0	78.8	79.4	83.7	87.6	85.0	81.4	80.1
18	78.9	78.8	78.7	78.8	79.0	78.9	79.5	84.2	87.9	84.8	81.3	80.1
19	78.9	78.8	78.7	78.8	79.0	78.9	79.6	84.7	88.1	84.65	81.3	80.1
20	78.9	78.8	78.7	78.8	79.0	78.9	79.7	85.1	88.2	84.4	81.2	80.1
21	78.9	78.8	78.7	78.8	79.0	78.9	79.8	85.2	88.3	84.2	81.2	80.1
22	78.9	78.8	78.7	78.8	79.0	78.9	79.9	85.3	88.3	84.1	81.1	80.1
23	78.9	78.8	78.7	78.7	79.0	78.9	80.0	85.5	88.3	84.0	81.1	80.1
24	78.9	78.8	78.7	78.7	79.0	78.9	80.1	85.6	88.3	83.9	81.0	80.1
25	78.8	78.8	78.8	78.7	78.9	78.9	80.2	85.7	88.3	83.8	81.0	80.1
26	78.8	78.8	78.8	78.7	78.9	78.9	80.3	85.8	88.2	83.7	80.9	80.1
27	78.8	78.8	78.8	78.8	78.9	78.9	80.45	85.8	88.0	83.5	80.9	80.1
28	78.8	78.9	78.8	78.8	78.9	78.9	80.6	85.7	87.8	83.3	80.8	80.1
29	78.8	78.9	78.8	78.8	78.9	78.9	80.7	85.7	87.6	83.2	80.7	80.1
30	78.8	78.9	78.8	78.8	.....	78.9	80.8	85.6	87.5	83.1	80.6	80.1
31	78.8	.....	78.8	78.8	.....	78.9	.....	85.6	.....	83.0	80.6	.....

FLATHEAD RIVER NEAR POLSON, MONT.

LOCATION.—In sec. 19, T. 22 N., R. 21 W., at Mischell's ferry at Norrisvale, 5 miles below Newell tunnel, 15 miles northwest of Ronan, and 12 miles below Polson, Flathead County.

DRAINAGE AREA.—7,010 square miles.

RECORDS AVAILABLE.—July 23, 1907, to September 30, 1920.

GAGE.—Vertical staff in four sections on left bank installed April 9, 1916. Prior to April 9, 1916, a chain gage on right bank at same datum. Gage read by M. Sylapich.

DISCHARGE MEASUREMENTS.—Made from highway bridge at Polson 12 miles upstream from gage.

CHANNEL AND CONTROL.—Control not well defined. Current fairly swift, banks are high.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 12.5 feet June 1 (discharge, 48,200 second-feet); minimum stage 1.1 feet January 12–26 (discharge, 2,070 second-feet).

Maximum stage recorded during year ending September 30, 1920, 11.9 feet June 23–25 (discharge, 44,200 second-feet); minimum stage, −0.1 foot December 9–14 and March 14 (discharge, 1,360 second-feet).

1907–1920: Maximum stage recorded, 16.4 feet June 12, 1913 (discharge, 75,400 second-feet); minimum stage −0.1 foot December 9–14, 1919, and March 14, 1920 (discharge, 1,360 second-feet).

ICE.—Stage-discharge relation not seriously affected by ice, and open-channel rating assumed applicable.

DIVERSIONS.—Several small diversions from tributaries above Flathead Lake.

REGULATION.—Flathead Lake forms a natural regulation.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined. Gage read once daily to tenths. Daily discharge ascertained by applying daily gage height to rating table. Records good.

COOPERATION.—Gage-height record furnished by United States Reclamation Service; determination of flow by United States Geological Survey.

Daily discharge, in second-feet, of Flathead River near Polson, Mont., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	3,740	3,350	2,790	2,790	2,400	2,400	2,310	18,000	48,200	23,100	7,540	3,600
2	3,690	3,350	2,790	2,690	2,400	2,400	2,310	19,500	47,500	22,600	7,270	4,170
3	3,630	3,350	2,690	2,690	2,400	2,400	2,310	20,000	46,900	22,000	6,760	3,740
4	3,580	3,350	2,690	2,590	2,400	2,400	2,400	21,000	45,600	21,500	6,760	3,600
5	3,520	3,350	2,690	2,590	2,400	2,400	2,400	21,500	44,200	21,000	6,290	3,600
6	3,470	3,350	2,690	2,490	2,400	2,400	2,490	22,000	42,900	20,500	6,290	3,350
7	3,350	3,350	2,690	2,490	2,400	2,400	2,490	21,500	42,300	19,500	6,290	3,470
8	3,470	3,350	2,690	2,400	2,400	2,400	2,590	21,000	41,600	18,500	6,060	3,470
9	3,470	3,350	2,690	2,310	2,400	2,400	2,790	21,000	41,000	17,500	6,060	3,350
10	3,350	3,350	2,690	2,150	2,400	2,310	2,900	20,500	40,300	16,600	6,060	3,350
11	3,350	3,350	2,490	2,150	2,400	2,310	3,010	20,500	39,000	16,200	5,840	3,230
12	3,350	3,350	2,490	2,070	2,400	2,310	3,010	20,000	37,800	15,700	5,840	3,120
13	3,350	3,350	2,490	2,070	2,400	2,310	3,120	20,000	36,500	15,300	5,840	3,120
14	3,350	3,350	2,490	2,070	2,400	2,310	3,600	19,500	35,200	14,800	5,430	3,230
15	3,350	3,350	2,490	2,070	2,400	2,310	4,020	19,500	33,400	14,400	5,430	3,120
16	3,470	3,350	2,490	2,070	2,400	2,310	4,500	19,000	32,800	14,000	5,430	3,120
17	3,440	3,230	2,590	2,070	2,400	2,310	4,850	19,000	31,600	13,600	5,230	3,010
18	3,400	3,230	2,590	2,070	2,400	2,310	5,040	19,000	31,000	13,200	5,230	3,010
19	3,360	3,230	2,590	2,070	2,400	2,310	5,040	19,500	30,400	12,800	5,230	2,900
20	3,330	3,120	2,590	2,070	2,400	2,310	5,230	20,500	30,400	12,400	4,850	2,790
21	3,300	3,120	2,590	2,070	2,400	2,310	5,430	22,000	29,800	11,600	4,850	2,790
22	3,260	3,120	2,590	2,070	2,400	2,310	6,060	23,600	29,300	10,900	4,850	2,790
23	3,230	3,120	2,590	2,070	2,400	2,310	7,010	25,800	28,700	10,200	4,670	2,790
24	3,120	3,120	2,590	2,070	2,400	2,310	7,820	29,300	28,100	9,930	4,500	2,790
25	3,120	3,010	2,590	2,070	2,400	2,310	8,400	32,200	27,500	9,620	4,500	2,690
26	3,120	3,010	2,590	2,070	2,400	2,310	9,310	34,000	27,000	9,310	4,330	2,790
27	3,120	3,010	2,590	2,150	2,400	2,310	10,250	35,200	25,800	9,000	4,330	2,690
28	3,120	3,010	2,590	2,230	2,400	2,310	11,200	37,800	24,700	8,700	4,330	2,590
29	3,120	3,010	2,590	2,310	.....	2,310	12,300	41,600	24,200	8,400	4,020	2,490
30	3,350	3,010	2,790	2,400	.....	2,310	15,700	43,600	23,600	8,110	3,880	2,490
31	3,230	.....	2,900	2,400	.....	2,310	.....	45,600	.....	7,820	3,880	.....
1919-20.												
1	2,490	2,150	2,490	1,540	1,570	1,570	1,570	6,290	28,100	38,100	14,400	7,820
2	2,490	2,230	2,490	1,580	1,570	1,520	1,570	6,640	27,500	37,800	14,000	7,820
3	2,440	2,230	2,640	1,580	1,580	1,520	1,570	6,520	27,500	37,400	13,600	7,820
4	2,440	2,150	2,640	1,600	1,590	1,570	1,570	7,010	27,000	37,100	13,200	7,820
5	2,440	2,190	2,400	1,600	1,590	1,620	1,570	7,270	26,400	36,500	12,800	7,540
6	2,440	2,190	2,000	1,620	1,590	1,620	1,570	7,270	26,400	35,900	12,400	7,540
7	2,440	2,190	1,620	1,600	1,600	1,460	1,570	7,270	27,000	34,600	11,600	6,760
8	2,000	2,230	1,570	1,600	1,620	1,460	1,570	8,110	28,100	34,000	10,900	6,290
9	2,310	2,150	1,360	1,600	1,620	1,460	1,620	8,700	30,400	33,400	10,900	5,430
10	2,310	2,040	1,360	1,600	1,620	1,460	1,740	9,930	32,200	32,200	10,900	4,850
11	2,310	2,310	1,360	1,600	1,620	1,460	1,740	11,600	33,400	31,000	10,600	4,170
12	2,270	2,540	1,360	1,620	1,620	1,460	1,740	12,400	34,000	30,400	9,620	4,020
13	2,310	2,540	1,360	1,680	1,620	1,380	1,740	14,000	35,200	29,800	9,620	4,170
14	2,310	2,400	1,360	1,620	1,620	1,360	1,770	14,800	35,900	28,100	9,310	4,330
15	2,310	2,230	1,460	1,600	1,620	1,460	1,860	17,500	37,100	27,000	9,310	4,330
16	2,310	2,150	1,460	1,490	1,620	1,490	1,930	18,500	38,400	26,400	9,310	4,330
17	2,290	2,070	1,520	1,520	1,620	1,490	2,000	20,500	39,700	25,800	9,000	4,330
18	2,280	2,070	1,520	1,520	1,620	1,500	2,150	21,500	41,000	25,300	9,000	4,170
19	2,230	2,070	1,520	1,460	1,620	1,520	2,230	23,100	42,300	24,700	9,000	4,330
20	2,190	2,070	1,520	1,460	1,620	1,520	2,400	25,300	42,900	24,200	8,700	4,330
21	2,310	2,070	1,520	1,520	1,620	1,520	2,490	26,400	43,600	23,600	8,400	4,330
22	2,400	2,070	1,520	1,540	1,600	1,520	2,590	27,000	43,600	22,000	7,540	4,330
23	2,310	2,150	1,520	1,560	1,590	1,520	2,690	28,100	44,200	21,000	7,540	4,330
24	2,270	1,990	1,520	1,550	1,570	1,530	4,170	28,100	44,200	20,500	7,540	4,330
25	2,270	2,310	1,520	1,550	1,560	1,550	4,670	28,700	44,200	19,500	8,400	4,170
26	2,190	2,070	1,570	1,550	1,550	1,570	4,760	28,700	42,900	18,500	8,400	4,170
27	2,230	1,860	1,570	1,550	1,570	1,570	5,630	29,300	42,900	17,500	8,400	4,170
28	2,070	2,590	1,520	1,550	1,570	1,570	4,850	28,700	41,600	17,100	8,400	4,170
29	2,150	2,690	1,520	1,550	1,570	1,570	5,430	28,700	39,700	16,600	8,110	4,330
30	2,230	2,490	1,520	1,550	.....	1,570	6,060	28,100	38,400	16,200	8,110	4,330
31	2,150	.....	1,520	1,550	.....	1,570	.....	28,100	.....	15,300	7,820	.....

NOTE.—Gage not read Oct. 2–5, 17–22, 25–26, 1918, and July 1–3, 1920; discharge interpolated.

Monthly discharge of Flathead River near Polson, Mont., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 7,010 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	3,740	3,120	3,360	0.479	0.55	207,000
November	3,350	3,010	3,230	.461	.51	192,000
December	2,900	2,490	2,630	.375	.43	162,000
January	2,790	2,070	2,250	.321	.37	138,000
February	2,400	2,400	2,400	.342	.36	133,000
March	2,400	2,310	2,340	.334	.39	144,000
April	15,700	2,310	5,350	.763	.85	318,000
May	45,600	18,000	24,900	3.55	4.09	1,530,000
June	48,200	23,600	34,900	4.98	4.56	2,080,000
July	23,100	7,820	14,500	2.07	2.39	892,000
August	7,540	3,880	5,410	.772	.89	333,000
September	4,170	2,490	3,110	.444	.50	185,000
The year	48,200	2,070	8,720	1.24	16.83	6,310,000
1919–20.						
October	2,490	2,070	2,300	.328	.38	141,000
November	2,690	1,860	2,220	.317	.35	132,000
December	2,640	1,360	1,670	.238	.27	103,000
January	1,680	1,460	1,560	.223	.26	95,900
February	1,620	1,550	1,600	.228	.25	92,000
March	1,620	1,360	1,510	.215	.25	92,800
April	6,060	1,570	2,630	.375	.42	156,000
May	29,300	6,290	18,200	2.60	3.00	1,120,000
June	44,200	26,400	36,200	5.16	5.76	2,150,000
July	38,100	15,300	27,000	3.85	4.44	1,660,000
August	14,400	7,540	9,900	1.41	1.63	609,000
September	7,820	4,020	5,160	.736	.82	307,000
The year	44,200	1,360	9,180	1.31	17.83	6,660,000

MIDDLE FORK OF FLATHEAD RIVER AT BELTON, MONT.

LOCATION.—In NW. ¼ sec. 36, T. 32 N., R. 19 W., at Hotel Belton, half a mile below highway bridge at Belton, Flathead County, and 2 miles above Lake McDonald outlet.

DRAINAGE AREA.—900 square miles.

RECORDS AVAILABLE.—October 5, 1910, to September 30, 1920.

GAGE.—Sloping gage on left bank directly back of Hotel Belton; read by Mrs. S. C. Brock.

DISCHARGE MEASUREMENTS.—Made from cable 200 feet below gage or from boat.

CHANNEL AND CONTROL.—Practically permanent. Banks high; not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 10.0 feet at 8 a. m. May 28 (discharge, 13,600 second-feet); minimum discharge, 320 second-feet January 10–15 and February 28.

Maximum stage recorded during year ending September 30, 1920, 9.2 feet May 19 (discharge, 11,500 second-feet); minimum stage, 1.4 feet February 16–18 and March 16 (discharge, 260 second-feet).

1910–1920: Maximum stage recorded, 20.0 feet at 9 a. m. June 21, 1916 (discharge determined by extension of rating curve, 49,000 second-feet); minimum stage, 1.3 feet March 29–30, 1912 (discharge, 182 second-feet).

ICE.—Stage-discharge relation slightly affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by ice. Rating curve fairly well defined between 325 and 20,000 second-feet. Gage read once daily to half-tenths. Daily discharge ascertained by applying gage height to rating table. Records fair.

The following discharge measurement was made by W. A. Lamb:

October 22, 1918: Gage height, 2.45 feet; discharge, 726 second-feet.

Daily discharge, in second-feet, of Middle Fork of Flathead River at Belton, Mont., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	552	552	390	355	475	.....	475	8,600	7,030	3,260	760	475
2	525	525	390	355	430	.....	580	8,830	6,190	3,260	850	475
3	525	525	390	355	390	.....	580	5,780	5,000	3,000	940	430
4	525	525	390	355	430	.....	580	5,190	5,680	2,740	940	430
5	580	525	410	355	480	.....	580	4,450	6,400	2,460	910	430
6	580	525	410	355	530	.....	1,080	4,070	7,030	2,460	820	430
7	580	525	410	355	580	.....	1,730	3,260	6,190	2,400	820	430
8	580	525	410	338	580	.....	2,400	3,130	5,580	1,910	790	430
9	580	525	410	338	580	.....	1,910	3,000	4,810	1,910	760	430
10	580	525	390	320	580	.....	1,910	3,000	4,450	1,910	760	430
11	580	525	390	320	580	.....	1,910	3,680	4,280	1,910	760	430
12	580	525	390	320	475	.....	2,000	4,280	4,120	1,910	760	430
13	580	475	430	320	475	.....	2,000	4,280	4,120	1,470	760	430
14	580	475	452	320	475	.....	2,000	4,450	4,120	1,470	700	430
15	580	475	430	320	430	.....	1,910	5,000	4,120	1,470	700	430
16	640	525	430	390	410	.....	1,910	5,000	4,120	1,390	610	430
17	640	525	430	700	410	.....	1,910	5,190	4,450	1,390	580	430
18	670	525	410	940	390	.....	1,910	5,980	4,450	1,310	580	430
19	700	525	410	940	390	.....	1,910	6,820	4,120	1,230	580	430
20	730	525	410	1,010	372	452	2,090	9,060	4,280	1,230	580	430
21	730	525	410	1,010	372	430	2,290	11,800	4,450	1,160	580	430
22	760	475	390	1,080	355	430	3,260	12,000	4,450	1,080	580	430
23	760	475	390	1,160	355	430	4,280	12,400	4,280	940	580	430
24	730	475	390	1,310	355	430	5,280	13,400	4,070	760	580	390
25	700	430	372	1,310	350	430	6,400	11,500	3,680	640	580	390
26	700	390	372	1,310	340	475	8,140	11,000	3,540	580	580	390
27	700	390	355	1,080	320	475	8,140	12,600	3,130	580	475	390
28	670	390	355	1,080	320	475	8,140	13,600	2,740	580	475	390
29	670	390	355	940	.....	475	8,140	12,000	2,510	580	475	390
30	610	390	355	790	.....	475	8,660	10,500	2,400	580	475	390
31	610	.....	355	580	.....	475	.....	9,300	.....	580	475	.....
1919–20.												
1	390	290	355	580	.....	.....	475	2,510	5,980	5,280	1,600	700
2	390	290	.....	525	.....	.....	475	2,290	6,820	5,190	1,510	670
3	390	290	.....	475	.....	.....	475	2,290	7,690	5,000	1,390	670
4	390	290	.....	475	.....	.....	475	2,510	8,600	5,000	1,310	670
5	390	290	.....	475	.....	.....	475	2,740	9,060	4,900	1,190	640
6	390	290	.....	475	.....	.....	475	3,820	9,060	4,630	1,120	670
7	390	290	.....	475	.....	.....	475	5,190	9,060	4,120	1,080	760
8	390	290	.....	475	.....	.....	475	6,820	10,000	3,820	1,040	820
9	355	290	.....	.....	.....	290	430	6,920	10,800	3,400	1,040	940
10	355	290	.....	.....	.....	290	430	6,920	10,300	3,130	1,010	1,040
11	355	290	.....	.....	.....	290	430	7,140	9,540	3,000	1,010	1,160
12	355	290	.....	.....	.....	320	640	7,250	9,540	2,870	1,010	1,230
13	320	290	.....	.....	320	320	790	7,470	9,060	2,740	1,010	1,310
14	320	320	.....	.....	320	320	880	7,470	9,060	2,560	1,010	1,390
15	320	355	.....	.....	320	320	1,080	7,470	9,060	2,510	975	1,390
16	320	390	.....	.....	260	260	1,230	8,600	8,600	2,400	940	1,390
17	320	390	.....	.....	260	290	1,470	10,000	8,600	2,290	880	1,350
18	320	390	.....	.....	260	320	1,600	11,200	8,600	2,240	820	1,310
19	320	390	.....	.....	290	355	1,730	11,500	8,600	2,190	790	1,230
20	320	355	.....	.....	320	390	1,910	10,500	8,600	2,190	730	1,310
21	320	355	.....	.....	.....	430	2,090	9,540	8,370	2,140	700	1,310
22	320	355	.....	.....	.....	475	2,510	9,060	7,690	2,090	700	1,390
23	290	355	.....	.....	.....	475	4,070	8,600	6,610	2,000	700	1,390
24	290	355	.....	.....	.....	475	3,000	8,600	5,980	1,910	700	1,430
25	290	355	.....	.....	.....	475	1,640	8,600	5,190	1,910	700	1,430
26	290	372	.....	.....	.....	475	1,390	8,140	4,810	1,860	700	1,430
27	290	372	820	.....	.....	475	1,080	7,470	4,810	1,820	700	1,430
28	290	355	820	.....	.....	475	1,430	6,920	5,000	1,780	700	1,390
29	290	355	700	.....	.....	475	1,820	6,820	5,190	1,730	700	1,390
30	290	355	700	.....	.....	475	2,870	6,400	5,580	1,680	700	1,350
31	290	.....	580	.....	.....	475	.....	6,190	.....	1,680	700	.....

NOTE.—Discharge, Feb. 3–6 and 25–28, 1919, estimated because of slight ice effect. Data inadequate for determination of discharge Mar. 1–19, Dec. 2–26, 1919, Jan. 9 to Feb. 12, and Feb. 20 to Mar. 8, 1920, because of serious ice effect.

Monthly discharge of Middle Fork of Flathead River near Belton, Mont., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 900 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October	760	525	630	0.700	0.81	38,700
November	552	390	490	.544	.61	29,200
December	452	355	396	.440	.51	24,300
January	1,310	320	668	.742	.86	41,100
February	580	320	437	.486	.51	24,300
March 20–31	475	430	454	.504	.22	10,800
April	8,600	475	3,130	3.48	3.88	86,000
May	13,600	3,000	7,520	8.36	9.64	462,000
June	7,030	2,400	4,530	5.03	5.61	270,000
July	3,260	580	1,550	1.72	1.98	95,300
August	940	475	671	.746	.86	41,300
September	475	390	424	.471	.53	25,200
1919–20.						
October	390	290	334	.371	.43	20,500
November	390	290	331	.368	.41	19,700
January 1–8	580	475	494	.549	.16	7,840
February 13–20	320	260	294	.327	.10	4,660
March 9–31	475	260	389	.432	.37	17,700
April	4,070	430	1,280	1.42	1.58	76,200
May	11,500	2,290	7,000	7.78	8.97	430,000
June	10,800	4,810	7,860	8.73	9.74	468,000
July	5,280	1,680	2,910	3.23	3.72	179,000
August	1,600	700	941	1.05	1.21	57,900
September	1,430	640	1,150	1.28	1.43	68,400

BIG CREEK NEAR POLSON, MONT.

LOCATION.—Near township line between sec. 4, T. 22 N., R. 19 W., and sec. 33, T. 23 N., R. 19 W., just below power house of Mission Range Power Co., three-fourths mile above mouth, and 7 miles east of Polson, Flathead County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 1, 1917, to September 30, 1920.

GAGE.—Stevens 8-day water-stage recorder on left bank, used since June 14, 1917; prior to that date temporary gage on left bank 200 feet below.

CHANNEL AND CONTROL.—An artificial control about 200 feet below gage. The control was repaired August 18, 1917, but was not completed until October 29, 1917. Banks high and not subject to overflow. One channel at all stages.

DISCHARGE MEASUREMENTS.—Made from foot log just below gage or by wading.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year ending September 30, 1919, 2.3 feet at 6.30 p. m. May 27 (discharge, 69 second-feet); minimum discharge, 0.6 second-foot September 7.

Maximum stage recorded during year ending September 30, 1920, 1.78 feet May 14 (discharge, 29.4 second-feet); minimum discharge, 1.7 second-feet March 10, computed from kilowatt output.

1917–1920: Maximum stage recorded 2.4 feet at 6 p. m. June 9, 1917 (discharge from extension of rating curve, 104 second-feet); minimum discharge 0.6 second-foot September 7, 1919.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—None.

REGULATION.—Operation of power plant materially affects flow, especially during low-water period.

ACCURACY.—Stage-discharge relation changed during August and September, 1919; practically permanent during 1920. Rating curve well defined between 5 and 40 second-feet. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by planimeter. Discharge for part of year determined from the kilowatt output at plant as shown in footnotes to daily-discharge table. Records fair.

COOPERATION.—Records for year ending September 30, 1920, furnished by United States Reclamation Service.

Discharge measurements of Big Creek near Polson, Mont., during the year ending Sept. 30, 1919.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 13	R. O. Crawford [a]	1.41	7.0	Sept. 9	R. O. Crawford [a]	1.42	6.2
Aug. 6	do	1.31	3.8	24	do	1.36	5.4
18	W. A. Lamb	1.37	4.4				

[a] Engineer, U. S. Reclamation Service.

Daily discharge, in second-feet, of Big Creek near Polson, Mont., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	8.1	7.1	5.4	.....	3.7	4.1	6.7	8.6	27	5.4	4.3	3.8
2	7.1	7.1	5.8	.....	4.4	4.1	5.8	6.2	29	7.1	4.2	4.1
3	6.7	6.7	5.8	.....	5.0	5.0	6.2	5.0	30	6.7	4.1	3.2
4	6.7	7.1	5.8	.....	5.4	5.4	7.1	4.1	29	6.2	5.4	3.7
5	5.8	8.1	5.0	4.5	4.5	5.4	6.2	3.2	30	5.8	5.4	3.2
6	7.6	7.1	4.5	.....	5.0	5.4	5.4	3.2	29	4.1	3.7	3.7
7	7.6	7.1	4.5	.....	5.4	5.4	5.8	2.8	27	4.5	3.2	1.4
8	7.4	7.1	3.2	.....	5.4	5.4	5.8	2.8	25	2.8	3.2	3.7
9	7.2	6.7	5.8	.....	5.0	5.0	5.8	5.4	23.8	2.2	4.1	3.2
10	7.0	7.1	5.4	.....	6.7	5.0	6.7	5.4	22.6	3.2	1.7	3.7
11	6.9	7.1	3.7	.....	6.2	5.0	8.6	4.1	21.2	4.1	2.8	3.2
12	6.8	7.1	4.1	.....	5.8	4.1	9.1	3.7	20.0	2.8	8.1	3.7
13	6.7	6.7	4.5	.....	5.8	4.5	7.1	3.7	18.6	2.2	8.1	4.1
14	7.1	6.2	4.5	.....	5.8	4.1	7.6	2.8	18.0	2.5	8.6	2.0
15	7.1	5.3	4.5	.....	5.8	3.2	7.1	8.1	17.4	2.8	7.1	3.7
16	7.1	6.2	4.5	.....	5.4	2.8	8.6	10.0	16.2	2.8	7.1	3.7
17	6.7	5.4	2.8	5.8	5.8	2.2	8.1	11.5	15.0	3.2	4.5	4.5
18	6.7	5.8	2.8	4.5	6.2	3.7	8.6	14.4	14.4	2.8	4.5	4.5
19	6.7	5.4	2.8	4.1	6.2	4.1	8.1	21.9	14.4	2.5	4.1	4.5
20	6.2	5.4	2.8	4.5	5.8	3.7	8.1	29	11.0	2.0	4.1	5.4
21	6.7	5.8	2.8	4.5	6.7	4.1	8.4	30	11.0	5.4	4.5	3.2
22	6.2	5.8	3.0	3.7	6.7	4.1	8.7	36	7.6	4.5	4.5	5.0
23	6.7	5.8	3.2	5.4	4.1	4.1	9.0	37	5.3	4.5	4.5	5.0
24	7.1	5.8	3.5	5.0	.....	3.7	9.3	34	12.0	4.1	3.2	5.0
25	6.7	5.8	3.8	5.0	.....	4.1	9.7	34	8.1	4.5	3.7	5.4
26	6.7	5.8	4.1	3.2	.....	4.1	10.1	36	6.2	4.5	4.1	5.4
27	6.7	6.2	4.1	4.5	.....	4.5	10.5	53	6.2	3.7	3.2	5.8
28	7.1	6.2	3.7	5.0	.....	4.4	14.4	53	5.4	5.0	4.5	3.7
29	7.1	6.2	4.1	5.0	.....	5.0	12.0	39	4.5	4.8	4.1	5.4
30	7.1	6.2	4.1	4.5	.....	5.4	10.0	29	5.4	4.6	3.2	5.0
31	7.1	.....	4.1	3.7	.....	8.6	.....	25	.....	4.4	3.5	.....

Daily discharge, in second-feet, of Big Creek near Polson, Mont., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1.	4.8	5.3	5.8	3.6	3.3	2.9	2.6	3.7	3.7	4.4	4.0	3.2
2.	4.8	6.3	5.1	4.5	4.0	3.2	3.2	3.4	3.7	5.0	2.8	3.1
3.	5.2	2.8	5.2	4.9	4.2	3.1	3.6	4.0	3.5	3.9	3.4	3.1
4.	4.8	5.6	5.1	3.6	4.2	3.0	2.6	4.0	3.3	3.2	2.9	2.6
5.	3.8	4.8	5.2	4.5	4.3	2.6	2.6	3.8	3.4	2.8	3.5	2.4
6.	4.6	5.2	5.0	6.9	4.1	3.2	3.5	3.8	3.2	4.5	3.7	2.8
7.	4.6	5.2	4.1	4.6	3.1	2.9	3.7	4.0	3.5	4.7	3.8	2.8
8.	5.2	5.2	4.6	4.9	3.0	3.5	4.0	4.0	3.4	5.3	3.4	2.7
9.	4.8	3.8	5.3	3.7	4.0	3.6	3.5	3.8	3.5	4.8	3.5	2.9
10.	5.2	4.8	4.3	3.9	4.2	1.7	4.5	3.8	3.3	4.8	4.0	3.0
11.	5.2	4.6	4.1	3.0	3.5	3.5	3.1	12.4	4.3	3.7	3.1	3.1
12.	3.5	5.1	4.4	3.9	3.6	3.6	3.9	4.0	4.3	4.2	3.3	2.6
13.	4.3	5.4	4.5	4.0	3.3	3.1	4.1	4.3	4.0	5.0	3.2	3.2
14.	4.6	5.3	4.0	4.0	4.0	3.0	4.2	29.4	6.1	4.9	3.9	3.2
15.	4.8	5.3	3.7	3.8	3.0	3.5	4.0	4.3	14.8	4.6	3.3	3.4
16.	5.2	4.8	4.8	4.2	4.1	3.1	3.8	5.6	17.8	4.6	3.4	3.4
17.	4.8	3.7	4.5	4.4	3.4	2.9	3.4	15.4	10.2	4.7	3.6	3.3
18.	5.2	5.1	4.0	3.3	3.9	3.5	3.4	17.2	14.2	3.5	3.9	3.2
19.	3.8	5.1	4.9	3.0	3.4	3.0	3.4	14.8	13.0	4.0	3.5	2.5
20.	4.8	5.4	5.3	3.5	4.2	3.6	3.3	11.3	10.2	5.0	3.2	3.3
21.	4.8	5.2	3.7	4.5	3.1	3.1	4.1	11.9	9.6	4.6	3.6	3.5
22.	4.6	5.5	5.1	4.0	4.0	3.4	3.2	4.0	6.1	3.5	3.5	3.5
23.	4.3	3.9	5.1	3.6	1.9	3.8	4.1	3.4	7.5	4.6	3.1	3.5
24.	5.1	5.0	5.3	3.4	4.2	3.8	3.7	4.3	4.0	4.7	5.6	3.4
25.	4.7	5.2	3.9	3.3	3.0	3.8	3.3	5.6	5.2	3.8	3.8	3.5
26.	4.0	5.4	4.4	4.1	3.0	3.9	3.5	4.6	4.6	4.0	3.7	2.8
27.	4.3	4.3	4.9	4.2	4.0	2.8	3.7	4.6	3.7	4.6	3.4	3.5
28.	5.5	5.1	5.1	4.1	3.0	3.3	3.4	3.7	3.1	4.5	3.8	3.2
29.	5.0	5.1	3.9	4.2	2.9	2.7	3.7	3.7	3.1	4.0	3.2	3.3
30.	5.1	3.5	4.9	4.2	.....	3.7	3.5	3.4	3.4	3.9	2.3	3.2
31.	5.5	.....	5.2	2.6	.....	2.8	.....	3.8	.....	3.6	3.4	.....

NOTE.—Gage not read Oct. 8–12, Dec. 22–25, Dec. 30, 31, 1918, Jan. 1–4, 6–16, Feb. 24 to Mar 1, Mar. 10, Apr. 21–26, and July 29 to Aug. 2, 1919; discharge interpolated for these periods except Jan. 1–4, 6–16, and Feb. 24–28. Discharge for following periods when total flow passed through the power plant computed from kilowatt output of the plant: Oct. 24 to Nov. 3, 1919, Nov. 12, 1919, to April 24, 1920, and July 1 to Aug. 31, 1920. Discharge, May 12, 1920, interpolated.

Monthly discharge of Big Creek near Polson, Mont., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	8.1	5.8	6.92	426
November	8.1	5.4	6.40	381
December	5.8	2.8	4.15	255
February 1–23	6.7	3.7	5.51	251
March	8.6	2.2	4.54	279
April	14.4	5.4	8.15	485
May	53.0	2.8	18.1	1,110
June	30.0	4.5	17.0	1,010
July	7.1	2.0	4.05	249
August	8.6	1.7	4.56	280
September	5.8	1.4	4.06	242
1919–20.				
October	5.5	3.5	4.74	291
November	6.3	2.8	4.90	292
December	5.8	3.7	4.69	288
January	6.9	2.6	4.01	247
February	4.3	1.9	3.58	206
March	3.9	1.7	3.21	197
April	4.5	2.6	3.55	211
May	29.4	3.4	6.77	416
June	17.8	3.1	6.12	364
July	5.3	2.8	4.30	264
August	5.6	2.3	3.51	216
September	3.5	2.4	3.11	185
The year	29.4	1.7	4.38	3,180

JOCKO RIVER NEAR JOCKO, MONT.

LOCATION.—In sec. 10, T. 16 N., R. 19 W., 500 feet above headworks of United States Reclamation Service Jocko K canal, 800 feet above mouth of Big Knife Creek, and 2 miles northeast of Jocko, Missoula County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 11, 1918, to September 30, 1919; August 20, 1908, to September 30, 1916, at old station 2 miles downstream from present site. Flow at the two points not the same as Big Knife Creek enters, and a canal diverts between them.

GAGE.—Vertical staff on right bank; read occasionally by employees of United States Reclamation Service.

DISCHARGE MEASUREMENTS.—Made from suspension bridge 50 feet below gage or by wading.

CHANNEL AND CONTROL.—Control composed of small boulders and gravel; slightly shifting. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 5.74 feet May 23 (discharge, 1,080 second-feet); minimum stage, 3.04 feet March 7 (discharge, 48 second-feet).

1918–1919: Maximum stage 7.5 feet June 11, 1918 (discharge, 2,720 second-feet); minimum stage, 3.04 feet March 7, 1919 (discharge, 48 second-feet).

ICE.—Station not in operation during the ice period.

DIVERSIONS.—None above station. Jocko K canal diverts 500 feet below gage.

REGULATION.—None.

ACCURACY.—Stage-discharge relation fairly permanent; not affected by ice. Rating curve fairly well defined. Gage read occasionally to hundredths. Daily discharge ascertained by applying gage height to rating table for days of gage readings, and interpolating discharge for intervals between readings. Records fair.

COOPERATION.—Complete data furnished by United States Reclamation Service. Monthly computations changed slightly to agree with United States Geological Survey computation rules.

Discharge measurements of Jocko River near Jocko, Mont., during the year ending Sept. 30, 1919.

[Made by R. O. Crawford.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 26	3.48	95
Jan. 18	3.19	60
June 27	4.23	242

Daily discharge, in second-feet, of Jocko River near Jocko, Mont., for the year ending Sept. 30, 1919.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	100	103	73	51	53	54	a 90	458	404	a 209	114	78
2	a 100	a 102	73	51	52	55	95	a 408	a 436	a 197	a 116	a 78
3	102	.....	a 73	a 51	a 51	55	111	369	440	a 197	116	a 77
4	103	.....	73	52	52	a 56	a 107	326	445	189	a 116	a 77
5	104	.....	73	53	53	53	104	286	450	a 181	a 110	a 77
6	105	.....	73	54	54	50	101	a 245	a 455	177	a 109	a 77
7	106	.....	a 73	a 56	a 55	a 48	99	246	416	a 174	a 107	77
8	a 107	.....	70	54	55	49	a 97	247	377	a 172	a 104	76
9	105	.....	67	53	56	50	99	248	338	a 170	a 103	a 76
10	103	.....	64	a 52	57	52	101	250	a 299	a 165	102	a 76
11	a 102	.....	a 61	52	a 58	a 54	a 103	252	286	a 161	a 100	76
12	102	.....	63	53	56	54	101	254	273	a 157	a 99	a 76
13	101	.....	65	54	54	53	99	a 256	a 261	156	a 97	74
14	100	.....	68	55	52	a 53	98	338	322	a 154	a 96	72
15	99	.....	a 71	a 56	a 51	53	97	420	384	a 150	a 95	a 70
16	a 99	.....	69	57	52	52	a 96	502	a 446	a 144	a 93	70
17	99	.....	68	a 58	54	52	108	584	354	a 140	92	a 69
18	98	.....	67	a 60	a 56	a 52	120	666	a 261	a 137	a 91	a 68
19	97	.....	a 66	60	56	53	a 133	748	251	a 135	a 90	68
20	97	.....	66	60	56	53	155	831	a 242	132	a 88	68
21	96	.....	a 67	a 60	56	a 54	177	914	231	a 130	a 87	67
22	95	.....	63	60	a 56	54	200	997	220	a 126	a 86	a 67
23	a 95	.....	59	60	54	55	a 222	a 1,080	a 209	a 126	a 84	66
24	94	.....	a 56	60	53	56	318	872	a 185	a 123	83	a 66
25	94	.....	56	a 60	a 52	a 56	a 413	664	183	a 121	a 83	66
26	a 93	.....	57	60	52	57	449	456	a 181	a 118	a 82	65
27	95	.....	a 57	59	53	a 58	486	a 248	a 209	118	a 81	a 65
28	98	.....	55	a 59	a 53	64	523	279	a 234	a 118	a 81	65
29	101	.....	53	57	.....	70	a 560	310	224	a 116	a 81	65
30	a 104	.....	52	55	.....	76	509	341	a 214	a 113	a 79	64
31	103	.....	a 51	54	.....	83	.....	372	.....	a 112	79	.....

a Gage read.

Monthly discharge of Jocko River near Jocko, Mont., for the year ending Sept. 30, 1919.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	107	93	99.9	6,140
December	73	51	64.6	3,970
January	60	51	56.0	3,440
February	58	51	54.0	3,000
March	83	48	55.9	3,440
April	560	90	199	11,800
May	1,080	245	467	28,700
June	455	181	308	18,300
July	209	112	149	9,160
August	116	79	95.0	5,840
September	78	64	71.2	4,240

REVAIS CREEK NEAR DIXON, MONT.

LOCATION.—In T. 18 N., R. 22 W., below highway bridge near residence of A. Bishop, 4 miles southwest of Dixon, Sanders County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 30, 1911, to September 30, 1916, and October 1, 1917, to September 30, 1919.

GAGE.—Staff gage attached to tree on right bank about 100 feet below a log highway bridge, read by A. Bishop.

DISCHARGE MEASUREMENTS.—Made by wading or from bridge.

CHANNEL AND CONTROL.—Channel narrow; banks high and not subject to overflow. Bed composed of small boulders. Control shifts.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 2.95 feet May 23 (discharge, 144 second-feet); minimum stage, 1.40 feet August 11–31 and September 1–26 (discharge, 4.0 second-feet).

1911–1919: Maximum stage recorded, 3.7 feet June 19, 1916 (discharge, 512 second-feet); minimum discharge, 3 second-feet January 23 to March 19 and September 13, 1918.

ICE.—Ice apparently has little if any effect on stage-discharge relation.

DIVERSIONS.—None of importance.

REGULATION.—None. The melting snow causes a small diurnal fluctuation during the spring.

ACCURACY.—Stage-discharge relation changed slightly during winter of 1918–19; fairly permanent during period of records in 1919. Rating curve fairly well defined. Gage read twice daily to nearest half-tenth. Daily discharge ascertained by applying mean gage height to rating table. Records fair.

COÖPERATION.—Data furnished by United States Reclamation Service.

Discharge measurements of Revais Creek near Dixon, Mont., during the year ending Sept. 30, 1919.

[Made by R. O. Crawford.[a]]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Mar. 21	1.49	6.80
Aug. 2	1.55	8.26

[a] Engineer, U. S. Reclamation Service.

Daily discharge, in second-feet, of Revais Creek near Dixon, Mont., for the year ending Sept. 30, 1919.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	15	99	87	21	7	4	16	21	87	45	7	4	4
2	15	87	76	21	9	4	17	21	87	36	7	4	4
3	18	87	76	15	11	4	18	28	87	36	7	4	4
4	21	87	76	15	11	4	19	28	93	36	7	4	4
5	21	76	65	15	11	4	20	32	106	28	7	4	4
6	21	76	65	15	7	4	21	40	118	28	7	4	4
7	21	65	55	15	7	4	22	60	132	28	7	4	4
8	21	65	55	11	7	4	23	70	144	28	7	4	4
9	21	65	55	11	7	4	24	82	138	28	7	4	4
10	21	65	55	11	7	4	25	87	132	21	7	4	4
11	21	65	45	11	4	4	26	87	125	21	7	4	4
12	21	55	45	11	4	4	27	99	112	21	7	4	6
13	21	55	45	11	4	4	28	99	112	21	7	4	7
14	21	60	45	7	4	4	29	112	118	21	7	4	7
15	21	70	45	7	4	4	30	93	99	21	7	4	7
							31		87		7	4	

Monthly discharge of Revais Creek near Dixon, Mont., for the year ending Sept. 30, 1919.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
April	112	15	42.0	2,500
May	144	55	92.1	5,660
June	87	21	43.6	2,590
July	21	7	9.97	613
August	11	4	5.42	333
September	7	4	4.37	260
				12,000

PRIEST RIVER AT OUTLET OF PRIEST LAKE, NEAR COOLIN, IDAHO.

LOCATION.—In SW. ¼ sec. 5, T. 59 N., R. 4 W., at southwest end of Priest Lake, 2 miles northwest of Coolin, in Bonner County.

DRAINAGE AREA.—572 square miles.

RECORDS AVAILABLE.—June 18, 1911, to September 30, 1920; fragmentary.

GAGE.—Stevens water-stage recorder on right bank 600 feet below outlet; installed November 24, 1914; inspected by J. K. Ward. June 18, 1911, to April 6, 1912, and July 13, 1912, to January 8, 1913, two vertical staff gages on wharf at Coolin (not accurately referred to bench marks before being destroyed by ice). April 18, 1913, to November 23, 1914, and August 26 to October 9, 1915 (when water-stage recorder was not operating), inclined staff about 200 feet east of wharf at Coolin.

DISCHARGE MEASUREMENTS.—Prior to September 17, 1913, made from a boat at outlet; after that date, made from a cable about 300 feet above, or by wading.

CHANNEL AND CONTROL.—Bed rough; banks high; control permanent. Many large boulders and angular rocks at control catch logs and cause backwater.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1, 1917, to September 30, 1918, and May 1, 1919, to September 30, 1920, from water-stage recorder, 5.86 feet on May 29, 1919 (discharge, 5,800 second-feet); minimum stage, from recorder, 0.29 foot November 1 and 2, 1917 (discharge, 172 second-feet); may have been lower at some period when recorder was not operating or when stage-discharge relation was affected by logs.

1911–1920: Maximum stage recorded, 6.83 feet at 1.30 p. m. May 30, 1917 (discharge, 7,290 second-feet); minimum stage recorded November 1 and 2, 1917.

ICE.—Ice forms on lake and occasionally in river just below outlet. Stage-discharge relation not affected by ice except possibly for short periods when ice, running out of lake, jams on rocks at control.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent except as affected by logs over indeterminate periods. Open-water rating curves well defined; curve used after January 4, 1918, revised slightly so as to average the current-meter measurements better. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage-height graph. Records excellent October 1 to December 23, 1917; thereafter poor on account of stage-discharge relation being affected by logs and unsatisfactory operation of recorder.

COOPERATION.—Gage-height record furnished by United States Forest Service.

Discharge measurements of Priest River at outlet of Priest Lake, near Coolin, Idaho, during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Aug. 31	Paulsen and Parker....	0.81	378	May 2	John McCombs.....	1.96	1,060
Oct. 16	John McCombs.....	.40	218	June 3	.....do.....	3.38	2,510
				Aug. 19	.....do.....	1.06	500
1920.				Sept. 29	D. J. F. Calkins.....	1.45	684
May 2	.....do.....	1.99	1,090	30	.....do.....	1.45	665

Daily discharge, in second-feet, of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the years ending Sept. 30, 1918–1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1917–18.												
1	254	172	181		611	514	875	2,400	3,290	2,240	804	548
2	250	172	178	650	599	509	910	2,570		2,130	804	524
3	244	175	184		596	528	910	2,690		2,020	795	509
4	247	181	199		593	524	910	2,930		1,920	781	499
5	247	187	202	726	591	514	950	3,170		1,870	763	490
									3,500			
6	247	187	208	744	588	499	990	3,290		1,820	751	485
7	254	187	205	763	585	499	1,030	3,290		1,770	738	471
8	258	187	202	766	582	485	1,030	3,410		1,790	726	471
9	258	187	205	769	580	485	1,110	3,290		1,670	703	462
10	247	187	202	757	577	490	1,200	3,290		1,620	680	462
11	244	187	202	763	574	495	1,280	3,290		1,520	674	457
12	244	187	212	763	571	495	1,380	3,290		1,520	657	457
13	236	190	222	757	568	495	1,520	3,290	3,900	1,470	652	457
14	233	190	230	751	566	490	1,620	3,410		1,420	641	466
15	230	187	230	751	563	490	1,670	3,540		1,380	641	462
16	219	187	264	744	560	485	1,720	3,670		1,330	636	457
17	219	184	279	738	557	490	1,720	3,670		1,280	636	457
18	212	184	308	732	555	509	1,720	3,670		1,280	620	452
19	205	181	327	726	552	519	1,770	3,630		1,240	630	448
20	202	181	339	708	549	519	1,770	3,590	3,300	1,200	620	439
21	202	184	347	703	546	533	1,820	3,540		1,150	609	430
22	199	184	364	697	544	543	1,870	3,500		1,110	609	362
23	193	184	364	691	541	568	1,970	3,460		1,070	599	358
24	193	184		685	538	589	2,080	3,420		1,030	599	354
25	187	184		680	538	609	2,130	3,370	2,810	990	589	350
26	187	181		674	543	646	2,180	3,330	2,690	950	584	350
27	190	184	450	657	578	691	2,180	3,290	2,690	950	573	346
28	187	190		652	524	720	2,240	3,290	2,570	910	563	338
29	187	193		652	.....	757	2,300	3,290	2,570	910	558	338
30	187	184		636	.....	788	2,350	3,290	2,350	875	548	334
31	178	.....		624	.....	827	.....	3,290	.....	875	538	.....
1919.												
1	.....	.....	.....	.....	.....	.....	.....	4,060	5,350	2,400	798	370
2	.....	.....	.....	.....	.....	.....	.....	4,020	5,050	2,350	776	374
3	.....	.....	.....	.....	.....	.....	.....	3,970	4,900	2,240	755	358
4	.....	.....	.....	.....	.....	.....	.....	3,930	4,760	2,130	734	346
5	.....	.....	.....	.....	.....	.....	.....	3,890	4,620	2,080	712	342
6	.....	.....	.....	.....	.....	.....	.....	3,840	4,480	1,970	691	350
7	.....	.....	.....	.....	.....	.....	.....	3,800	4,340	1,870	686	354
8	.....	.....	.....	.....	.....	.....	.....	3,760	4,200	1,820	663	346
9	.....	.....	.....	.....	.....	.....	.....	3,710	4,060	1,720	641	338
10	.....	.....	.....	.....	.....	.....	.....	3,670	3,930	1,670	636	334
11	.....	.....	.....	.....	.....	.....	.....	3,630	3,670	1,620	615	322
12	.....	.....	.....	.....	.....	.....	.....	3,580	3,540	1,520	599	319
13	.....	.....	.....	.....	.....	.....	.....	3,540	3,410	1,470	578	322
14	.....	.....	.....	.....	.....	.....	.....	3,540	3,290	1,420	578	322
15	.....	.....	.....	.....	.....	.....	.....	3,410	3,290	1,380	568	319
16	.....	.....	.....	.....	.....	.....	.....	3,540	3,290	1,330	563	307
17	.....	.....	.....	.....	.....	.....	.....	3,670	3,170	1,280	558	303
18	.....	.....	.....	.....	.....	.....	.....	3,670	3,170	1,240	548	292
19	.....	.....	.....	.....	.....	.....	.....	3,670	3,170	1,150	543	285
20	.....	.....	.....	.....	.....	.....	.....	3,930	3,170	1,110	528	277
21	.....	.....	.....	.....	.....	.....	.....	4,200	3,170	1,070	519	274
22	.....	.....	.....	.....	.....	.....	.....	4,480	3,170	1,030	504	270
23	.....	.....	.....	.....	.....	.....	.....	4,880	3,050	990	490	266
24	.....	.....	.....	.....	.....	.....	.....	5,050	3,050	969	466	259
25	.....	.....	.....	.....	.....	.....	.....	5,200	2,930	947	457	255
26	.....	.....	.....	.....	.....	.....	.....	5,350	2,930	926	434	262
27	.....	.....	.....	.....	.....	.....	.....	5,500	2,810	905	416	266
28	.....	.....	.....	.....	.....	.....	.....	5,650	2,690	883	404	244
29	.....	.....	.....	.....	.....	.....	.....	5,800	2,690	862	399	233
30	.....	.....	.....	.....	.....	.....	.....	5,650	2,570	840	391	222
31	.....	.....	.....	.....	.....	.....	.....	5,500	.....	819	382	.....

Daily discharge, in second-feet, of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the years ending Sept. 30, 1918–1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	222	225		319	315	286	387	950	2,460	2,240	814	391
2	225	229		315	315	283	390	1,030	2,460	2,180	794	391
3	225	229		303	312	281	393	1,070	2,460	2,130	763	387
4	225	236		296	312	279	397	1,110	2,460	2,080	738	378
5	211	244		292	307	276	400	1,150	2,460	2,020	720	366
6	211	240	240	296	312	274	403	1,200	2,460	1,920	703	362
7	207	244		296	319	280	406	1,240	2,570	1,870	680	362
8	216	240		292	319	287	410	1,240	2,570	1,790	657	354
9	225	233			319	294	413	1,380	2,690	1,700	646	342
10	229	236			317	300	416	1,770	2,810	1,620	630	342
11	225	233			314	306	421	2,130	2,810	1,570	630	370
12	218		225		312	313	426	2,300	2,810	1,520	630	383
13	214		229		310	320	457	2,460	2,810	1,570	615	420
14	211		229	290	308	326	490	2,690	2,810	1,520	589	426
15	207	240	233		306	327	524	2,810	2,930	1,470	578	504
16	207		240		303	329	538	2,930	3,050	1,420	543	509
17	207		242		301	330	558	2,930	3,050	1,380	504	519
18	203		243		299	331	578	3,050	3,050	1,330	495	519
19	200	277	245		296	333	599	3,050	3,050	1,280	485	519
20	200	277	246		294	334	625	3,170	2,930	1,240	471	514
21	200	285	248		292	334	657	3,170	2,930	1,200	471	534
22	214	285	251		292	338	680	3,170	2,930	1,150	457	553
23	218	285	259		291	342	703	3,170	2,930	1,110	452	573
24	188	277	277	300	290	350	720	3,050	2,810	1,070	439	599
25	192	285	288		290	358	726	2,930	2,690	1,030	426	615
26	196	270	300		290	362	751	2,930	2,690	990	412	630
27	188		303		289	370	775	2,810	2,570	950	412	652
28	196	270	311		288	374	820	2,570	2,460	910	395	662
29	200		315		288	374	875	2,570	2,350	910	399	680
30	203		315	319	.....	374	910	2,570	2,300	875	412	691
31	207	.....	319	319	.....	378	.....	2,570	.....	834	399	.....

NOTE.—Recorder not operating over frequent periods; braced figures show mean discharge for periods included, determined after comparison with records of flow of other streams. Discharge, Jan. 31 to Feb. 1, Feb. 3–23, and May 19–26, 1918, May 2–12, July 24 to Aug. 5, Oct. 8, and Dec. 17–20, 1919, and Feb. 10–20, 22–28, Mar. 1–5, 6–13, 15–19, Apr. 2–9, July 8–9, and Sept. 21, 1920, interpolated.

Monthly discharge of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the years ending Sept. 30, 1918–1920.

[Drainage area, 572 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1917–18.						
October	258	178	221	0.386	0.44	13,600
November	193	172	184	.322	.36	10,900
December	.....	178	299	.523	.60	18,400
January	769	.....	707	1.24	1.43	43,500
February	611	524	567	.991	1.03	31,500
March	827	485	558	.976	1.13	34,300
April	2,350	875	1,570	2.74	3.06	93,400
May	8,670	2,400	3,300	5.77	6.65	203,000
June	.....	2,350	3,360	5.87	6.55	200,000
July	2,240	875	1,400	2.45	2.82	86,100
August	804	538	656	1.15	1.33	40,300
September	548	334	434	.759	.85	25,800
The year	.....	172	1,110	1.94	26.25	801,000

Monthly discharge of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the years ending Sept. 30, 1918–1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919.						
May	5,800	3,410	4,260	7.45	8.59	262,000
June	5,350	2,570	3,600	6.29	7.02	214,000
July	2,400	819	1,420	2.48	2.86	87,300
August	798	382	569	.995	1.15	35,000
September	374	222	304	.531	.59	18,100
The period						616,000
1919–20.						
October	229	188	209	.365	.42	12,900
November	285		253	.442	.49	15,100
December	319		257	.449	.52	15,800
January	319		298	.521	.60	18,300
February	319	288	303	.530	.57	17,400
March	378	274	324	.566	.65	19,900
April	910	387	562	.983	1.10	33,400
May	3,170	950	2,300	4.02	4.64	141,000
June	3,050	2,300	2,710	4.74	5.29	161,000
July	2,240	834	1,450	2.53	2.92	89,200
August	814	395	560	.979	1.13	34,400
September	691	342	485	.848	.95	28,900
The year	3,170	188	810	1.42	19.28	587,000

SULLIVAN LAKE NEAR METALINE FALLS, WASH.

LOCATION.—Approximately in sec. 31, T. 39 N., R. 44 E. (unsurveyed), near forest-ranger station at north end of Sullivan Lake, 4¼ miles east of Metaline Falls, in Pend Oreille County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 16, 1912, to September 30, 1920.

GAGE.—Since May 9, 1913, float gage on dam at outlet of lake; read once daily to half-tenths by A. J. McDougall. Prior to May 9, 1913, a vertical staff gage at same site and datum.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 26.6 feet May 23; minimum stage recorded, 11.2 feet March 10, 31, and April 1.

Maximum stage recorded during year ending September 30, 1920, 23.6 feet July 25; minimum stage recorded, 0.7 foot April 9–10, 1920.

1912–1920: Maximum stage recorded, 26.6 feet June 17–20, 1916, and May 23, 1919; minimum stage recorded April 9–10, 1920.

REGULATION.—Most of the surplus flow of Sullivan Creek is diverted into the lake. Sufficient water is stored in the lake to afford a continuous flow of about 60 second-feet in flume of Inland Portland Cement Co. Zero of gage at elevation of gate sills; crest of log chute is 22 feet, and crest of spillway 25 feet above gate sills.

COOPERATION.—Gage height furnished by Inland Portland Cement Co.

Daily gage height, in feet, of Sullivan Lake near Metaline Falls, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	16.5	15.2	13.95	12.7	11.8	11.7	11.2	20.2	25.2	25.0	23.9	.....
2	16.5	15.2	13.9	12.7	11.8	11.5	11.3	20.75	26.0	25.0	23.9	.....
3	16.4	15.3	13.95	12.6	11.75	11.4	11.3	21.2	26.0	24.95	23.85	.....
4	16.4	15.2	13.9	12.5	11.8	11.3	11.4	21.5	26.0	24.95	23.85	22.1
5	16.4	15.2	13.85	12.4	11.95	11.4	11.6	21.7	25.95	24.9	23.8	22.05
6	16.4	15.1	13.8	12.3	12.05	11.4	11.7	22.0	25.9	24.9	23.7	22.0
7	16.35	15.05	13.75	12.2	12.1	11.4	11.95	22.5	25.85	24.9	23.6	21.95
8	16.25	15.0	13.7	12.1	12.15	11.3	12.3	22.8	25.8	44.85	23.6	21.9
9	16.15	15.0	13.7	12.0	12.3	11.25	12.4	23.2	25.9	24.8	23.5	21.9
10	15.95	14.9	13.6	12.95	12.4	11.2	12.6	23.4	25.9	24.75	23.45	21.85
11	15.9	14.8	13.6	11.95	12.4	11.3	12.9	23.6	25.85	44.7	23.4	21.85
12	15.85	14.7	13.6	11.9	12.3	11.3	13.1	23.9	25.8	24.65	23.35	21.8
13	15.85	14.6	13.55	12.0	12.05	11.3	13.3	24.3	25.7	24.5	23.3	2.8
14	15.85	14.6	13.6	12.1	11.95	11.3	13.4	24.6	25.6	24.5	23.3	21.7
15	15.8	14.6	13.6	12.1	11.9	11.3	13.7	24.8	25.7	24.5	23.2	21.6
16	15.85	14.6	13.6	12.1	11.9	11.4	13.9	25.1	25.7	24.5	23.15	21.55
17	15.8	14.5	13.5	12.1	11.9	11.4	14.4	25.3	25.6	24.5	23.1	21.5
18	15.8	14.5	13.5	12.0	11.85	11.4	14.6	25.4	25.55	24.5	23.05	21.45
19	15.75	14.45	13.4	12.0	11.8	11.4	14.8	25.5	25.45	24.5	23.0	21.4
20	15.6	14.45	13.45	12.1	11.8	11.4	15.0	25.7	25.35	24.45	23.0	21.35
21	15.5	14.4	13.4	12.1	11.7	11.5	15.1	26.0	25.3	24.4	22.95	21.35
22	15.5	14.3	13.3	12.1	11.7	11.6	15.3	26.1	25.3	24.4	22.9	21.3
23	15.5	14.25	13.25	12.2	11.65	11.6	15.75	26.6	25.3	24.4	22.85	21.2
24	15.4	14.25	13.2	12.2	11.6	11.6	16.0	26.5	25.3	24.4	22.8	21.1
25	15.4	14.2	.....	12.2	11.6	11.5	16.5	26.4	25.25	24.4	22.75	21.0
26	15.4	14.2	13.1	12.0	11.7	11.5	17.0	26.4	25.2	24.4	22.75	20.9
27	15.3	14.15	13.0	12.0	11.7	11.5	17.5	26.3	25.2	24.3	22.7	20.8
28	15.35	14.1	13.0	12.0	11.7	11.4	18.1	26.3	25.15	24.2	22.6	20.7
29	15.3	14.05	.....	11.9	.....	11.4	18.7	26.2	25.1	24.1	22.6	20.6
30	15.3	14.0	.....	11.85	.....	11.3	19.5	26.1	25.05	24.0	22.5	20.5
31	15.3	.....	12.75	11.8	.....	11.2	.....	25.9	.....	23.9	.....	.....
1919–20.												
1	20.4	18.4	11.0	7.1	3.2	1.2	0.85	2.7	14.1	22.2	23.2	20.7
2	20.4	18.3	10.8	7.0	3.2	1.15	.85	2.8	14.3	22.3	23.1	20.6
3	20.3	18.1	10.65	6.9	3.2	1.15	.85	2.9	14.5	22.4	23.0	20.5
4	20.2	18.0	10.5	6.7	3.1	1.15	.8	2.9	14.7	22.5	23.0	20.4
5	20.1	17.85	10.4	6.5	3.0	1.1	.8	3.0	14.9	22.55	22.95	20.3
6	20.0	17.7	10.3	6.4	3.0	1.1	.8	3.1	15.0	22.55	22.75	20.3
7	19.95	17.6	10.2	6.2	2.9	1.1	.75	3.3	15.3	22.6	22.55	20.3
8	19.9	17.5	10.1	6.0	2.8	1.1	.75	3.4	15.5	22.7	22.4	20.25
9	19.8	17.25	10.0	5.8	2.8	1.1	.7	3.6	15.8	22.75	22.4	20.25
10	19.7	16.8	9.8	5.6	2.8	1.1	.7	3.8	15.0	22.8	22.35	20.2
11	19 6	16.3	9.7	5.5	2.7	1.1	.9	4.1	16.3	22.85	22.3	20.2
12	20.1	15.8	9.6	5.5	2.5	1.1	1.0	4.2	16.5	22.9	22.25	20.1
13	20.0	15.3	9.5	5.4	2.35	1.2	1.1	4.4	16.8	22.95	22.2	20.05
14	19.9	14.7	9.4	5.3	2.2	1.1	1.2	4.5	17.3	23.1	22.2	20.05
15	19.85	14.2	9.3	5.1	2.1	1.1	1.3	4.6	17.9	23.15	22.2	20.05
16	19.8	13.9	9.05	4.9	2.0	1.05	1.4	5.5	18.4	23.2	22.1	19.95
17	19.8	13.6	8.8	4.8	1.8	1.0	1.4	6.0	18.6	23.3	22.1	19.95
18	19.7	13.4	8.6	4.7	1.7	1.0	1.4	6.9	18.8	23.4	22.0	19.9
19	19.6	13.1	8.4	4.5	1.6	1.0	1.5	7.2	18.9	23.4	21.95	19.9
20	19.5	12.9	8.2	4.3	1.5	1.0	1.6	8.5	19.3	23.4	21.95	19.9
21	19.4	12.7	8.0	4.1	1.3	1.0	1.6	9.9	19.6	23.45	21.9	19.9
22	19.3	12.5	7.9	3.9	1.2	1.05	1.7	11.0	19.9	23.5	21.8	20.0
23	19.2	12.3	7.75	3.7	1.2	1.0	1.8	11.6	20.3	23.55	21.7	20.05
24	19.1	12.1	7.7	3.5	1.2	1.05	2.0	12.4	20.6	23.5	21.6	20.05
25	19.0	11.8	.....	3.3	1.2	1.15	2.1	12.7	20.9	23.6	21.5	20.05
26	19.0	11.6	7.6	3.2	1.2	1.1	2.1	12.95	21.3	23.55	21.4	20.0
27	18.9	11.55	7.5	3.1	1.2	1.0	2.2	13.4	21.6	23.55	21.35	20.05
28	18.8	11.4	7.4	3.1	1.2	.95	2.3	13.6	21.8	23.5	21.3	20.0
29	18.7	11.3	7.3	3.1	1.2	.9	2.4	13.8	21.9	23.45	21.2	20.0
30	18.6	11.2	7.3	3.1	.....	.9	2.6	13.9	22.0	23.4	21.0	20.0
31	18.5	.....	7.2	3.2	.....	.9	.....	14.0	.....	23.3	20.8	.....

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SULLIVAN CREEK NEAR METALINE FALLS, WASH.

LOCATION.—In sec. 30, T. 39 N., R. 44 E., one-eighth mile below Outlet Creek, half a mile below Sullivan Lake, and 4 miles east of Metaline Falls, Pend Oreille County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 16, 1912, to September 30, 1920.

GAGE.—Vertical staff in four sections on left bank, installed September 21, 1917. Lower sections of gage destroyed May 17, 1919, and a temporary gage was installed May 25 at same location; readings from temporary gage referred to datum of previous gage. Gage read by A. J. McDougall. Prior to September 21, 1917, vertical staff on right bank directly opposite present gage and at same datum.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 40 feet below gage.

CHANNEL AND CONTROL.—Stream bed of cobblestones and coarse gravel; shifting. Banks high and not subject to overflow. Gradient steep. Stage of zero flow, according to measurements made October 27, 1919, gage height 0.0 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 4.4 feet May 23 (discharge, 1,580 second-feet); minimum stage recorded, 1.10 feet March 25 (discharge, 46 second-feet).

Maximum stage recorded during year ending September 30, 1920, 2.3 feet on June 10 and 19 (discharge, 495 second-feet); minimum stage recorded, 0.95 foot April 2–5 (discharge, 56 second-feet).

1912–1920: Maximum stage recorded, 4.2 feet June 2, 1913 (discharge, 1,650 second-feet); minimum stage recorded on March 25, 1919.

ICE.—Stage-discharge relation affected by ice only during extremely severe winters.

DIVERSIONS.—Water is diverted from Sullivan Creek about a mile above station for storage in Sullivan Lake, but entire run-off of drainage basin passes gage.

REGULATION.—Storage in Sullivan Lake is used by Inland Portland Cement Co. to increase low-water flow.

ACCURACY.—Stage-discharge relation changed on April 8 and May 23, 1919; slightly affected by ice December 11–16, 1919. Rating curves fairly well defined up to 1,000 second-feet. Gage read to hundredths once daily; difficult to read gage accurately owing to surge. Daily discharge ascertained by applying daily gage height to rating table. Records poor prior to May 23, 1919; good thereafter.

COOPERATION.—Station maintained in cooperation with United States Forest Service and Inland Portland Cement Co.

Discharge measurements of Sullivan Creek near Metaline Falls, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 20	D. J. F. Calkins	1.38	89.6	Apr. 26	John McCombs	1.06	68.2
21	do	1.35	83.4	26	do	1.06	70.1
1919.				May 20	do	1.72	244
Apr. 23	R. B. Kilgore	1.69	189	Aug. 9	do	1.23	104
23	do	1.69	186	9	do	1.23	103
Oct. 27	John McCombs	1.16	83.6				
27	do	1.16	86.4				

Daily discharge, in second-feet, of Sullivan Creek near Metaline Falls, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	77	81	97	64	106	84	74	526	1,030	361	109	106
2	77	83	97	64	103	88	77	526	880	361	118	110
3	79	83	97	64	103	88	79	479	731	340	123	114
4	81	84	97	81	99	88	120	479	635	318	155	118
5	83	84	97	81	95	86	145	433	780	318	149	136
6	81	84	99	81	92	86	180	410	731	297	146	138
7	83	83	99	81	92	86	186	387	731	297	133	141
8	83	83	99	79	92	86	278	433	683	276	128	144
9	81	83	99	79	101	86	258	433	683	276	120	141
10	81	81	81	79	103	86	258	387	731	264	120	141
11	83	83	72	83	101	67	258	320	635	264	120	141
12	86	79	72	83	95	66	208	299	635	248	118	141
13	83	81	70	81	90	67	115	278	635	186	111	146
14	83	83	74	81	88	67	113	299	685	173	107	111
15	84	83	72	81	88	69	115	342	635	160	107	109
16	101	84	72	81	88	64	128	433	635	160	105	109
17	103	81	70	81	88	62	133	526	635	149	102	109
18	101	81	70	86	86	60	173	574	635	138	100	109
19	101	81	70	106	86	59	183	622	635	138	100	102
20	88	81	70	108	86	59	193	790	635	146	100	102
21	83	81	69	108	86	59	193	790	588	138	100	100
22	83	79	69	108	86	60	193	1,240	588	136	100	98
23	81	69	69	106	86	66	186	1,580	588	136	100	98
24	81	64	69	106	84	52	190	1,520	588	133	98	98
25	81	70	68	106	84	46	258	1,460	564	133	98	100
26	81	70	67	108	84	67	342	1,400	541	133	98	109
27	81	81	67	108	84	110	433	1,340	541	133	98	111
28	84	95	67	108	84	59	502	1,460	541	133	96	109
29	84	97	67	108	.....	62	526	1,180	405	133	96	109
30	83	97	67	106	.....	70	526	1,130	361	109	98	109
31	81	.....	67	106	.....	74	.....	1,130	.....	109	102	.....
1919–20.												
1	109	89	113	105	113	75	57	78	144	166	126	361
2	109	89	109	102	118	75	56	60	138	166	123	361
3	102	87	111	102	118	75	56	59	173	166	120	340
4	100	85	109	92	118	75	56	62	179	166	120	318
5	100	85	109	89	118	74	56	87	199	166	120	318
6	100	85	107	89	118	72	57	75	236	166	116	236
7	100	84	107	89	118	72	59	92	318	166	113	144
8	100	84	102	92	116	72	60	113	340	155	113	128
9	100	126	109	92	113	71	61	141	450	141	98	113
10	98	126	102	113	113	71	61	173	495	138	96	138
11	98	126	100	113	111	67	75	276	405	138	100	149
12	98	128	100	113	109	61	84	297	340	136	102	152
13	98	130	100	113	107	64	75	276	383	133	102	182
14	98	133	100	109	107	66	75	276	361	128	98	192
15	98	138	100	107	105	66	61	276	361	138	98	189
16	98	141	100	107	105	61	61	276	361	146	96	182
17	98	138	102	107	105	61	68	318	450	144	96	176
18	98	144	100	107	105	60	75	297	450	146	94	163
19	96	144	100	105	105	60	84	297	495	146	94	160
20	96	141	100	98	105	59	85	256	361	146	92	160
21	96	141	102	109	94	59	85	199	450	146	92	160
22	96	138	102	138	90	60	85	138	450	138	340	141
23	96	138	107	138	89	59	87	113	428	138	340	138
24	90	133	107	138	85	59	87	92	818	136	340	138
25	87	136	107	138	85	59	84	166	276	133	340	129
26	90	133	107	133	85	59	69	199	297	133	318	116
27	92	123	107	133	80	58	80	276	297	130	318	113
28	94	113	109	133	75	58	94	236	218	130	318	113
29	92	113	109	138	75	58	92	236	199	128	405	113
30	92	113	107	138	.....	58	94	199	166	128	405	111
31	90	.....	107	138	.....	57	.....	179	.....	128	361	.....

NOTE.—Gage not read Dec. 25 and 29–30, 1918, Aug. 31 to Sept. 3 and Dec. 25, 1919; discharge interpolated. Gage heights May 17–24, 1919, estimated by observer. Stage-discharge relation slightly affected by ice Dec. 11–16, 1919.

Monthly discharge of Sullivan Creek near Metaline Falls, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	103	77	84.6	5,200
November	97	64	81.6	4,860
December	99	67	78.1	4,800
January	108	64	90.4	5,560
February	106	84	91.4	5,080
March	110	46	71.9	4,420
April	526	74	221	13,200
May	1,580	278	749	46,100
June	1,030	361	642	38,200
July	361	109	203	12,500
August	155	96	111	6,820
September	146	98	117	6,960
The year	1,580	46	212	154,000
1919–20.				
October	109	87	97.1	5,970
November	144	84	119	7,080
December	113	100	105	6,450
January	138	89	113	6,950
February	118	75	103	5,920
March	75	57	64.5	3,970
April	94	56	72.6	4,320
May	318	59	188	11,600
June	495	138	325	19,300
July	166	128	144	8,850
August	405	92	184	11,300
September	361	111	181	10,800
The year	495	56	141	103,000

KETTLE RIVER BASIN.

CURLEW CREEK NEAR CURLEW, WASH.

LOCATION.—In sec. 21, T. 38 N., R. 33 E., 400 feet below mouth of Lambert Creek half a mile below outlet of Curlew Lake, 9 miles above Curlew, and 12 miles northeast of Reliance, Ferry County.

DRAINAGE AREA.—93 square miles (measured on topographic and Forest service maps; uncertain because divide between Curlew Creek and Sanpoil River can not be determined accurately).

RECORDS AVAILABLE.—May 4, 1917, to September 30, 1920.

GAGE—Vertical staff on right bank attached to upstream wing wall of railroad culvert; read by Henry Kuehne and Mrs. P. G. Kuehne. Gage was lowered 0.3 foot August 25, 1920; gage readings August 25 to September 30, 1920, reduced to datum of previous gage.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Sensitive control formed by wooden culvert under railroad, having a free fall of 1 foot. Banks above gage fairly high, not subject to overflow. Channel below culvert crooked, subject to overflow at high stages. Stage of zero flow, according to levels run October 8, 1918, gage height −0.12 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 2.4 feet May 23 (discharge, 50 second-feet); minimum discharge estimated at 0.5 second-foot December 31 to January 5, when stage-discharge relation was affected by ice.

Maximum stage recorded during year ending September 30, 1920, 0.9 foot May 14 and 15 (discharge, 12 second-feet); no flow December 12 and 13 and September 22–26 and 29–30.

1917–1920: Maximum stage recorded, 3.08 feet May 30, June 2 and 6, 1917 (discharge, 65 second-feet); no flow December 12 and 13, 1919, and September 22–26 and 29–30, 1920.

ICE.—Stage-discharge relation seriously affected by ice; flow estimated from gage-height record, observer's notes, and weather records.

DIVERSIONS.—None.

REGULATION.—Natural storage in Curlew Lake.

ACCURACY.—Stage-discharge relation changed by leak under the control for indefinite periods assumed to be April 1 to June 18, 1919, February 1 to March 31, and August 1–24, 1920; also affected by ice. Rating curves well defined. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table or by shifting-control method during periods when stage-discharge relation was affected by leakage under the control. Records excellent except for periods when stage-discharge relation was affected by leakage under the control or by ice, for which periods they are fair.

Discharge measurements of Curlew Creek near Curlew, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 8	D. J. F. Calkins	0.15	1.04	Aug. 21	G. L. Parker	0.20	1.38
8	do	.15	.99				
8	do	.15	1.08	1920.			
				Apr. 8	John McCombs	.20	2.06
1919.				8	do	.20	2.30
May 8	R. B. Kilgore	2.02	40.0	May 14	do	.90	11.7
9	do	2.06	40.3	14	do	.88	11.4
Aug. 21	G. L. Parker	.20	1.42	Aug. 25	do	.00	*a*.25

a Estimated; flow too small to measure.

Daily discharge, in second-feet, of Curlew Creek near Curlew, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	0.9	1.1	1.4		5.9	5.0	15.7	42	42	7.3	2.5	1.0
2	1.0	1.3	1.6		6.2	4.9	15.7	42	39	7.6	2.4	1.0
3	1.0	1.3	1.6		5.7	4.7	16.8	42	37	7.5	2.3	1.0
4	1.0	1.5	1.8		4.9	4.6	17.8	42	36	7.1	2.4	1.2
5	1.1	1.4	1.9		4.6	4.7	18.8	42	33	6.8	2.8	1.3
6	1.0	1.4	1.9		4.3	4.7	19.9	42	32	6.5	2.7	1.1
7	1.0	1.3	1.8		3.9	4.8	21	42	29	6.7	2.6	1.3
8	1.0	1.3	1.9		4.4	4.8	22	39	29	6.4	2.4	1.4
9	1.0	1.1	1.8	0.6	5.1	4.9	22	39	28	6.1	2.4	1.5
10	1.0	1.4	1.8		5.8	4.9	22	39	27	5.8	2.3	1.6
11	1.0	1.4	1.9		5.5	5.0	23	42	24	5.7	2.2	1.8
12	1.0	1.3	2.0		5.4	4.9	23	42	23	5.5	2.2	1.7
13	1.0	1.3	2.0		5.1	4.6	23	42	22	5.4	2.1	1.6
14	1.0	1.4	2.0		5.0	4.5	23	42	21	3.9	2.0	1.4
15	1.0	1.6	2.1		5.2	4.3	23	44	19.9	3.8	1.9	1.5
16	1.2	1.6			5.1	4.1	24	44	18.8	3.6	1.8	1.4
17	1.4	1.7		.6	5.0	4.0	24	44	17.8	3.7	1.8	1.3
18	1.6	1.7		1.0	5.1	7.1	26	44	16.8	3.6	1.7	1.4
19	1.3	1.8		2.2	5.4	11.2	28	44	15.7	3.4	1.6	1.3
20	1.1	1.7		2.0	5.5	12.6	28	47	13.6	3.4	1.6	1.3
21	1.0	1.6		2.0	5.8	11.2	29	47	11.6	3.2	1.4	1.3
22	1.0	1.6		2.2	5.4	10.9	29	50	11.6	3.3	1.4	1.2
23	1.0	1.5		3.0	4.9	11.6	30	50	11.1	3.4	1.3	1.1
24	.9	1.6	1.0	3.6	4.6	12.6	32	50	10.5	3.4	1.3	1.1
25	1.0	1.7		3.9	4.4	12.6	34	47	8.1	3.2	1.2	1.0
26	1.0	2.0		4.6	4.5	12.6	36	44	8.1	3.1	1.2	1.0
27	1.0	1.8		4.9	4.9	13.6	37	47	7.9	2.8	1.1	1.0
28	1.0	1.6		5.2	5.1	14.6	39	47	7.6	2.8	1.0	.9
29	1.0	1.6		5.4	.....	14.6	39	47	7.5	2.8	1.0	1.0
30	1.0	1.4		5.5	.....	15.7	39	44	7.1	2.7	1.1	.9
31	1.0	.....		5.7	.....	15.7	.....	44	.....	2.6	1.2	.....

Daily discharge, in second-feet, of Curlew Creek near Curlew, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	0.8	0.9	2.2		1.8	2.3	2.1	6.1	6.5	3.3	1.6	0.4
2	.8	1.0			1.9	2.4	2.2	6.2	6.7	3.3	1.5	.5
3	.8	1.1			2.0	2.5	2.4	6.4	6.8	3.3	1.2	.4
4	.8	1.3			2.1	2.6	2.4	6.8	6.7	3.1	1.1	.3
5	.8	1.5			2.3	2.5	2.3	7.4	6.4	2.9	1.0	.3
6	.7	1.6	1.0		2.5	2.4	2.3	8.3	6.5	2.7	.8	.3
7	.7	1.9		1.5	2.5	2.3	2.4	8.8	7.4	2.7	.8	.4
8	.7	2.1			2.6	2.3	2.2	9.1	8.6	2.7	.8	.3
9	.8	2.3			2.9	2.4	2.5	9.7	8.3	2.6	.7	.4
10	.7	2.4			2.8	2.5	2.6	10	7.4	2.4	.7	.3
11	.7				2.6	2.8	2.8	10	6.8	2.4	.7	.3
12	.7				2.6	3.0	3.1	10	6.5	2.4	.7	.3
13	.7				2.6	3.3	3.2	11	6.4	4.9	.6	.3
14	.7				2.4	3.1	3.5	12	7.1	5.2	.6	.3
15	.7	1.5			2.3	2.9	3.9	12	9.4	4.4	.6	.2
16	.8			2.0	2.2	2.6	4.2	11	9.1	3.5	.5	.2
17	.8				2.1	2.1	4.0	11	8.0	3.3	.5	.2
18	.8	1.7		2.4	2.0	2.0	3.9	10	7.7	3.1	.5	.2
19	.8	2.0	.4	2.4	2.3	1.9	3.6	9.9	7.1	2.9	.4	.2
20	.9	2.2			2.3	2.0	4.1	9.6	6.8	2.9	.4	.2
21	.9	2.4		2.0	2.6	1.9	4.4	9.1	6.5	2.7	.4	.1
22	.8	2.6			2.9	1.9	4.8	8.9	5.7	2.6	.4	.0
23	.9	2.7			3.0	2.0	5.0	8.5	6.2	2.6	.3	.0
24	1.0	2.8			3.2	2.1	5.2	8.0	5.4	2.4	.3	.0
25	1.0	3.0			2.9	2.2	5.3	7.4	5.2	2.2	.3	.0
26	1.0	2.9	1.1		2.8	2.4	5.4	7.6	4.9	2.0	.3	.0
27	1.0	2.8	1.3	1.5	2.7	2.5	5.7	7.7	4.7	1.9	.4	.1
28	.8	2.5	1.3		2.5	2.2	5.7	7.4	4.7	1.9	.4	.1
29	.8	2.4	1.4		2.4	2.4	5.8	7.0	4.4	1.9	.4	.0
30	.8	2.4	1.6		.....	2.3	6.0	6.8	4.4	1.7	.5	.0
31	.9	.....	1.8		.....	2.2	.....	6.5	.....	1.7	.5	.....

NOTE.—Discharge estimated, because of ice, from observer's notes and weather records, Dec. 16–31, 1918, Jan. 1–16, 28, Feb. 25, Mar. 5–10, Nov. 11–17, and Dec. 2–25, 1919, Jan. 1–17, 20–31, and Feb. 1–2, 1920. Braced figures show mean discharge for periods included.

Monthly discharge of Curlew Creek near Curlew, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918-19.				
October	1.6	0.9	1.05	64.6
November	2.0	1.1	1.50	89.3
December	2.1	.....	1.40	86.1
January	5.7	.....	1.98	122
February	6.2	3.9	5.10	283
March	15.7	4.0	8.26	508
April	39	15.7	26.0	1,550
May	50	39	44.0	2,710
June	42	7.1	20.5	1,220
July	7.6	2.6	4.62	284
August	2.8	1.0	1.84	113
September	1.8	.9	1.25	74.4
The year	50	.....	9.80	7,100
1919-20.				
October	1.0	.7	.81	49.8
November	3.0	.9	1.97	117
December	2.2	0	.85	52.3
January	.....	.....	1.69	104
February	3.2	1.8	2.48	143
March	3.3	1.9	2.39	147
April	6.0	2.1	3.77	224
May	12	6.1	8.72	536
June	9.4	4.4	6.61	393
July	5.2	1.7	2.83	174
August	1.6	.3	.64	39.4
September	.5	.0	.21	12.5
The year	12	.0	2.74	1,990

HALL CREEK BASIN.

HALL CREEK AT INCHELIUM, WASH.

LOCATION.—In NE. ¼ sec. 6, T. 32 N., R. 37 E., half a mile above highway bridge, three-fourths mile above mouth, and three-fourths mile northwest of Inchelium in Ferry County.

DRAINAGE AREA.—163 square miles; at former location at Wires Bridge, 3 miles above mouth, 160 square miles; measured on topographic map and maps of Colville Indian Reservation and Colville National Forest.

RECORDS AVAILABLE.—December 18, 1912, to September 30, 1920.

GAGE.—Stevens water-stage recorder on right bank half a mile above highway bridge since August 27, 1916; inspected by Walter Johnson and H. G. Parmeter. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable 15 feet downstream or by wading.

CHANNEL AND CONTROL.—Bed of stream composed of gravel and boulders; shifts during extremely high water. Channel straight above and below gage. Banks high. Stage of zero flow according to measurements made August 23, 1919, and August 27, 1920, gage height 0.7 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 3.85 feet at midnight April 29 (discharge, 730 second-feet); minimum discharge estimated at 4 second-feet on January 1, when stage-discharge relation was affected by ice.

Maximum stage during year ending September 30, 1920, from recorder, 2.22 feet at 5 p. m. May 11 (discharge, 92 second-feet); minimum stage, from recorder, 1.14 feet at 2 p. m. July 28 (discharge, 5.8 second-feet).

1912–1920: Maximum stage recorded, 3.10 feet at 6.20 a. m. April 16, 1914 (discharge, 965 second-feet); minimum discharge probably occurred on January 1, 1919.

ICE.—Stage-discharge relation seriously affected by ice; flow estimated from gage-height record, discharge measurements, observer's notes, weather records, and comparison with records for near-by streams.

DIVERSIONS.—Water is diverted for use in Gwen mine power plant but is returned above gage.

REGULATION.—Effect of operation of power plant negligible.

ACCURACY.—Stage-discharge relation changed during high water on April 30, 1919; also affected by ice. Rating curves well defined below 500 second-feet; curve used for year ending September 30, 1920, revised slightly so as to average the current-meter measurements better. Operation of water-stage recorder satisfactory except November 1–16, 1918. Because of discrepancy at high stages between readings of outside and inside gages recorder was referred to outside gage. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection. Records good except for periods when recorder was not operating or when stage-discharge relation was affected by ice, for which they are poor.

Discharge measurements of Hall Creek at Inchelium, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height	Discharge.
1918-19.		*Feet.*	*Sec.-ft.*	1919-20.		*Feet.*	*Sec.-ft.*
Oct. 10	D. J. F. Calkins	1.37	12.4	Apr. 6	John McCombs	1.50	17.6
11	do	1.36	12.2	May 7	do	2.07	69.6
Jan. 15	R. B. Kilgore	a 1.57	17.3	7	do	2.07	68.0
Apr. 13	do	3.10	333	Aug. 22	do	1.26	8.2
13	do	3.10	336	22	do	1.26	8.3
May 6	do	3.28	412				
6	do	3.28	405				
Aug. 23	G. L. Parker	1.51	16.8				
23	do	1.51	17.6				

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Hall Creek at Inchelium, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	10		13		54	45	272	658	234	62	27	18
2	10		16			44	316	634	221	61	26	18
3	10		17			44	352	574	206	58	26	17
4	11		18		40	44	420	500	192	55	31	16
5	12		20			44	520	456	182	54	35	17
				5.7								
6	13		20		48	44	465	425	170	54	33	18
7	14	20	20		46	44	432	396	162	51	29	19
8	13		19		47	44	384	380	158	48	27	20
9	13		19		48	43	352	376	150	45	25	20
10	13		18		57	44	348	380	145	44	23	20
11	13		18		60	45	356	380	138	43	23	18
12	13		16		58	45	344	380	132	42	22	22
13	12		15		56	45	344	360	125	39	22	27
14	12			16	54	46	332	344	119	37	21	22
15	12	40	11		53	48	316	332	114	35	20	20
16	13				54	47	300	332	110	35	20	18
17	20	34			54	49	320	340	106	31	20	18
18	18	29	9	18	51	58	450	332	100	31	20	18
19	16	26		28	49	66	505	328	95	31	20	18
20	14	24	7.9	38	51	65	510	336	91	31	19	17
21	14	23		31	50	67	505	348	85	31	18	17
22	13	20	7.3	31	49	74	490	364	82	30	18	17
23	13	16		67	48	83	480	372	79	29	18	18
24	13	8.5		134		98	505	368	77	30	18	17
25	13			102		106	556	348	74	29	18	17
26	14			82	47	110	604	340	71	28	17	17
27	14	9.0	7.9	77		119	640	320	68	29	17	17
28	20			73		125	706	304	67	28	17	17
29	18			69	.....	136	694	290	64	27	17	18
30	16			63	.....	175	706	276	64	26	17	18
31	16	.....		63	.....	230	.....	254	.....	26	17	.....
1919–20.												
1	20	18	.....	.....	.....	.....	17	70	48	24	10	13
2	22	20	.....	.....	.....	.....	17	70	46	23	10	12
3	21	18	.....	.....	.....	.....	17	69	44	20	10	11
4	20	18	.....	.....	.....	.....	17	68	42	19	9.7	11
5	20	19	.....	.....	.....	.....	17	65	42	18	9.7	10
6	20	18	.....	.....	.....	.....	17	61	42	18	9.7	10
7	19	18	.....	.....	.....	.....	17	66	45	17	9.3	10
8	18	18	.....	.....	.....	.....	18	72	60	17	9.3	9.7
9	18	17	.....	.....	.....	.....	18	74	58	15	9.1	9.3
10	18	19	.....	.....	.....	.....	19	74	53	15	9.3	10
11	19	18	.....	.....	.....	.....	19	85	49	14	9.3	11
12	19	18	.....	.....	.....	.....	22	85	47	17	8.8	12
13	19	18	.....	.....	.....	.....	38	79	46	20	8.6	13
14	18	18	.....	.....	.....	17	46	82	45	20	8.6	13
15	18	18	.....	.....	.....	17	37	79	47	19	8.1	14
16	18	18	.....	.....	.....	17	39	78	46	16	8.1	12
17	18	20	.....	.....	.....	17	39	74	44	15	7.6	12
18	18	23	.....	.....	.....	16	36	72	41	15	7.9	11
19	18	22	.....	.....	.....	17	40	69	39	14	8.3	10
20	18	22	.....	.....	.....	17	48	68	37	13	8.3	10
21	18	21	.....	.....	.....	16	45	65	35	13	8.1	12
22	18	20	.....	.....	.....	15	40	63	35	13	8.3	14
23	18	20	.....	.....	.....	15	42	60	33	13	8.3	18
24	18	20	.....	.....	.....	15	40	58	33	13	8.1	24
25	17	18	.....	.....	.....	14	41	56	33	12	8.3	20
26	16		.....	.....	.....	15	44	54	35	12	9.1	18
27	17		.....	.....	.....	16	54	55	32	12	10	16
28	18	18	.....	.....	.....	17	61	55	31	10	12	15
29	18		.....	.....	.....	17	61	52	28	11	13	15
30	18		.....	.....	.....	17	69	49	26	11	15	14
31	17	.....	.....	.....	.....	17	.....	48	.....	10	15	.....

NOTE.—Water-stage recorder not operating Nov. 1–16, 1918; discharge obtained by hydrographic comparison with near-by streams. Discharge estimated because of ice Nov. 25–30, Dec. 1, 14–17, 19–21, 23–31, 1918, Jan. 1–17, Feb. 2–5, 24–28, and Nov. 12–14, 1919. No record Nov. 26, 1919 to Mar. 13, 1920. Braced figures show mean discharge for period included.

Monthly discharge of Hall Creek at Inchelium, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	20	10	13.7	842
November	.....	.....	20.5	1,220
December	20	.....	12.4	762
January	134	.....	33.7	2,070
February	60	.....	40.4	2,740
March	230	43	73.5	4,520
April	706	272	450	26,800
May	658	254	382	23,500
June	234	64	123	7,320
July	62	26	38.7	2,380
August	35	17	22.0	1,350
September	27	16	18.5	1,100
The year	706	.....	103	74,600
1919–20.				
October	22	16	18.5	1,140
November	23	.....	18.9	1,120
December	.....	.....	17.0	1,050
January	.....	.....	18.0	1,110
February	.....	.....	15.0	863
March	17	.....	15.7	965
April	69	17	34.5	2,050
May	85	48	66.9	4,110
June	60	26	41.4	2,460
July	24	10	15.5	953
August	15	7.6	9.51	585
September	24	9.3	13.0	774
The year	85	7.6	23.7	17,200

NOTE.—In order that total annual flow might be determined, a rough estimate by comparison with Nespelem River at Nespelem was made for the period Dec. 1, 1919, to March 13, 1920.

STRANGER CREEK BASIN.

STRANGER CREEK AT METEOR, WASH.

LOCATION.—In sec. 21, T. 32 N., R. 36 E., at highway bridge at Meteor, 8 miles southwest of Inchelium, Ferry County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 29, 1916, to September 30, 1920.

GAGE.—Vertical staff on right bank 15 feet downstream from bridge; read by E. J. Sparling.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel. One channel at all stages. Left bank subject to overflow at extremely high stages. Concrete control 6 feet downstream from gage. Stage of zero flow, according to measurements made April 6 and August 23, 1920, gage height zero.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 2.0 feet April 7–12 and April 20 to May 3 (discharge, 164 second-feet); minimum discharge estimated at 0.5 second-foot on January 1 when stage-discharge relation was affected by ice.

Maximum stage recorded, during year ending September 30, 1920, 0.62 foot at 7.30 a. m. April 13 (discharge, 15.3 second-feet); probably no flow on December 12; creek frozen almost solid.

1916–1920: Maximum stage recorded, 2.0 feet May 15–19, 1917, April 7–12 and April 20 to May 3, 1919 (discharge, 164 second-feet); probably no flow on December 12, 1919.

ICE.—Stage-discharge relation affected by ice for short periods; flow estimated from recorded gage heights, discharge measurements, observer's notes, weather records, and comparison with near-by streams.

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed gradually June 1 to August 22, 1920, on account of leak under concrete control; also affected by ice. Rating curves well defined. Gage read twice daily to hundredths, with the exception that no readings were made on Saturday afternoons. Daily discharge ascertained by applying daily mean gage height to rating tables or by shifting-control method. Records excellent, except for periods when stage-discharge relation was affected by ice, for which they are poor, and June 1 to August 22, 1920, for which they are fair.

Discharge measurements of Stranger Creek at Meteor, Wash., during the years ending Sept. 30, 1919, and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 11	D. J. F. Calkins	0.10	0.87	May 7	R. B. Kilgore	1.74	124
11	do	.10	.82	Aug. 24	G. L. Parker	.24	2.5
1919.				24	do	.26	2.8
Jan. 16	R. B. Kilgore	a.64	3.5	1920.			
Apr. 12	do	1.95	158	Apr. 6	John McCombs	.47	8.2
12	do	1.95	154	May 7	do	.50	9.8
May 7	do	1.74	124	7	do	.50.	10.1

Daily discharge, in second-feet, of Stranger Creek at Meteor, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	0.8	1.0	3.7			15.1	49	164	45	14.2	5.6	2.4
2	.9	1.0	3.7			16.1	49	164	41	14.2	5.6	2.4
3	1.0	1.6	3.9			16.1	72	164	39	13.3	6.2	2.3
4	1.1	2.1	3.9			16.1	118	156	37	12.4	6.2	2.3
5	1.4	2.1	3.9	1	2	15.1	132	148	37	12.0	5.9	2.1
6	1.0	1.8	3.7			13.3	148	132	35	12.0	5.6	2.1
7	.9	1.8	3.7			15.1	164	125	35	11.6	5.6	2.8
8	.9	1.8	3.9			15.1	164	118	33	11.6	5.6	2.8
9	.9	1.8	3.9		14.2	15.1	164	112	30	11.2	5.0	2.8
10	.9	2.8	4.2		16.1	15.1	164	112	28	10.7	4.4	2.8
11	.9	3.1	4.4		17.2	15.1	164	112	28	10.7	3.9	2.6
12	.9	2.8	5.0		17.2	15.6	164	99	26	10.7	3.9	2.8
13	.9	2.8	5.0		17.2	15.6	156	93	25	10.7	3.9	2.8
14	.9	3.5	5.0		16.6	16.1	148	88	25	9.9	3.9	2.4
15	.9	6.2	5.0	6	16.1	16.1	148	88	23	9.9	3.7	2.4
16	1.4	4.7	5.0		14.7	15.1	148	82	23	9.5	3.7	2.3
17	1.2	4.4	5.0		12.4	16.1	148	77	22	9.1	3.7	2.4
18	1.1	4.2	5.3		13.3	16.1	156	72	21	8.4	3.5	2.4
19	1.1	4.2	5.0		19.5	16.1	156	67	21	8.0	3.1	2.4
20	1.0	4.2	5.0		16.1	18.3	164	67	21	7.6	3.1	2.4
21	1.0	4.2			16.1	17.2	164	67	19.5	7.6	3.1	2.3
22	1.0	3.9			16.1	17.2	164	67	18.3	7.6	2.8	2.3
23	1.0	2.1			13.3	18.3	164	62	18.3	6.9	2.8	2.1
24	1.0					18.3	164	60	17.2	6.9	2.8	2.1
25	1.0					19.5	164	59	17.2	6.9	2.8	2.1
26	1.0	2	1.5	5	12	21	164	58	16.1	6.9	2.8	2.1
27	1.3					23	164	56	15.1	6.6	2.4	2.1
28	1.3					27	164	52	15.1	6.6	2.4	2.0
29	1.1				.....	28	164	49	15.1	6.2	2.3	2.0
30	1.0				.....	35	164	48	14.7	6.2	2.4	2.1
31	1.0	.....			.....	40	.....	48	.....	5.9	2.4	.....

Daily discharge, in second-feet, of Stranger Creek at Meteor, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	2.1	1.7					9.9	10.7	8.4	5.0	1.1	0.9
2	2.1	1.7					9.1	10.7	8.4	4.5	1.1	.9
3	2.1	1.8					7.6	10.7	8.4	4.2	1.0	.9
4	2.1	1.8					9.5	10.3	8.4	4.2	.8	.8
5	2.0	1.8					9.1	10.3	8.1	3.8	.7	.8
6	1.8	1.8					8.7	9.9	8.1	3.3	.6	.7
7	1.7	1.8					9.1	9.9	8.5	3.3	.5	.6
8	1.7	.7					9.1	9.9	9.2	3.3	.5	.7
9	1.6						9.5	9.9	8.5	3.3	.5	.6
10	1.6						9.1	10.3	8.5	3.3	.5	.7
11	1.6						9.1	10.3	8.1	3.3	.5	.9
12	1.6	1.5					9.1	10.3	8.1	4.3	.5	1.1
13	1.6						13.3	10.3	7.7	3.8	.5	1.6
14	1.6				2	5	10.7	10.3	7.8	3.6	.5	1.6
15	1.6						10.7	10.3	7.8	3.4	.5	1.1
16	1.6	2.3	2	2			10.7	9.9	7.1	3.0	.6	1.0
17	1.6	2.4					10.7	9.9	7.1	3.0	.6	1.0
18	1.6	2.6					10.7	9.9	7.1	2.8	.6	1.0
19	1.6	2.4					11.6	9.9	6.8	2.8	.6	1.0
20	1.6	2.4					11.6	9.9	6.4	2.6	.6	1.0
21	1.6	2.4					11.6	9.5	5.8	2.6	.6	1.3
22	1.6	2.4					10.7	9.5	5.8	2.3	.6	1.8
23	1.6	2.6					10.7	9.5	5.5	2.3	.6	2.1
24	1.4	2.6					10.7	9.1	5.5	2.2	.6	2.0
25	1.4	2.6					10.7	9.1	5.5	2.0	.6	1.7
26	1.4	2.4					10.3	8.7	5.6	2.0	.7	1.6
27	1.6	2.1					10.3	9.1	5.3	1.7	.8	1.6
28	1.7					11.6	9.9	9.1	5.3	1.6	.8	1.4
29	1.7	2			.....	9.9	9.9	8.4	5.3	1.6	1.2	1.3
30	1.7				.....	9.1	10.7	8.4	5.0	1.4	1.3	1.3
31	1.7	.....			.....	9.5	.....	8.4	.....	1.4	1.0	.....

NOTE.—Discharge estimated because of ice Nov. 24–30, Dec. 21, 1918, to Feb. 8, 1919, Feb. 24–28, Nov. 9–15 and 28–30, 1919. Discharge June 1 to August 22, 1920, ascertained by shifting-control method. Braced figures show mean discharge for periods included.

Monthly discharge of Stranger Creek at Meteor, Wash., for the years ending September 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	1.4	0.8	1.03	63.3
November	6.2	1.0	2.74	163
December	5.3	.....	3.38	208
January	.....	.....	4.03	248
February	19.5	.....	11.1	616
March	40	13.3	18.6	1,140
April	164	49	147	8,750
May	164	48	92.5	5,690
June	45	14.7	25.4	1,510
July	14.2	5.9	9.42	579
August	6.2	2.3	3.91	240
September	2.8	2.0	2.36	140
The year	164	.....	26.7	19,300
1919–20.				
October	2.1	1.4	1.68	103
November	2.6	.....	1.96	117
December	.....	.....	2.0	123
January	.....	.....	2.0	123
February	.....	.....	2.0	115
March	.....	.....	5.65	347
April	13.3	7.6	10.1	601
May	10.7	8.4	9.75	600
June	9.2	5.0	7.10	422
July	5.0	1.4	2.96	182
August	1.3	.5	.70	43.0
September	2.1	.6	1.17	69.6
The year	13.3	.....	3.92	2,850

NOTE.—Monthly discharge December, 1919, to March, 1920, roughly estimated by inspection of records of flow for gaging stations on Hall Creek and Nespelem River; gage not read Dec. 7, 1919, to Mar. 27, 1920.

SPOKANE RIVER BASIN.

COEUR D'ALENE LAKE AT COEUR D'ALENE, IDAHO.

LOCATION.—In SW. ¼ sec. 13, T. 50 N., R. 4 W., at Johnson's Wharf, 800 feet southeast of railroad station at Coeur d'Alene, Kootenai County.

DRAINAGE AREA.—3,750 square miles (measured by engineers of Washington Water Power Co. on map compiled from best information available).

RECORDS AVAILABLE.—February 11, 1905, to September 30, 1920. April 25, 1903, to February 11, 1905, at St. Joe Boom Co.'s gage at mouth of St. Joe River.

GAGE.—Vertical staff on pile at wharf; read by Henry Kloppenburg. Gage datum is 2,100 feet above mean sea level.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 31.86 feet May 2; minimum stage recorded, 21.82 feet January 16.

Maximum stage recorded during year ending September 30, 1920, 29.56 feet May 19-20; minimum stage recorded, 20.86 feet December 16–21.

1903–1920: Maximum stage recorded, 36.00 feet at 6.15 p. m. January 3, 1918; minimum stage recorded, 19.9 feet on October 10–12, 1904, September 24–25, 1905, and October 14 to November 3, 1906.

DIVERSIONS.—None.

REGULATION.—Considerable storage is used by the Washington Water Power Co. Regulation is affected by Taintor gates and bear-trap dam at Post Falls.

ACCURACY.—Gage read to hundredths once daily October 1 to March 13, and July 29 to September 30, and twice daily during remainder of year.

COOPERATION.—Gage-height record furnished by Washington Water Power Co.

Daily gage height, in feet, of Coeur d'Alene Lake at Coeur d'Alene, Idaho, for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	24.14	23.80	23.46	22.80	26.56	24.88	27.76	31.80	28.62	25.54	24.72	23.64
2	24.12	23.80	23.44	22.62	26.29	24.74	28.00	31.86	28.34	25.54	24.68	23.60
3	24.12	23.70	23.46	22.44	26.00	24.73	28.26	31.84	28.02	25.54	24.64	23.56
4	24.10	23.76	23.52	22.36	25.79	24.78	28.54	31.64	27.76	25.54	24.64	23.52
5	24.08	23.72	23.56	22.32	25.65	24.76	28.94	31.40	27.50	25.54	24.64	23.48
6	24.06	23.68	23.60	22.28	25.50	24.65	29.54	31.12	27.24	25.54	24.62	23.46
7	24.04	23.64	23.66	22.24	25.37	24.61	29.92	30.80	27.00	25.50	24.60	23.46
8	24.02	23.62	23.70	22.12	25.21	24.52	30.02	30.48	26.76	25.48	24.60	23.42
9	24.00	23.60	23.74	22.10	25.12	24.42	29.98	30.18	26.54	25.44	24.60	23.40
10	23.98	23.60	23.76	22.04	25.12	24.29	29.88	29.94	26.32	25.42	24.56	23.36
11	23.96	23.62	23.76	22.02	25.14	24.18	29.84	29.78	26.04	25.40	24.52	23.32
12	23.94	23.62	23.76	21.96	25.16	24.10	29.94	29.64	25.86	25.40	24.48	23.30
13	23.92	23.64	23.78	21.94	25.14	24.04	30.00	29.42	25.70	25.36	24.44	23.30
14	23.88	23.66	23.93	21.92	25.06	24.02	30.00	29.20	25.48	25.34	24.42	23.24
15	23.84	23.70	24.28	21.88	25.02	24.04	29.90	29.00	25.32	25.34	24.36	23.22
16	23.82	23.74	24.85	21.82	24.92	24.06	29.76	28.80	25.20	25.34	24.32	23.22
17	23.84	23.82	25.01	21.88	24.92	24.08	29.56	28.76	25.12	25.32	24.30	23.20
18	23.82	23.86	24.92	22.19	24.90	24.34	29.46	28.72	25.12	25.26	24.28	23.18
19	23.78	23.92	24.82	23.01	25.02	24.96	29.50	28.68	25.18	25.24	24.24	23.14
20	23.76	23.92	24.72	23.85	25.14	25.72	29.62	28.66	25.24	25.20	24.20	23.10
21	23.74	23.88	24.60	24.71	25.28	26.08	29.78	28.78	25.28	25.16	24.16	23.04
22	23.72	23.86	24.44	25.43	25.34	26.29	29.96	28.96	25.34	25.14	24.10	23.00
23	23.68	23.82	24.22	26.19	25.44	26.48	30.08	29.10	25.40	25.06	24.04	22.96
24	23.64	23.78	24.04	26.83	25.46	26.62	30.18	29.32	25.44	25.04	24.00	22.92
25	23.64	23.74	23.90	27.42	25.50	26.78	30.32	29.36	25.46	25.02	23.94	22.88
26	23.62	23.66	23.74	27.71	25.38	26.86	30.60	29.32	25.48	25.00	23.90	22.84
27	23.62	23.62	23.54	27.74	25.21	26.92	30.94	29.24	25.54	24.94	23.86	22.74
28	23.64	23.60	23.40	27.60	25.05	27.00	31.14	29.14	25.56	24.88	23.84	22.70
29	23.66	23.56	23.26	27.38	.....	27.06	31.38	29.08	25.56	24.84	23.78	22.66
30	23.74	23.52	23.12	27.11	.....	27.22	31.60	28.96	25.56	24.82	23.74	22.64
31	23.80	.....	22.96	26.85	.....	27.48	.....	28.86	.....	24.78	23.66	.....

Daily gage height, in feet, of Coeur d'Alene Lake at Coeur d'Alene, Idaho, for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	22.60	21.66	21.54	21.68	24.48	25.00	24.93	27.02	27.[illegible]	26.36	26.35	25.42
2	22.58	21.66	21.52	21.68	24.64	24.98	24.84	27.11	26.99	26.32	26.32	25.42
3	22.56	21.64	21.48	21.66	24.82	24.96	24.76	27.16	26.79	26.34	26.30	25.40
4	22.54	21.68	21.42	21.64	24.96	24.94	24.62	27.20	26.62	26.38	26.26	25.40
5	22.50	21.72	21.38	21.62	25.08	24.94	24.59	27.21	26.49	26.39	26.22	25.38
6	22.46	21.70	21.34	21.60	25.20	24.92	24.59	27.21	26.41	26.40	26.18	25.34
7	22.44	21.70	21.28	21.58	25.32	24.90	24.64	27.27	26.36	26.41	26.14	25.32
8	22.40	21.68	21.24	21.56	25.40	24.94	24.75	27.45	26.36	26.44	26.12	25.28
9	22.36	21.66	21.20	21.54	25.52	24.94	25.01	27.76	26.33	26.48	26.10	25.24
10	22.32	21.68	21.14	21.52	25.60	24.96	25.41	28.13	26.30	26.48	26.10	25.22
11	22.28	21.66	21.08	21.50	25.66	24.98	25.78	28.47	26.25	26.44	26.06	25.20
12	22.24	21.64	21.04	21.48	25.72	25.02	26.06	28.76	26.28	26.48	26.04	25.18
13	22.20	21.60	21.00	21.48	25.74	25.14	26.47	28.96	26.38	26.44	26.04	25.24
14	22.18	21.56	20.94	21.46	25.70	25.85	26.83	29.10	26.41	26.44	26.02	25.36
15	22.14	21.60	20.90	21.44	25.64	26.40	27.09	29.23	26.40	26.47	25.98	25.38
16	22.10	21.60	20.86	21.44	25.60	26.50	27.23	29.35	26.41	26.48	25.94	25.40
17	22.04	21.64	20.86	21.50	25.56	26.40	27.25	29.43	26.42	26.49	25.90	25.40
18	22.02	21.68	20.86	21.64	25.52	26.21	27.18	29.51	26.38	26.51	25.86	25.40
19	21.96	21.70	20.86	21.74	25.48	26.06	27.10	29.56	26.31	26.49	25.76	25.40
20	21.92	21.72	20.86	21.86	25.44	25.94	27.05	29.55	26.34	26.49	25.70	25.38
21	21.88	21.72	20.86	21.94	25.46	25.96	27.08	29.42	26.44	26.49	25.66	25.36
22	21.84	21.74	20.90	22.00	25.32	25.86	27.06	29.28	26.45	26.49	25.64	25.40
23	21.80	21.74	20.96	22.00	25.26	25.88	26.96	29.11	26.29	26.46	25.64	25.40
24	21.78	21.74	21.04	22.04	25.20	25.88	26.82	28.95	26.22	26.45	25.64	25.44
25	21.74	21.72	21.12	22.04	25.12	25.87	26.66	28.77	26.31	26.45	25.56	25.50
26	21.72	21.70	21.26	22.40	25.08	25.81	26.51	28.57	26.38	26.44	25.52	25.52
27	21.70	21.68	21.42	22.94	25.04	25.68	26.47	28.35	26.42	26.43	25.44	25.56
28	21.68	21.64	21.50	23.34	25.02	25.53	26.59	28.07	26.34	26.42	25.40	25.62
29	21.68	21.58	21.56	23.66	25.02	25.34	26.76	27.84	26.36	26.41	25.38	25.64
30	21.66	21.56	21.64	23.96	.....	25.19	26.92	27.61	26.36	26.40	25.44	25.68
31	21.66	.....	21.66	24.24	.....	25.04	.....	27.43	.....	26.38	25.44	.....

SPOKANE RIVER AT POST FALLS, IDAHO.

LOCATION.—In sec. 4, T. 50 N., R. 5 W. Boise meridian, a quarter of a mile below power plant of Washington Water Power Co., three-fourths mile below intake of Spokane Valley Land & Water Co.'s canal, and 1 mile west of Post Falls, Kootenai County.

DRAINAGE AREA.—3,880 square miles, revised (measured by engineers of the Washington Water Power Co. on maps compiled from best information available.

RECORDS AVAILABLE.—January 1, 1913, to September 30, 1920.

GAGE.—Vertical staff in three sections on left bank; read by Nils Lindberg and Grant Merrill. Elevation of zero of gage, 2,000 feet above sea level.

DISCHARGE MEASUREMENTS.—Made from cable 300 feet below gage.

CHANNEL AND CONTROL.—River bed composed of coarse gravel and boulders; shifts during floods. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 76.0 feet May 2 (discharge, 25,800 second-feet); minimum stage, 66.5 feet August 9, 11, 13, and September 15–17 (discharge, 1,020 second-feet).

Maximum stage recorded during year ending September 30, 1920, 74.4 feet May 17 (discharge, 19,400 second-feet); minimum stage recorded, 66.2 feet July 25–27 (discharge, 860 second-feet).

1911–1920: Maximum stage recorded 79.20 feet at 7.30 a. m., May 18, 1917 (discharge, 39,800 second-feet); minimum stage recorded on July 25–27, 1920.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Spokane Valley Land & Water Co.'s canal diverts above gage for irrigation. Mean diversion during 1920, 63 second-feet. Storage in Coeur d'Alene Lake partly regulated by operation of gates in dam at Post Falls.

REGULATION.—Varying load on power plant causes fluctuation in stage. The flow is partly regulated by storage in Coeur d'Alene Lake.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined above 1,000 second-feet. Gage read once or twice daily to hundredths. When discharge is less than 5,000 second-feet stage is variable, owing to changing load at power plant, and the mean of two readings daily may not indicate true mean stage. Daily discharge ascertained by applying daily mean gage height to rating table. Records for discharge below 5,000 second-feet, good; above 5,000 second-feet, excellent.

COOPERATION.—Gage-height record furnished by the Washington Water Power Co.

Discharge measurements of Spokane River at Post Falls, Idaho, during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 26	D. J. F. Calkins.....	66.73	1,160	Nov. 2	John McCombs.....	66.72	1,170
1919.				1920.			
May 2	Kilgore and Logan.....	75.80	25,900	Apr. 21	.....do.....	72.47	12,200
Sept. 6	Parker and Paulsen....	66.72	1,190	May 5	.....do.....	72.49	12,500
				Aug. 30	.....do.....	66.67	1,180

Daily discharge, in second-feet, of Spokane River at Post Falls, Idaho, for the years ending Sept. 30, 1918–1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1917–18.												
1.....	1,620	1,620	960	33,900	9,850	6,020	15,100	17,500	11,000	2,110	1,240	1,420
2.....	1,850	1,420	1,020	36,900	9,030	5,830	15,800	17,500	10,700	2,110	1,240	1,520
3.....	1,620	1,420	960	39,200	8,760	5,830	15,800	17,900	9,300	2,110	1,240	1,330
4.....	1,520	1,620	1,020	34,700	8,500	5,640	16,100	17,900	6,620	1,850	1,330	1,240
5.....	1,730	1,520	1,020	38,300	8,500	5,450	15,800	17,900	8,500	1,850	1,240	1,160
6.....	1,620	1,520	1,090	37,400	8,500	5,640	15,400	19,400	7,510	1,850	1,330	1,090
7.....	1,620	1,620	960	36,100	8,760	5,450	15,400	19,400	8,000	1,730	1,160	1,160
8.....	1,620	1,620	960	34,700	9,570	5,450	14,700	19,400	10,100	1,850	1,330	1,090
9.....	1,520	1,620	960	33,400	9,850	5,260	14,700	19,000	10,400	1,420	1,160	1,160
10.....	1,520	1,520	960	32,200	10,400	5,070	15,400	18,300	10,700	1,620	1,160	1,160
11.....	1,520	1,730	1,020	30,000	10,400	5,070	16,100	17,900	10,700	1,520	1,330	1,090
12.....	1,520	1,420	1,020	28,300	10,700	5,260	17,200	17,200	11,000	1,520	1,420	1,240
13.....	1,520	1,420	1,020	26,600	10,700	5,070	17,900	16,500	10,700	1,520	1,090	1,160
14.....	1,520	1,330	1,020	25,000	10,400	5,260	18,600	16,100	11,000	2,390	1,240	1,240
15.....	1,620	1,240	960	23,700	10,100	5,260	19,000	16,100	11,000	1,330	1,240	1,420
16.....	1,620	1,160	1,020	22,100	9,850	5,260	19,400	15,800	10,100	1,620	1,330	1,240
17.....	1,520	1,160	1,020	20,500	9,570	5,260	19,400	15,800	9,030	1,420	1,090	1,160
18.....	1,520	1,330	1,240	19,400	9,300	5,830	19,000	15,800	6,210	1,520	1,330	1,160
19.....	1,520	1,330	1,980	18,300	9,030	6,210	19,000	15,800	3,440	1,520	1,330	1,330
20.....	1,520	1,420	2,820	17,200	8,500	7,050	18,300	15,400	7,280	1,420	1,160	1,330
21.....	1,520	1,240	11,300	16,100	8,250	7,510	17,500	15,400	3,440	1,520	1,160	1,420
22.....	1,730	1,090	12,200	15,400	7,750	8,000	17,200	14,700	4,310	1,620	1,090	1,160
23.....	1,520	960	12,200	14,400	7,510	8,500	17,500	14,400	4,690	1,520	1,160	1,420
24.....	1,850	960	12,500	13,800	7,280	9,030	17,500	13,800	7,050	1,520	1,090	1,240
25.....	1,980	1,020	13,100	13,100	7,050	10,100	17,900	13,400	6,020	1,240	1,330	1,160
26.....	1,420	1,020	13,400	12,800	6,830	11,600	18,300	12,800	1,620	1,330	1,160	1,240
27.....	1,420	960	13,400	12,200	6,620	10,100	18,300	12,500	2,530	1,240	1,160	1,240
28.....	1,520	960	14,700	12,200	6,210	14,100	17,900	12,200	2,890	1,330	1,090	1,160
29.....	1,620	960	18,300	11,000	.....	14,700	17,900	11,900	2,670	1,240	1,090	1,240
30.....	1,850	1,620	23,300	10,700	.....	14,700	17,500	11,600	2,390	1,240	1,160	1,160
31.....	1,850	.....	29,200	10,400	.....	15,100	.....	11,300	.....	1,090	1,090	.....

Daily discharge, in second-feet, of Spokane River at Post Falls, Idaho, for the years ending Sept. 30, 1918–1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,240	1,240	1,980	3,610	11,600	6,620	14,400	25,400	16,100	2,390	1,420	1,240
2	1,330	1,620	1,980	3,610	11,300	6,210	15,100	25,800	15,400	2,390	1,420	1,090
3	1,160	1,420	2,110	3,440	10,100	6,020	15,800	25,400	14,700	2,390	1,330	1,240
4	1,240	1,850	1,980	1,850	9,030	6,210	16,500	24,500	13,800	1,850	1,520	1,240
5	1,330	1,850	1,980	2,110	6,620	6,210	17,200	24,100	13,400	1,850	1,330	1,160
6	1,240	1,520	1,980	2,110	6,210	5,830	18,600	23,300	13,100	1,850	1,420	1,160
7	1,330	1,520	1,980	1,420	6,020	5,830	20,200	22,100	12,500	1,730	1,090	1,330
8	1,240	1,520	1,980	1,420	5,830	5,830	20,500	21,300	11,900	1,730	1,090	1,160
9	1,240	1,730	1,980	1,850	5,830	5,640	20,900	20,500	11,300	2,390	1,020	1,160
10	1,240	1,330	2,110	2,110	5,640	5,450	20,200	19,800	10,700	1,730	1,090	1,090
11	1,240	1,620	1,850	1,850	5,830	5,450	20,200	19,400	10,400	1,620	1,020	1,090
12	1,240	1,730	1,980	2,110	5,830	5,450	20,200	18,600	9,850	1,620	1,090	1,090
13	1,240	1,520	1,980	2,110	5,830	5,070	20,500	18,300	9,300	1,330	1,020	1,090
14	1,240	1,620	2,250	2,110	5,640	5,260	20,200	17,500	8,760	1,420	1,090	1,090
15	1,160	1,620	2,530	2,110	5,640	5,450	20,200	17,200	8,000	1,420	1,160	1,020
16	1,240	1,850	2,530	2,110	5,450	5,260	19,800	16,500	7,280	3,120	1,090	1,020
17	1,240	1,850	7,050	1,980	5,450	5,260	18,600	16,500	4,500	1,420	1,160	1,020
18	1,240	1,980	6,620	1,730	5,450	5,450	19,000	16,100	4,690	1,420	1,160	1,090
19	1,240	1,730	5,830	1,980	2,110	6,020	18,600	16,100	3,280	1,420	1,240	1,160
20	1,240	1,850	5,830	2,110	2,390	7,050	19,000	16,100	3,120	1,420	1,160	1,090
21	1,240	1,980	5,830	2,110	2,390	9,570	19,400	16,500	2,970	1,620	1,160	1,090
22	1,240	2,110	5,640	2,670	2,970	10,100	20,200	16,800	2,530	1,520	1,090	1,160
23	1,520	1,980	5,450	4,880	2,970	11,300	20,500	17,200	2,530	1,420	1,090	1,160
24	1,420	2,110	5,070	11,900	2,970	11,900	20,900	17,900	2,390	1,520	1,160	1,090
25	1,160	2,110	4,690	13,100	3,280	12,200	20,900	17,900	2,670	1,420	1,240	1,090
26	1,240	1,980	4,690	14,100	7,280	12,500	21,700	17,900	2,530	1,420	1,160	1,090
27	1,240	1,980	4,500	14,400	7,510	12,500	22,900	17,500	2,390	1,420	1,160	1,090
28	1,850	1,850	4,690	14,100	6,410	12,500	23,300	17,200	2,390	1,520	1,090	1,160
29	1,240	1,850	4,310	13,800	.....	12,800	24,100	17,200	2,390	1,420	1,090	1,090
30	1,420	1,980	4,310	13,100	.....	13,100	24,500	16,800	2,390	1,420	1,160	1,160
31	1,330	.....	3,950	12,500	.....	13,800	.....	16,500	.....	1,520	1,160	.....
1919–20.												
1	1,090	1,160	1,160	1,240	1,240	1,520	7,280	12,500	12,800	4,500	1,330	1,160
2	1,090	1,090	1,240	1,330	1,330	1,520	5,640	12,500	12,500	3,610	1,330	1,090
3	1,160	1,160	1,160	1,240	1,240	1,520	5,640	12,800	11,900	1,850	1,240	1,020
4	1,160	1,160	1,240	1,330	1,330	1,520	5,450	12,800	11,600	2,110	1,330	1,160
5	1,160	1,160	1,160	1,330	1,240	1,330	5,640	12,800	11,000	2,110	1,330	1,020
6	1,240	1,090	1,240	1,240	1,240	1,330	5,450	12,800	10,700	1,980	1,330	1,090
7	1,160	1,160	1,160	1,330	1,240	1,330	5,450	13,100	10,100	1,730	1,240	1,090
8	1,160	1,160	1,240	1,420	1,240	1,330	5,640	13,400	10,400	1,520	1,160	1,090
9	1,160	1,090	1,160	1,240	1,240	1,330	5,070	13,800	10,100	1,520	1,160	1,420
10	1,090	1,160	1,090	1,240	1,240	1,240	6,020	15,100	9,850	2,390	1,020	1,160
11	1,160	1,160	1,160	1,240	1,240	1,240	6,410	15,800	9,030	2,670	1,020	1,160
12	1,160	1,160	1,240	1,330	1,240	1,240	8,760	16,500	7,510	2,390	1,160	1,160
13	1,090	1,090	1,240	1,240	2,250	1,240	9,570	17,200	6,210	2,530	1,240	1,160
14	1,090	1,160	1,240	1,330	2,670	5,070	11,900	17,500	8,500	1,520	1,330	1,160
15	1,090	1,090	1,240	1,240	2,670	10,700	12,500	17,900	8,500	1,330	1,330	1,090
16	1,090	1,090	1,240	1,240	2,670	11,300	13,100	18,300	8,250	1,330	1,330	1,090
17	1,020	1,090	1,240	1,160	2,820	11,300	13,100	19,400	8,760	2,670	1,090	1,090
18	1,160	1,160	1,240	1,240	4,130	10,400	13,100	18,600	8,760	1,330	1,330	1,090
19	1,160	1,090	1,240	1,330	2,670	8,760	12,800	18,600	7,280	1,420	1,330	1,090
20	1,160	1,160	1,240	1,240	2,670	6,410	12,800	18,600	4,690	1,420	1,240	1,160
21	1,160	1,240	1,240	1,240	2,670	2,250	12,800	18,300	5,450	1,160	1,240	960
22	1,160	1,160	1,240	1,240	2,670	8,760	12,500	17,900	7,510	1,090	1,020	960
23	960	1,160	1,240	1,240	2,670	9,300	12,500	17,500	8,500	1,090	1,020	960
24	1,160	1,240	1,240	1,240	2,670	9,300	12,200	17,200	3,950	960	1,090	960
25	1,160	1,160	1,330	1,240	2,670	9,300	11,900	16,500	2,820	860	1,330	960
26	1,160	1,160	1,240	1,240	1,620	9,300	11,600	16,100	2,970	860	1,240	960
27	1,240	1,330	1,240	1,240	1,520	9,850	11,300	15,400	5,830	860	1,420	960
28	1,160	1,240	1,240	1,240	1,520	9,570	11,900	14,700	4,500	960	1,240	1,090
29	1,240	1,160	1,330	1,240	1,420	9,030	11,900	14,400	3,280	1,090	1,330	1,330
30	1,160	1,160	1,240	1,240	.....	8,760	12,200	13,800	3,950	1,240	1,090	1,330
31	1,160	.....	1,240	1,330	.....	8,500	.....	13,400	.....	1,520	1,090	.....

NOTE.—Gage not read Sept. 11, 1920; discharge interpolated.

Monthly discharge of Spokane River and Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the years ending Sept. 30, 1918–1920.

[Drainage area, 3,880 square miles.]

Month.	Discharge in second-feet.						Run-off (combined).	
	River.			Canal (mean.)	Combined.			
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	Inches.	Total in acre-feet.
1917–18.								
October	1,980	1,420	1,610	50	1,660			102,000
November	1,730	960	1,330	40	1,370			81,500
December	29,200	960	6,340	40	6,380			392,000
January	39,200	10,400	23,500	30	23,500			1,440,000
February	10,700	6,210	8,850	40	8,890			494,000
March	15,100	5,070	7,570	50	7,620			469,000
April	19,400	14,700	17,200	60	17,300			1,030,000
May	19,400	11,300	15,800	90	15,900			978,000
June	11,000	1,620	7,350	110	7,460			444,000
July	2,390	1,090	1,590	120	1,710			105,000
August	1,420	1,090	1,210	110	1,320			81,200
September	1,520	1,090	1,240	70	1,310			78,000
The year	39,200	690	7,810	67.7	7,880	2.03	27.56	5,690,000
1918–19.								
October	1,850	1,160	1,280	50	1,330			81,800
November	2,110	1,240	1,760	40	1,800			107,000
December	7,050	1,850	3,600	40	3,640			224,000
January	14,400	1,420	5,170	30	5,200			320,000
February	11,600	2,110	5,840	40	5,880			327,000
March	13,800	5,070	7,990	50	8,040			494,000
April	24,500	14,400	19,800	60	19,900			1,180,000
May	25,800	16,100	19,200	90	19,300			1,190,000
June	16,100	2,390	7,580	120	7,700			458,000
July	3,120	1,330	1,700	130	1,830			113,000
August	1,520	1,020	1,180	120	1,300			79,900
September	1,330	1,020	1,130	75.9	1,210			72,000
The year	25,800	1,020	6,340	70.7	6,410	1.65	22.40	4,650,000
1919–20.								
October	1,240	960	1,140	53.0	1,190			73,200
November	1,330	1,090	1,160	38.5	1,200			71,400
December	1,330	1,090	1,230	6.58	1,240			76,200
January	1,420	1,160	1,270	.00	1,270			78,100
February	4,130	1,240	1,970	.00	1,970			113,000
March	11,300	1,240	5,660	46.9	5,710			351,000
April	13,100	5,070	9,740	69.9	9,810			584,000
May	19,400	12,500	15,700	96.5	15,800			972,000
June	12,800	2,820	7,910	122	8,030			478,000
July	4,500	860	1,730	134	1,860			114,000
August	1,420	1,020	1,230	128	1,360			83,600
September	1,420	960	1,100	60.1	1,160			69,000
The year	19,400	860	4,150	63.2	4,210	1.09	14.84	3,060,000

NOTE.—No gage-height record on canal October, 1917, to August, 1919; monthly discharge of canal for this period was estimated by study of discharge for all months for which records are available. These figures should be used with caution, being derived for the purpose of obtaining the combined discharge of river and canal. Monthly figures showing discharge in second-feet per square mile and run-off in inches are not published owing to regulation by Coeur d'Alene Lake; the yearly figures represent more nearly the natural discharge and run-off.

SPOKANE RIVER AT SPOKANE, WASH.

LOCATION.—In sec. 9, T. 25 N., R. 43 E., above Washington Water Power Co.'s abandoned steam plant in Spokane, 2.8 miles above Spokane Falls, and 4 miles above Latah Creek in Spokane County.

DRAINAGE AREA.—4,350 square miles (measured by engineers of Washington Water Power Co. on maps compiled from best information available).

RECORDS AVAILABLE.—March 22, 1891, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank 500 feet above the steam plant; installed July 31, 1915; inspected daily by employee of Washington Water Power Co. For description of earlier gages see Water-Supply Paper 412. Approximate elevation of gage datum, 1,800 feet above sea level.

DISCHARGE MEASUREMENTS.—Made from cable 75 feet upstream from gage.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. One channel at all stages. Control is stretch of channel contracted by bridge structures and embankments between station and crest of Spokane Falls; shifts at high water.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 79.4 feet May 1 (discharge, 24,600 second-feet); minimum stage from recorder, 69.0 feet at 3 a. m. September 17 (discharge, 1,520 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 77.3 feet May 19 and 20 (discharge, 18,200 second-feet); minimum stage, from recorder, 68.60 feet from 8 a. m. to noon July 27 (discharge, 1,330 second-feet).

1891–1920: Maximum stage recorded, 83.8 feet at midnight May 17, 1917 (discharge, 41,900 second-feet); minimum stage recorded, 1.3 feet (Martha Street gage) September 28–30, 1905 (discharge, 1,240 second-feet).

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Water is diverted above the station for irrigation by the Spokane Valley Land & Water Co.

REGULATION.—Flow is partly regulated by storage in Coeur d'Alene Lake.

ACCURACY.—Stage-discharge relation changed during high water on January 23 and May 2, 1919, and May 20, 1920. Rating curves well defined. Operation of water-stage recorder excellent. Daily discharge October, 1918, to May, 1920, ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection or, for a few days when there was considerable variation in stage, by averaging discharge for intervals of the day. Daily discharge June to September, 1920, ascertained by use of discharge integrator. Records excellent.

COOPERATION.—Gage-height record and some discharge measurements furnished by Washington Water Power Co.

Discharge measurements of Spokane River at Spokane, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 24	D. J. F. Calkins	69.30	1,840	Apr. 19	R. B. Kilgore	77.40	18,500
27	do	69.22	1,740	20			
1919.				28–29	do	78.90	23,600
Jan. 18	R. B. Kilgore	69.70	2,350	Nov. 1	John McCombs	69.19	1,690
25	do	75.00	12,400	1920.			
Feb. 23	do	70.54	3,510	Apr. 24	do	74.82	12,100
Mar. 4	do	72.38	6,720	July 27	Eugene Logan	68.62	1,350
				Aug. 16	John McCombs	69.18	1,860

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,720	1,940	2,350	4,210	11,100	7,080	13,700	24,600	15,500	2,920	2,050	1,720
2	1,780	2,050	2,350	4,060	10,400	6,890	14,200	23,900	15,000	2,720	1,940	1,620
3	1,720	2,110	2,350	3,760	9,530	6,700	15,000	23,900	14,200	2,720	1,940	1,720
4	1,780	1,940	2,350	2,660	8,600	6,700	15,500	23,600	13,700	2,600	2,050	1,720
5	1,830	2,050	2,410	2,660	7,280	6,700	16,600	23,000	13,000	2,530	2,000	1,720
6	1,780	2,000	2,350	2,600	7,080	6,700	17,900	22,000	12,500	2,470	2,000	1,780
7	1,830	2,110	2,350	2,530	6,890	6,510	19,000	21,100	12,000	2,470	1,830	1,720
8	1,780	2,170	2,350	2,530	6,700	6,510	19,300	20,200	11,600	2,470	1,830	1,720
9	1,720	2,050	2,350	2,530	6,700	6,320	19,300	19,600	11,100	2,530	1,720	1,720
10	1,720	2,000	2,290	2,530	6,510	6,320	19,300	19,100	10,700	2,530	1,720	1,670
11	1,780	1,940	2,390	2,530	6,510	6,130	19,300	18,800	10,200	2,350	1,720	1,670
12	1,780	1,940	2,410	2,530	6,510	5,950	19,600	18,200	9,810	2,290	1,720	1,670
13	1,780	2,000	2,350	2,470	6,510	5,590	19,600	17,700	9,180	2,170	1,720	1,670
14	1,780	2,110	2,580	2,470	6,510	5,770	19,600	17,100	8,550	2,110	1,670	1,670
15	1,780	2,110	2,720	2,470	6,510	5,770	19,600	16,600	7,950	2,050	1,670	1,720
16	1,720	2,350	3,640	2,470	6,320	5,770	19,000	16,000	7,170	2,170	1,670	1,670
17	1,720	2,290	6,420	2,470	6,320	5,770	18,800	15,800	5,360	2,110	1,670	1,670
18	1,720	2,350	6,240	2,410	5,850	5,950	18,500	15,800	4,690	2,050	1,720	1,670
19	1,720	2,290	6,060	2,530	3,210	6,510	18,500	15,500	4,060	2,050	1,780	1,720
20	1,720	2,410	6,060	2,470	3,300	7,480	18,500	15,500	4,060	2,050	1,780	1,720
21	1,720	2,350	5,880	2,660	3,330	9,530	19,000	15,800	3,680	2,050	1,720	1,670
22	1,720	2,290	5,880	3,050	3,560	10,400	19,600	16,000	3,330	2,050	1,720	1,720
23	1,720	2,350	5,530	6,600	3,560	10,800	19,900	16,600	3,330	2,050	1,670	1,720
24	1,780	2,350	5,360	10,800	3,640	11,100	20,200	16,800	3,260	2,050	1,720	1,720
25	1,720	2,350	5,190	12,200	4,570	11,500	20,500	17,100	3,330	2,000	1,780	1,670
26	1,720	2,350	5,020	13,000	7,080	11,800	21,100	17,100	3,120	2,000	1,720	1,720
27	1,720	2,290	4,850	13,400	7,700	12,000	22,000	16,800	3,120	2,050	1,720	1,720
28	1,830	2,290	4,850	13,200	7,080	12,200	22,600	16,600	3,050	2,050	1,720	1,720
29	1,830	2,290	4,690	12,800	.....	12,200	23,300	16,600	3,050	2,000	1,670	1,720
30	1,880	2,350	4,530	12,500	.....	12,700	23,900	16,300	2,980	2,050	1,720	1,670
31	1,830	.....	4,370	11,800	.....	13,200	.....	16,000	.....	2,050	1,670	.....
1919–20.												
1	1,720	1,720	1,670	1,730	1,730	2,030	7,540	12,100	13,000	4,690	1,920	1,780
2	1,670	1,720	1,720	1,730	1,730	2,090	6,570	12,300	12,500	4,480	1,880	1,700
3	1,670	1,720	1,720	1,730	1,730	2,030	6,570	12,600	12,100	2,920	1,820	1,700
4	1,720	1,670	1,720	1,730	1,730	1,910	6,380	12,600	11,700	2,920	1,870	1,670
5	1,720	1,670	1,780	1,730	1,730	1,850	6,380	12,600	11,300	3,050	1,880	1,710
6	1,720	1,670	1,720	1,680	1,730	1,790	6,190	12,600	11,100	2,760	1,840	1,680
7	1,720	1,720	1,720	1,730	1,730	1,790	6,380	12,800	10,700	2,500	1,830	1,710
8	1,670	1,670	1,720	1,790	1,730	1,790	6,380	13,100	10,600	2,280	1,800	1,700
9	1,670	1,670	1,720	1,730	1,680	1,790	6,190	13,500	10,400	2,280	1,800	1,860
10	1,720	1,670	1,670	1,730	1,680	1,730	6,950	14,500	10,100	2,910	1,760	1,810
11	1,720	1,620	1,720	1,730	1,730	1,680	7,220	15,300	9,460	2,860	1,720	1,800
12	1,720	1,670	1,670	1,730	1,850	1,730	8,770	15,800	8,220	2,600	1,760	1,810
13	1,720	1,670	1,720	1,730	2,470	2,050	10,300	16,300	7,000	2,860	1,780	1,740
14	1,720	1,670	1,720	1,730	2,740	5,350	11,400	16,800	8,580	2,360	1,840	1,720
15	1,670	1,620	1,670	1,730	2,810	9,840	12,100	17,100	8,660	2,120	1,840	1,730
16	1,670	1,620	1,720	1,730	2,880	10,500	12,300	17,600	8,730	2,150	1,840	1,720
17	1,670	1,670	1,720	1,730	2,880	10,300	12,600	17,900	8,960	2,080	1,780	1,700
18	1,670	1,670	1,670	1,730	2,880	9,190	12,600	17,900	9,060	2,130	1,820	1,720
19	1,720	1,670	1,670	1,730	2,880	8,080	12,300	18,200	7,900	2,140	1,840	1,740
20	1,670	1,650	1,670	1,680	2,950	6,630	12,300	18,200	5,720	2,100	1,820	1,760
21	1,670	1,720	1,720	1,680	2,950	5,510	12,300	17,900	5,620	2,000	1,840	1,640
22	1,670	1,720	1,670	1,680	2,950	8,490	12,300	17,600	7,720	1,900	1,700	1,630
23	1,620	1,670	1,670	1,730	2,950	9,190	12,300	17,400	9,030	1,860	1,640	1,680
24	1,670	1,670	1,720	1,730	2,950	9,190	12,100	16,800	5,600	1,780	1,660	1,600
25	1,670	1,670	1,720	1,790	2,670	9,190	11,600	16,600	3,780	1,700	1,760	1,580
26	1,620	1,670	1,720	1,730	2,090	9,400	11,400	16,000	3,910	1,600	1,860	1,560
27	1,830	1,780	1,720	1,680	2,090	9,400	11,000	15,500	4,830	1,490	1,960	1,600
28	1,830	1,720	1,720	1,680	2,030	9,190	11,200	15,000	5,400	1,600	1,910	1,670
29	1,670	1,720	1,670	1,730	2,030	8,770	11,600	14,500	4,060	1,660	1,910	1,790
30	1,720	1,720	1,670	1,730	.....	8,560	11,900	14,000	4,340	1,740	1,710	1,760
31	1,670	.....	1,670	1,730	.....	7,940	.....	13,500	.....	1,920	1,710	.....

Monthly discharge of Spokane River at Spokane, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 4,350 square miles]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	1,880	1,720	1,760			108,000
November	2,410	1,940	2,180			130,000
December	6,420	2,290	3,890			239,000
January	13,400	2,410	5,380			331,000
February	11,100	3,210	6,390			355,000
March	13,200	5,590	8,210			505,000
April	23,900	13,700	19,100			1,140,000
May	24,600	15,500	18,400			1,130,000
June	15,500	2,980	7,750			461,000
July	2,920	2,000	2,250			138,000
August	2,050	1,670	1,780			109,000
September	1,780	1,620	1,700			101,000
The year	24,600	1,620	6,550	1.51	20.50	4,750,000
1919-20.						
October	1,830	1,620	1,700			105,000
November	1,780	1,620	1,680			100,000
December	1,780	1,670	1,700			105,000
January	1,790	1,680	1,720			106,000
February	2,950	1,680	2,280			131,000
March	10,500	1,680	5,770			355,000
April	12,600	6,190	9,840			586,000
May	18,200	12,100	15,300			941,000
June	13,000	3,780	8,340			496,000
July	4,690	1,490	2,370			146,000
August	1,960	1,640	1,810			111,000
September	1,860	1,560	1,710			102,000
The year	18,200	1,490	4,520	1.04	14.16	3,280,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not computed owing to regulation. The yearly figures represent more nearly the natural flow.

SPOKANE RIVER BELOW LITTLE FALLS, NEAR LONG LAKE, WASH.

LOCATION.—In NW. ¼ sec. 19, T. 27 N., R. 39 E., just above Chamokane Ferry, 1½ miles below Little Falls power plant of Washington Water Power Co., 4 miles below Chamokane Creek, and 5 miles below Long Lake, in Lincoln County.

DRAINAGE AREA.—6,380 square miles (measured by engineers of the Washington Water Power Co. on map compiled from best information available).

RECORDS AVAILABLE.—November 5, 1912, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank; gage datum, 1,200 feet above mean sea level.

DISCHARGE MEASUREMENTS.—Made from cable 50 feet below gage.

CHANNEL AND CONTROL.—Bed composed of large boulders; shifting at high stages. Banks high; one channel at all stages. No noticeable riffle control below gage.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 86.6 feet at 9 p. m. May 3 (discharge, 27,900 second-feet). Minimum mean daily discharge, 1,880 second-feet October 20; minimum discharge lower when water was below intake, which is at elevation 75.05 feet, for short periods on many days in October and November, on July 28, and on several days in August.

Maximum stage during year ending September 30, 1920, from water-stage recorder, 84.8 feet at 3.30 p. m. March 15 (discharge, 21,900 second-feet). Minimum mean daily discharge, 1,860 second-feet November 16; minimum discharge lower when water was below intake for short periods on many days throughout the year.

1912–1920: Maximum stage from water-stage recorder, 90.32 feet at 8.30 p. m. May 18, 1917 (discharge, 41,300 second-feet). Minimum mean daily discharge, 1,720 second-feet September 15, 1918; minimum discharge lower when water was below intake for parts of many days during low-water seasons.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Water is diverted by the Spokane Valley Land & Water Co. for irrigation above the station.

REGULATION.—Flow affected considerably by power regulation at Little Falls and Long Lake, and slightly by power regulation at Ninemile, Spokane, and Post Falls. Low-water flow is affected by regulation of storage in Coeur d'Alene Lake.

ACCURACY.—Stage-discharge relation changed during high water on May 3, 1919. Rating curves well defined. Operation of water-stage recorder not entirely satisfactory; see footnote to tables of daily discharge. Daily discharge for periods when gage operated ascertained by means of discharge integrator, or by applying to rating table mean gage heights determined from recorder graph by inspection. Records excellent when recorder was operating, good for remainder of year.

COOPERATION.—Gage-height record and part of the discharge measurements furnished by Washington Water Power Co.

Discharge measurements of Spokane River below Little Falls, near Long Lake, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 25	D. J. F. Calkins	75.80	2,320	Oct. 30	John McCombs	76.01	2,900
25	do	75.11	1,800	30	do	75.96	2,750
1919.				1920.			
Apr. 30	R. B. Kilgore	86.15	26,200	Apr. 19	do	82.17	14,400
May 3	do	86.53	28,000	Aug. 31	McCombs and Logan	75.89	2,670
Aug. 26	do	75.89	2,720				

Daily discharge, in second-feet, of Spokane River below Little Falls, near Long Lake, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	2,370	2,350	2,600	4,970	12,800	7,920	18,200	26,900	18,500	3,990	2,830	2,860
2	2,420	2,410	2,990	4,840	12,200	7,740	17,800	27,600	17,100	3,850	2,690	3,350
3	2,340	2,110	2,700	4,720	11,500	7,600	17,700	27,600	15,500	3,380	2,800	2,850
4	2,390	2,590	3,030	4,420	10,500	7,750	18,900	27,600	13,000	3,060	2,750	2,390
5	2,320	2,340	3,460	3,850	9,390	8,200	19,800	27,200	13,800	2,990	2,650	2,370
6	1,970	2,620	3,260	3,630	8,500	8,300	20,800	26,500	14,800	3,420	2,750	2,370
7	2,270	2,390	2,860	3,090	7,980	8,070	24,000	25,500	14,300	3,660	3,050	2,220
8	2,220	2,560	2,760	3,190	7,710	7,790	24,200	24,500	14,000	3,450	2,720	2,280
9	2,340	2,490	2,930	2,950	7,560	7,490	23,800	23,500	13,800	3,510	2,480	2,390
10	2,340	2,300	2,880	3,030	7,990	7,380	23,100	22,400	13,200	3,430	2,900	2,650
11	2,300	2,480	2,960	3,210	8,450	7,250	23,100	21,600	12,000	3,450	2,360	2,600
12	2,340	2,620	2,860	2,830	8,100	6,150	23,100	21,300	9,670	3,370	2,190	2,480
13	1,950	2,420	2,790	3,250	7,900	5,100	23,100	19,800	9,340	3,060	2,100	2,730
14	1,930	2,450	2,850	3,030	7,710	4,690	23,200	19,700	9,140	3,040	2,130	2,690
15	2,160	2,420	2,970	3,030	7,580	6,050	23,100	19,000	8,680	3,010	2,540	2,760
16	2,160	2,660	3,100	3,030	7,460	7,760	22,800	15,800	9,780	2,860	2,610	2,710
17	2,220	2,330	4,040	3,430	7,670	6,300	22,500	16,100	7,850	3,000	3,230	2,620
18	2,210	2,790	5,910	3,690	7,650	8,190	21,800	18,500	4,410	2,930	2,560	2,580
19	2,170	2,480	6,340	3,650	7,270	14,900	21,300	17,400	5,770	2,820	2,510	2,430
20	1,880	2,760	6,420	3,590	5,530	15,200	21,400	17,000	6,170	2,660	2,620	2,460
21	2,110	2,710	6,420	3,640	5,120	16,500	21,800	17,600	5,550	2,670	2,870	2,240
22	2,330	2,590	6,370	3,810	4,840	14,500	22,100	18,200	5,720	2,630	2,670	2,370
23	2,260	2,770	6,410	5,160	4,640	13,700	22,500	18,200	4,760	2,650	2,590	2,600
24	2,250	2,440	6,200	7,870	4,570	14,700	22,800	18,800	4,000	2,730	2,330	2,720
25	2,190	2,810	5,970	11,200		12,600	23,100	19,100	4,080	2,550	2,750	2,770
26	2,240	2,700	5,840	13,000	6,970	12,700	23,800	19,400	4,040	2,610	2,660	2,780
27	1,990	2,750	5,690	13,900		15,200	24,500	19,400	4,050	2,790	2,670	2,610
28	2,170	2,410	5,610	14,400		16,500	25,200	19,400	4,120	2,830	2,860	2,260
29	2,250	2,950	5,420	14,300	.....	15,500	25,900	19,100	3,850	2,920	2,940	2,400
30	2,390	2,660	5,300	13,900	.....	15,500	26,500	18,800	3,730	2,760	2,610	2,510
31	2,420	.....	5,110	13,400	.....	15,700	.....	18,800	.....	2,760	2,630	.....

Daily discharge, in second-feet, of Spokane River below Little Falls, near Long Lake, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	2,570	2,520	2,430	2,420	3,330	2,410	9,160	12,800	14,800	4,680	2,020	2,270
2	2,520	2,260	2,760	2,890	3,560	2,350	8,560	13,200	13,500	5,630	2,270	2,290
3	2,620	2,840	2,780	2,690	3,680	2,470	7,380	13,600	13,000	4,300	2,400	2,270
4	4,660	2,920	2,600	2,160	3,560	2,550	5,760	13,800	13,200	3,030	2,350	2,340
5	2,880	2,910	2,830	2,530	3,680	2,780	8,520	13,800	13,000	3,990	2,280	2,060
6	2,540	2,740	2,760	2,630	3,680	2,650	8,560	13,800	12,800	3,250	2,260	2,120
7	2,000	2,910	2,220	2,590	3,800	2,210	8,360	13,800	11,400	3,400	2,320	2,390
8	2,080	2,870	2,780	2,630	3,330	2,320	7,590	14,000	11,200	2,950	2,110	2,440
9	2,000	2,510	2,640	2,790	3,560	2,410	6,120	14,300	12,500	2,300	2,160	2,430
10	2,080	2,830	2,610	2,890	3,730	2,410	6,710	16,800	10,800	2,450	2,340	2,410
11	2,260	2,790	2,880	2,330	3,610	2,500	8,560	17,000	10,200	3,780	2,430	2,330
12	2,160	2,840	2,320	2,500	3,710	2,410	8,960	15,800	9,000	2,950	2,430	1,910
13	2,670	2,800	2,410	2,700	3,620	2,410	12,400	18,600	7,550	3,980	2,430	2,230
14	2,700	2,920	2,080	2,800	3,720	3,560	14,700	17,900	6,330	2,850	2,400	2,330
15	2,800	2,440	2,410	2,500	3,540	15,900	12,800	17,900	10,300	2,640	2,100	2,250
16	2,650	1,860	2,410	2,320	3,440	14,700	13,800	19,100	8,980	3,100	2,200	2,170
17	2,460	2,240	2,410	2,320	3,560	9,200	14,300	19,400	8,900	2,670	2,280	2,170
18	2,360	2,580	2,800	2,160	3,560	6,690	13,800	19,100	9,430	2,760	2,420	1,950
19	2,180	2,610	2,900	2,700	3,560	6,830	13,900	18,800	8,760	2,400	2,350	2,190
20	2,460	2,480	2,320	2,800	3,440	7,630	13,500	19,700	7,340	2,900	2,400	2,190
21	2,600	2,590	2,600	2,500	3,560	7,670	13,200	20,000	5,130	2,560	2,080	2,240
22	2,570	2,520	5,640	2,700	3,220	10,900	13,200	19,700	8,830	2,330	2,120	2,490
23	2,530	2,420	3,390	2,700	3,440	10,000	13,200	18,200	11,800	2,570	2,530	2,430
24	2,620	2,950	2,530	2,800	3,110	10,900	13,200	18,700	5,730	2,370	2,570	2,360
25	2,520	2,940	2,130	2,320	3,330	10,700	12,800	18,200	3,810	2,300	2,510	2,430
26	2,020	2,960	2,500	2,500	3,110	9,560	11,500	17,600	3,880	2,360	2,340	1,980
27	2,300	2,220	2,700	2,900	2,700	10,000	11,300	17,000	5,410	2,610	2,340	2,090
28	2,290	2,640	2,500	2,500	2,900	9,780	11,800	16,100	5,710	2,640	2,240	2,190
29	2,380	2,670	2,700	3,440	2,240	9,930	13,000	16,400	5,190	2,450	2,060	2,040
30	2,500	1,890	2,630	3,560	.....	9,780	13,000	15,300	5,230	2,490	2,500	2,060
31	2,500	.....	2,390	3,680	.....	9,780	.....	15,200	.....	2,320	2,300	.....

NOTE.—Water below elevation of intake, 75.05 feet, for short periods on many days; probable gage-height graph for these periods sketched on gage-height chart after study of output at Little Falls power station and tailrace gage heights. No gage-height record Feb. 25–28 and July 14, 1919: discharge Feb. 25–28 determined from cooperating party's estimate of daily mean gage heights, and on July 14 by interpolation. Recorder not operating satisfactorily Oct. 7–9, Nov. 16–17, Dec. 12–21, 26–29, 1919, Jan. 12–31, Feb. 1–9, 16–29, and Mar. 1, 8–14, 1920; daily discharge determined from detailed study of output of Little Falls power plant, record of amount of water wasted over spillway, and relation of mean daily gage heights in tailrace to mean daily gage heights at gaging station. Braced figures show mean discharge for period included.

Monthly discharge of Spokane River below Little Falls, near Long Lake, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 6,380 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	2,420	1,880	2,200	.....	.....	136,000
November	2,950	2,110	2,550	.....	.....	152,000
December	6,420	2,600	4,320	.....	.....	266,000
January	14,400	2,830	6,000	.....	.....	369,000
February	12,800	.....	7,800	.....	.....	433,000
March	16,500	4,690	10,400	.....	.....	640,000
April	26,500	17,700	22,400	.....	.....	1,330,000
May	27,600	15,800	21,000	.....	.....	1,290,000
June	18,500	3,730	9,160	.....	.....	545,000
July	3,990	2,550	3,060	.....	.....	188,000
August	2,230	2,100	2,650	.....	.....	163,000
September	3,350	2,220	2,570	.....	.....	153,000
The year	27,600	1,880	7,830	1.23	16.70	5,660,000

Monthly discharge of Spokane River below Little Falls, near Long Lake, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919–20.						
October	4,660	2,000	2,500			154,000
November	2,960	1,860	2,620			156,000
December	5,610	2,080	2,700			166,000
January	3,680	2,160	2,680			165,000
February	3,800	2,240	3,410			196,000
March	15,900	2,210	6,630			408,000
April	14,700	5,760	11,000			655,000
May	20,000	12,800	16,600			1,020,000
June	14,800	3,810	9,120			543,000
July	5,630	2,300	3,000			184,000
August	2,570	2,020	2,310			142,000
September	2,490	1,910	2,240			133,000
The year	20,000	1,860	5,400	.846	11.51	3,920,600

ST. JOE RIVER AT CALDER, IDAHO.

LOCATION.—In sec. 3, T. 45 N., R. 2 E. Boise meridian, at ferry 150 feet southwest of Chicago, Milwaukee & St. Paul Railway station at Calder, 5 miles below Marble Creek, and 11 miles east of St. Joe, Shoshone County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 13 to September 30, 1920; April 14, 1911, to September 30, 1912, at station about 2½ miles downstream.

GAGE.—Vertical staff on right bank; read by C. P. Latham. Elevation of gage datum, 2,100 feet above sea level.

DISCHARGE MEASUREMENTS.—Made from boat or by wading.

CHANNEL AND CONTROL.—Right bank high, not subject to overflow; left bank subject to overflow at high stages. Shifting gravel riffle 800 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period July 13 to September 30, 1920, 81.7 feet at 4.15 p. m. July 15 (discharge, 2,900 second-feet); minimum stage recorded, 79.30 feet August 24–25, and September 6–9 (discharge, 435 second-feet).

1911–1912, 1920: Maximum stage recorded 9.0 feet (old station) May 21, 1912 (discharge, 15,400 second-feet); minimum stage recorded 1.6 feet (old station) November 2, 1911 (discharge, 380 second-feet).

ICE.—Stage-discharge relation seriously affected by ice; flow estimated from discharge measurements, observer's notes, and weather records.

DIVERSIONS.—None.

REGULATION.—Flash dam at Marble Creek used to store water for flushing logs down river during low-water periods. Water released twice daily during summer and once daily in early autumn. Operation of dam causes diurnal fluctuation at gage of at least 1 foot. Duration of effect about 4 hours.

ACCURACY.—Stage-discharge relation permanent; may have been slightly affected by logs. Rating curve well defined below 2,000 second-feet. Gage read twice daily to tenths. The mean of two readings daily may not indicate true mean stage. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

COOPERATION.—Gage-height record and some discharge measurements furnished by Washington Water Power Co.

Discharge measurements of St. Joe River at Calder, Idaho, during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 14	Eugene Logan	80.76	1,570	Aug. 26	John McCombs	79.46	491
Aug. 5	McCombs and Logan	79.70	630	Sept. 21	Calkins and Logan	79.78	640
Aug. 5	do	79.73	651				

Daily discharge, in second-feet, of St. Joe River at Calder, Idaho, for the year ending Sept. 30, 1920.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1	.....	685	570	11	.....	685	785	21	1,040	520	625
2	.....	820	545	12	.....	718	1,040	22	860	520	475
3	.....	750	570	13	2,000	625	1,390	23	860	475	598
4	.....	820	570	14	1,870	718	1,620	24	785	455	598
5	.....	655	475	15	1,870	570	1,620	25	990	435	655
6	.....	685	435	16	1,500	570	1,500	26	750	475	785
7	.....	1,040	435	17	1,080	570	1,280	27	900	475	1,620
8	.....	655	435	18	1,500	520	900	28	1,080	475	1,390
9	.....	718	455	19	1,390	545	475	29	718	655	718
10	.....	945	475	20	1,390	520	545	30	1,230	1,186	570
								31	945	570	.....

Monthly discharge of St. Joe River at Calder, Idaho, for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
July 13–31	2,000	718	1,200	45,200
August	1,180	435	647	39,800
September	1,620	435	805	47,900

ST. MARIES RIVER AT LOTUS, IDAHO.

LOCATION.—In sec. 20, T. 45 N., R. 2 W. Boise meridian, 1,600 feet below Lotus station on Elk River branch of Chicago, Milwaukee & St. Paul Railway and 9 miles above St. Maries and mouth of river, Benewah County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 9, 1911, to October 31, 1912, and July 15 to September 30, 1920.

GAGE.—Vertical staff installed July 15, 1920, on left bank; read by Mrs. G. W. Jarmin. July 9, 1911, to October 31, 1912, vertical staff on right bank about half a mile downstream.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 1,600 feet above gage.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Channel straight for 500 feet below gage. Left bank high; not subject to overflow at gage. Right bank subject to overflow at high stages. Riffle control 300 feet below gage; shifting at high stages. Stage of zero flow according to measurements made August 6 and September 22, 1920, gage height 58.1 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period July 15 to September 30, 59.80 feet at 2.30 p. m. September 13 (discharge, 275 second-feet); minimum stage recorded, 59.09 feet at 11.30 a. m. August 25 (discharge, 54 second-feet).

1911–1912, 1920: Maximum stage recorded, 7.0 feet (old gage) on April 11, 1912 (discharge, 4,670 second-feet); minimum stage recorded August 25, 1920.

ICE.—Stage-discharge relation seriously affected by ice.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 150 second-feet. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table. Records good for stages below 150 second-feet.

COOPERATION.—Gage-height record and some discharge measurements furnished by Washington Water Power Co.

Discharge measurements of St. Maries River at Lotus, Idaho, during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 16	Eugene Logan	59.45	126	Aug. 27	John McCombs	59.10	54.3
Aug. 6	McCombs and Logan	59.19	67.5	Sept. 22	Calkins and Logan	59.22	74.8
27	John McCombs	59.10	62.1	22	do	59.23	77.8

Daily discharge, in second-feet, of St. Maries River at Lotus, Idaho, for the year ending Sept. 30, 1920.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1		81	88	11		68	70	21	95	58	74
2		74	70	12		67	141	22	90	55	74
3		70	68	13		66	275	23	90	55	88
4		67	67	14		66	198	24	88	55	106
5		67	62	15	129	62	158	25	88	54	126
6		67	62	16	123	60	126	26	84	55	236
7		70	61	17	111	58	106	27	81	55	231
8		72	58	18	109	58	79	28	79	58	189
9		70	58	19	109	56	74	29	79	79	135
10		68	60	20	100	55	74	30	81	111	104
								31	84	100	

Monthly discharge of St. Maries River at Lotus, Idaho, for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
July 15–31	129	79	95.3	3,210
August	111	54	66.4	4,080
September	275	58	111	6,600

HAYDEN LAKE AT HAYDEN LAKE, IDAHO.

LOCATION.—In sec. 18, T. 51 N., R. 3 W. Boise meridian, at Avondale and Hayden Lake pumping plants, a quarter of a mile north of Hayden Lake depot of Spokane & Eastern Railway & Power Co., Kootenai County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 19 to September 30, 1920.

GAGE.—Vertical staff in two sections fastened to rock and to rock-crib foundation of boat house about 300 feet north of substation of Spokane Eastern Railway & Power Co; also vertical staff in sump of Hayden Lake pumping plant about 200 feet north of the substation for use during ice season. Gages read to hundredths once daily by Sigurd Berven.

EXTREMES OF STAGE.—Maximum stage recorded, 4.42 feet May 24 and 25; minimum stage recorded, 1.08 feet Sept. 26–30.

ICE.—No ice during period of record.
DIVERSION.—Water pumped from lake for irrigation and domestic purposes.
REGULATION.—None.

Daily gage height, in feet, of Hayden Lake at Hayden Lake, Idaho, for the year ending Sept. 30, 1920.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	.....	4.40	3.86	2.66	1.46	16	.....	4.31	3.37	2.06	1.14
2	.....	4.38	3.82	2.61	1.42	17	.....	4.29	3.35	2.00	1.14
3	.....	4.37	3.77	2.57	1.40	18	.....	4.26	3.32	1.96	1.12
4	.....	4.35	3.75	2.53	1.36	19	4.38	4.24	3.30	1.92	1.12
5	.....	4.35	3.71	2.49	1.34	20	4.38	4.22	3.26	1.88	1.12
6	.....	4.33	3.67	2.45	1.30	21	4.39	4.18	3.20	1.86	1.12
7	.....	4.33	3.63	2.41	1.28	22	4.39	4.16	3.14	1.82	1.10
8	.....	4.33	3.57	2.35	1.26	23	4.40	4.12	3.06	1.78	1.10
9	.....	4.33	3.53	2.35	1.24	24	4.42	4.08	2.98	1.74	1.10
10	.....	4.33	3.47	2.31	1.22	25	4.42	4.06	2.94	1.70	1.10
11	.....	4.33	3.45	2.27	1.22	26	4.40	4.04	2.90	1.66	1.08
12	.....	4.33	3.43	2.23	1.20	27	4.40	4.02	2.86	1.62	1.08
13	.....	4.33	3.43	2.19	1.20	28	4.40	3.98	2.82	1.58	1.08
14	.....	4.33	3.39	2.15	1.18	29	4.40	3.94	2.78	1.54	1.08
15	.....	4.31	3.37	2.10	1.18	30	4.40	3.90	2.74	1.52	1.08
						31	4.40	.....	2.70	1.50	.....

SPOKANE VALLEY LAND & WATER CO.'S CANAL AT POST FALLS, IDAHO.

LOCATION.—In NE. ¼ sec. 4, T. 50 N., R. 5 W. Boise meridian, on right bank of Spokane River 1,200 feet below canal headgates and half a mile west of Post Falls, Kootenai County.

RECORDS AVAILABLE.—May 20, 1911, to September 30, 1917; September 6, 1919, to September 30, 1920.

GAGE.—Vertical staff on left side of flume; read by Emil Johnson. Prior to April 21, 1915, a vertical staff at end of flume, about 1,200 feet below present gage.

DISCHARGE MEASUREMENTS.—Made from crossties on top of flume or from footbridge across flume one-fourth mile below gage.

CHANNEL AND CONTROL.—Flume and canal section below gage; shifts continually, owing to effect of gravel bar at end of flume and plant growth, and possibly to regulation of headgates of diversion ditches below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period September 6, 1919, to September 30, 1920, 3.20 feet July 17–22 (discharge, 143 second-feet); no water in canal December 7 to February 29, and September 19–30, 1920.

1911–1917 and 1919–1920: Maximum stage recorded, 3.20 feet June 18–22, 1911 (discharge, 170 second-feet). No water in canal during periods in 1911, 1912, 1916, 1917, 1919, and 1920.

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation changed continually throughout the period. Rating curve defined by measurements made April 22 and 23, 1920, well defined between 10 and 160 second-feet, is used as standard curve. Gage read once daily to hundredths, which is considered adequate for determination of mean daily gage height, since two submerged orifices and wasteway above canal headgate are instrumental in causing gage height of canal to remain constant even though the stage of the river is subject to considerable daily fluctuation. Daily discharge ascertained by shifting-control method. Records good.

COOPERATION.—Gage-height record furnished by Spokane Valley Land & Water Co. and some discharge measurements furnished by Washington Water Power Co.

Canal diverts water from right bank of Spokane River in the SE. ¼ sec. 3, T. 50 N., R. 5 W. Boise meridian. Water is used for irrigation.

Discharge measurements of Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the period Sept. 6, 1919, to Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Sept. 6	Paulsen and Parker....	2.66	94.0	Apr. 23	John McCombs.....	2.19	87.8
Nov. 2	John McCombs.....	1.57	41.9	23	.....do.....	2.44	104
				23	McCombs and Clarke...	2.63	117
1920.				May 31	John McCombs.....	2.51	102
Apr. 22	.....do.....	.68	13.3	July 19	Eugene Logan.....	3.19	140
22	.....do.....	.99	24.8	20	.....do.....	3.19	138
22	.....do.....	1.17	31.7	Aug. 3	John McCombs.....	3.20	135
22	.....do.....	1.51	47.4	30	McCombs and Logan...	1.72	46.7
22	.....do.....	1.85	66.6	30	.....do.....	2.90	112

Daily discharge, in second-feet, of Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the period Sept. 16, 1919, to Sept. 30, 1920.

Day.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	57	44	35	0	0	33	57	87	101	129	136	101
2	.....	57	44	35	0	0	33	57	87	101	129	136	101
3	.....	57	44	35	0	0	33	57	87	108	129	136	101
4	.....	57	44	33	0	0	33	57	87	115	129	136	108
5	.....	75	42	33	0	0	42	57	87	122	129	136	108
6	94	75	42	33	0	0	42	57	94	122	129	136	108
7	91	57	42	0	0	0	42	57	94	122	129	136	101
8	88	57	44	0	0	0	42	57	94	122	129	136	101
9	85	54	40	0	0	0	47	60	94	122	129	136	101
10	82	54	40	0	0	0	47	60	94	122	129	129	101
11	78	54	37	0	0	0	47	60	94	122	129	129	101
12	75	54	37	0	0	0	47	60	87	122	129	129	101
13	72	54	37	0	0	0	47	60	94	122	136	129	101
14	69	52	37	0	0	0	47	60	94	122	136	129	101
15	69	52	37	0	0	0	47	60	94	122	136	129	87
16	69	52	37	0	0	0	52	69	94	122	136	129	94
17	69	52	37	0	0	0	52	69	94	122	143	129	94
18	69	52	37	0	0	0	54	69	94	122	143	129	94
19	69	52	37	0	0	0	54	69	94	122	143	129	0
20	69	52	37	0	0	0	54	87	94	122	143	129	0
21	75	52	37	0	0	0	54	87	101	122	143	129	0
22	75	50	37	0	0	0	52	72	101	122	143	122	0
23	75	50	37	0	0	0	52	90	101	122	136	122	0
24	75	47	37	0	0	0	52	87	101	129	136	122	0
25	75	47	37	0	0	0	50	87	108	129	136	122	0
26	75	47	35	0	0	0	50	87	108	129	136	122	0
27	75	47	35	0	0	0	50	87	108	129	136	122	0
28	75	44	35	0	0	0	50	87	108	129	136	122	0
29	75	44	35	0	0	0	50	87	108	129	136	115	0
30	75	44	35	0	0	.....	50	87	108	129	136	115	0
31	.....	44	.....	0	0	.....	50	.....	101	.....	136	115	.....

NOTE.—Gage not read Sept. 7-13, 1919; discharge interpolated.

Monthly discharge of Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the period Sept. 6, 1919, to Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1919.				
September 6-30	94	69	75.9	3,760
1919-20.				
October	75	44	53.0	3,260
November	44	35	38.5	2,290
December	35	0	6.58	405
January	0	0	0	0
February	0	0	0	0
March	54	33	46.9	2,880
April	90	57	69.9	4,160
May	108	87	96.5	5,930
June	129	101	122	7,260
July	143	122	134	8,240
August	136	115	128	7,870
September	108	0	60.1	3,580
The year	143	0	63.2	45,900

NESPELEM RIVER BASIN.

NESPELEM RIVER AT NESPELEM, WASH.

LOCATION.—In SE. ¼ sec. 24, T. 31 N., R. 30 E., half a mile above Nespelem, Okanogan County, 5 miles above Little Nespelem River, and 6 miles above mouth.

DRAINAGE AREA.—122 square miles (measured on map of Colville Indian Reservation, edition of 1911).

RECORDS AVAILABLE.—May 1, 1911, to September 30, 1920.

GAGE.—Vertical staff on left bank at gaging bridge, installed October 19, 1916; read by J. L. Davis, Charles Kronk, and E. Lynch. Prior to July 30, 1913, vertical staff about 1,000 feet upstream at different datum; July 30, 1913, to November 4, 1915, vertical staff at site of present gage but at datum 0.38 foot lower; November 5, 1915, to October 18, 1916, and October 5 to December 14, 1917, inclined staff at site of present gage but at datum 0.47 foot lower.

DISCHARGE MEASUREMENTS.—Made from gaging bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Concrete control built in October, 1916. Moss grows on concrete control during summer. Right bank flat; subject to overflow at gage height 4.0 feet; left bank high; not subject to overflow. Stage of zero flow, gage height 0.4 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 4.9 feet April 5, determined by leveling to high-water mark (discharge, 483 second-feet); minimum stage recorded, 0.78 foot October 1–3, 5–7, and 10–15 (discharge, 8.0 second-feet).

Maximum stage recorded during year ending September 30, 1920, 1.10 feet May 10 and 11 (discharge, 31 second-feet); minimum stage recorded, 0.75 foot August 8 and 15 (discharge, 6.7 second-feet).

1911–1920: Maximum stage recorded, April 5, 1919; minimum discharge, 6.7 second-feet January 16–27 and March 1 and 2, 1917, August 8 and 15, 1920.

ICE.—Stage-discharge relation seldom affected by ice.

DIVERSION.—Above all diversions.

REGULATION.—None.

ACCURACY.—Stage-discharge relation slightly affected by growth of moss on concrete control. Rating curve well defined. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table or by shifting-control method. Records excellent for stages above 30 second-feet; good for lower stages.

Discharge measurements of Nespelem River at Nespelem, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 14	D. J. F. Calkins	0.78	7.7	Sept. 23	L. D. Carson	0.84	8.9
15	do	.78	7.2	1920.			
1919.				Apr. 2	John McCombs	.85	12.5
Apr. 16	R. B. Kilgore	3.00	255	2	do	.85	13.0
17	do	3.05	260	Sept. 29	do	.77	7.8
				30	do	.78	7.9

Daily discharge, in second-feet, of Nespelem River at Nespelem, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	8.0	8.5	10.1	10.6	31	39	301	277	101	26	13.3	9.0
2	8.0	8.2	10.1	10.1	29	39	313	265	95	25	13.3	9.0
3	8.0	9.6	10.1	9.6	28	37	313	253	88	24	13.3	9.0
4	8.2	11.2	10.1	9.6	29	39	349	229	81	21	15.2	9.0
5	8.0	10.6	10.6	9.6	29	37	483	218	77	21	15.2	10.1
6	8.0	9.0	10.6	9.6	31	37	397	196	78	21	13.8	10.6
7	8.0	9.0	10.6	9.0	31	37	373	185	80	21	13.8	11.2
8	8.2	9.0	10.6	9.0	31	37	337	185	80	21	13.8	11.2
9	8.2	8.5	10.6	9.0	67	37	313	174	70	17.4	13.8	11.2
10	8.0	10.1	10.6	9.0	55	37	313	174	62	17.4	13.8	10.6
11	8.0	10.1	10.6	9.0	44	44	301	185	58	17.4	13.8	10.6
12	8.0	10.1	10.6	9.6	48	40	289	185	55	17.4	12.7	13.3
13	8.0	9.6	10.6	9.6	44	41	289	163	54	17.4	12.7	13.3
14	8.0	15	13.8	9.6	41	58	277	163	58	17.4	12.7	13.3
15	8.0		11.7	9.6	41	45	253	152	50	17.4	12.2	12.7
16	9.0	11.7	11.7	9.6	107	45	253	152	48	17.4	11.7	12.2
17	9.6	11.7	11.7	9.6	85	62	253	152	45	17.4	11.2	11.7
18	8.5	11.2	11.2	45	58	92	313	152	44	17.4	10.6	10.6
19	8.2	10.6	11.2	42	48	91	325	136	42	17.4	10.1	10.6
20	8.2	10.6	11.7	17.4	46	75	325	130	41	17.4	9.6	10.1
21	8.2	10.1	11.7	12.7	44	71	313	130	39	17.4	9.6	10.1
22	8.2	10.1	11.7	64	44	91	301	124	36	13.8	9.6	10.1
23	8.2	10.1	11.7	64	41	101	289	124	35	13.8	9.6	10.6
24	8.2	10.1	11.7	28	35	124	277	124	34	13.8	9.6	10.1
25	8.2	10.1	11.7	22	36	136	277	124	31	11.2	9.6	10.1
26	8.2	10.1	11.2	27	39	152	289	124	30	11.2	9.6	10.1
27	8.5	10.1	11.2	28	41	174	289	124	29	17.4	9.6	10.1
28	9.0	10.1	11.2	33	40	174	289	124	28	17.4	9.6	10.1
29	8.5	10.1	11.2	37	.....	185	289	119	27	13.3	9.0	10.1
30	8.5	10.1	11.2	35	.....	207	289	119	27	13.3	9.0	10.1
31	8.5	.....	10.9	35	.....	241	.....	107	.....	13.3	9.0	.....

Daily discharge, in second-feet, of Nespelem River at Nespelem, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	11.2	11.7	10.6	10.6	9.6	10.6	11.7	18.8	18.1	11.2	7.1	7.8
2	11.2	11.7	10.6	10.6	9.6	10.6	12.2	19.6	18.1	10.6	7.4	7.8
3	10.1	11.7	9.6	10.6	9.6	10.6	11.7	19.6	17.4	10.6	7.1	7.4
4	10.1	11.7	9.6	10.6	9.6	10.6	11.7	20	16.0	10.1	7.1	7.4
5	10.1	11.7	9.6	10.1	9.6	10.6	11.7	21	14.5	9.6	7.1	7.4
6	10.1	11.2	9.0	10.1	10.1	10.6	11.7	22	14.5	9.6	7.1	7.1
7	10.1	11.2	9.0	9.6	10.1	10.6	12.2	21	15.2	9.6	7.1	7.1
8	10.1	11.2	9.0	9.6	10.6	10.6	12.2	22	18.1	9.6	6.7	7.1
9	10.1	11.2	9.0	9.6	10.1	11.2	12.7	23	18.8	9.0	7.1	7.1
10	10.1	11.2	9.0	9.6	10.6	11.2	12.7	31	22	9.0	7.1	7.4
11	10.1	10.6	9.0	9.6	10.1	11.2	12.7	31	20	8.5	7.1	7.8
12	10.1	10.6	9.0	9.6	10.1	11.2	12.7	23	18.8	10.1	7.1	7.4
13	10.1	10.6	9.0	9.6	10.1	11.2	15.2	23	18.1	9.6	7.1	7.8
14	10.1	11.2	9.0	9.6	10.1	11.2	16.7	23	17.4	10.1	7.1	7.4
15	10.1	11.2	9.0	9.6	10.1	11.2	18.1	23	18.1	10.1	6.7	7.4
16	10.1	12.2	9.0	9.6	10.6	11.2	18.8	23	18.8	9.6	7.1	7.4
17	10.1	11.7	8.5	9.6	10.1	11.7	18.8	22	16.7	9.0	7.1	7.4
18	10.1	12.2	9.0	9.6	10.6	12.2	16.7	22	16.0	8.1	7.1	7.4
19	10.1	12.7	9.0	9.6	10.1	12.2	16.7	21	15.2	8.5	7.1	7.4
20	10.1	12.2	9.0	9.6	10.6	12.2	18.8	20	13.8	8.1	7.1	7.8
21	10.1	12.2	15.2	9.6	10.1	12.7	18.8	20	13.8	8.1	7.1	8.1
22	10.1	12.2	21	9.0	10.6	12.7	16.7	20	12.7	8.1	7.1	8.5
23	10.6	12.2	11.7	9.0	10.1	12.7	15.7	19.6	12.7	8.1	7.1	8.5
24	10.6	12.2	11.7	9.0	10.6	12.7	16.7	19.6	12.7	8.1	7.1	9.0
25	10.6	11.7	12.2	9.6	10.1	12.2	16.7	19.6	12.7	7.8	7.4	8.5
26	10.6	11.2	12.2	9.6	10.6	12.2	16.7	18.8	12.7	8.1	7.4	8.1
27	10.6	11.2	12.7	9.6	10.6	12.2	16.7	18.8	12.7	8.1	7.4	7.8
28	10.6	10.6	12.7	9.6	10.6	11.7	16.7	18.1	12.7	8.1	7.8	7.4
29	10.6	10.6	12.2	9.6	10.6	11.7	17.4	17.4	12.2	8.1	8.5	8.5
30	10.6	10.6	12.2	9.6	.....	11.7	18.8	18.1	11.7	8.1	8.1	8.1
31	10.6	.....	12.2	9.6	.....	11.7	.....	18.8	.....	7.8	7.8	.....

NOTE.—Gage not read Nov. 14 and 15, 1918; discharge estimated by comparison with records of flow of Stranger Creek. Discharge, Dec. 31, 1918, interpolated. Daily discharge Apr. 2 to Sept. 28, 1920, ascertained by shifting-control method.

Monthly discharge of Nespelem River at Nespelem, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918-19.				
October	9.6	8.0	8.27	508
November	.....	8.2	10.3	613
December	13.8	10.1	11.1	682
January	64	9.0	20.9	1,290
February	107	28	44.2	2,450
March	241	37	84.7	5,210
April	483	253	309	18,400
May	277	107	164	10,100
June	101	27	53.9	3,210
July	26	11.2	17.6	1,080
August	15.2	9.0	11.6	713
September	13.3	9.0	10.7	637
The year	483	8.0	61.9	44,900
1919-20.				
October	11.2	10.1	10.3	633
November	12.7	10.6	11.5	684
December	21	8.5	10.7	658
January	10.6	9.0	9.70	596
February	10.6	9.6	10.2	587
March	12.7	10.6	11.5	707
April	18.8	11.7	15.3	910
May	31	17.4	21.2	1,300
June	22	11.7	15.7	934
July	11.2	7.8	9.00	553
August	8.5	6.7	7.24	445
September	9.0	7.1	7.71	459
The year	31	6.7	11.7	8,470

OKANOGAN RIVER BASIN.

OKANOGAN RIVER AT OKANOGAN, WASH.

LOCATION.—In sec. 16, T. 33 N., R. 26 E., at Okanogan, Okanogan County, a quarter of a mile above Salmon Creek.

DRAINAGE AREA.—7,740 square miles (measured on topographic maps and maps of Okanogan National Forest, Colville Indian Reservation, and Canadian railway belt).

RECORDS AVAILABLE.—May 10, 1911, to September 30, 1920.

GAGE.—Inclined and vertical staff gage on right bank 300 feet above highway bridge at Okanogan, installed March 3, 1917, and used for daily readings to June 10, 1920. Chain gage installed on highway bridge June 11, 1920. Gages read by C. R. Altman, W. A. Steiner, G. E. Mitchell, and G. M. Littlejohn. Prior to October 21, 1915, and from April 28 to August 27, 1916, vertical staff attached to steamboat dock at site of present highway bridge; October 21, 1915, to April 27, 1916, and August 28, 1916, to March 2, 1917, inclined staff 300 feet above steamboat dock. All gages at same datum.

DISCHARGE MEASUREMENTS.—Made from boat at gage, or from highway bridge at Omak, 4 miles upstream.

CHANNEL AND CONTROL.—Bed composed of boulders and cobblestones; likely to shift at extremely high water. Banks fairly high. One channel at all stages. Stage of zero flow estimated on October 4, 1918, at gage height −2.4 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 12.0 feet May 29 and 31 (discharge, 18,000 second-feet); stage may have been higher May 30 when gage was not read; minimum stage recorded 1.7 feet January 6 and 7 (discharge, 610 second-feet).

Maximum stage recorded during year ending September 30, 1920, 7.9 feet June 17–19 (discharge, 10,800 second-feet); minimum discharge, 615 second-feet, December 10–12.

1911–1920: Maximum stage recorded, 12.21 feet June 20, 1916 (discharge, 22,200 second-feet); minimum stage recorded, 1.50 feet December 28, 1917 (discharge, 520 second-feet).

ICE.—Stage-discharge relation affected by ice except during mild winters; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Numerous small ditches divert water for irrigation above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation gradually changed during April and May, 1919, and also October 15–31, 1919, because of construction of bridge at control; affected by ice December 9 and 11, 1919. Rating curves well defined. Gage read once daily to hundredths, except as indicated in footnote to tables of daily discharge. Daily discharge ascertained by applying daily gage height to rating table; shifting-control method used April 1 to May 31, and October 15–31, 1919. Records good except for periods when gage was not read, for which they are poor.

COOPERATION.—Gage-height record furnished by United States Forest Service.

Discharge measurements of Okanogan River at Okanogan, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.		Discharge.	Date.	Made by—	Gage height.		Discharge.
		Staff.	Chain.				Staff.	Chain.	
1918.		*Feet.*	*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Feet.*	*Sec.-ft.*
Oct. 4	D. J. F. Calkins..	2.08	.....	778	Sept. 26	L. D. Carson.....	2.50	.....	962
					Dec. 15	.....do.....	2.07	1.86	688
1919.					18	.....do.....	2.14	1.90	814
Jan. 11	L. D. Carson.....	1.92	.....	710	1920.				
13	.....do.....	2.02	.....	767	June 10	Lasley Lee.....	7.89	6.92	8,250
June 9	.....do.....	9.32	.....	11,600	28	John McCombs...	7.34	6.42	7,730
10	.....do.....	9.12	.....	11,000	Aug. 31	R. B. Kilgore....	2.65	2.36	1,020
Aug. 17	G. L. Parker.....	3.45	.....	1,740	Sept. 27	John McCombs...	2.75	2.44	1,080

Daily discharge, in second-feet, of Okanogan River at Okanogan, Wash., for the years ending Sept. 30, 1919 and 1920.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	770		860	685	830	710	986	7,730	14,900	8,980	2,410	1,100
2	770		890	660	800	770	1,010	8,520	13,200	8,350	2,300	1,100
3	830		890	710	770	830	1,040	8,310	12,700	8,150	2,300	1,100
4	830		890	660	770	890	1,060	7,820	12,200	7,950	2,300	1,100
5	830		890	635	890	830	1,090	7,330	12,200	7,950	2,300	1,100
6	860		890	610	770	770	1,240	6,780	12,700	8,150	2,410	1,030
7	890		890	610	890	770	1,250	6,240	13,200	7,950	2,410	1,030
8	890		995	660	890	770	1,270	6,410	12,200	7,180	2,300	1,030
9	890		1,100	660	960	770	1,280	6,580	11,500	6,630	2,190	1,030
10	890		1,100	660	1,030	770	1,300	7,300	11,000	8,150	2,140	1,030
11	890		1,030	710	960	770	1,310	7,390	10,800	6,270	2,090	1,030
12	860	1,150	960	770	925	830	1,400	7,480	9,870	6,100	1,990	1,100
13	830		960	770	890	770	1,420	7,100	9,420	5,846	1,890	1,100
14	1,180		960	830	830	770	1,450	6,730	9,200	5,590	1,790	1,260
15	1,340		960	830	830	830	1,470	6,360	10,100	5,270	1,790	1,410
16	1,260		960	830	930	830	1,490	7,080	10,300	4,950	1,790	1,330
17	1,100		1,100	830	1,030	830	1,510	8,640	10,100	4,950	1,740	1,250
18	1,090		1,030	1,520	890	1,720	1,540	8,220	10,300	4,800	1,690	1,170
19	1,070		1,030	1,430	890	1,340	1,560	8,220	10,600	4,500	1,590	1,100
20	1,060		960	1,340	830	1,100	1,800	8,620	11,500	4,140	1,500	1,100
21	1,040		960	1,100	830	1,030	2,050	10,300	13,200	3,770	1,410	1,060
22	1,030		865	1,100	850	1,030	2,160	11,500	13,700	3,630	1,330	1,030
23	1,030		770	1,340	870	995		13,200	13,900	3,500	1,330	1,030
24	1,030		770	1,920	890	960		14,400	13,400	3,370	1,290	1,030
25	960	890	770	1,100	770	890		13,700	12,500	3,240	1,250	960
26		770	770	1,030	770	890	4,760	14,900	11,800	2,990	1,250	960
27		770	660	960	710	890		15,600	11,500	2,870	1,170	960
28		770	660	1,030	710	890		16,800	11,800	2,750	1,170	926
29	1,250	770	660	1,030	.....	890		18,000	10,800	2,630	1,100	891
30		830	660	960	.....	925	7,360	18,000	9,870	2,410	1,100	826
31		.....	710	1,030	.....	960	.....	18,000	.....	2,410	1,100	.....
1919-20.												
1	826	840	1,140	1,180	1,020	840	790	1,950	4,200	9,490	2,780	1,080
2	891	840	1,140	1,070	1,140	790	790	1,800	4,050	9,990	2,640	1,080
3	891	840	895	895	1,210	790	790	1,650	4,500	9,990	2,500	1,010
4	891	840	790	842	1,210	790	790	1,650	4,950	9,270	2,370	940
5	891	840	700	790	1,210	790	790	1,650	6,450	8,550	2,370	920
6	891	840	700	840	1,210	790	745	1,750	7,300	7,830	2,240	900
7	826	840	678	840	1,210	790	745	1,950	8,150	7,170	2,240	880
8	826	840	655	840	1,250	790	745	2,500	7,950	6,750	2,120	820
9	826	840	635	895	1,290	790	745	3,880	8,770	6,340	2,000	820
10	826	840	615	895	1,210	790	745	5,270	8,350	6,210	2,000	820
11	826	840	615	868	1,140	790	745	5,590	8,290	6,070	2,000	765
12	826	840	615	840	1,070	790	745	5,590	8,290	5,940	1,880	765
13	826	790	655	868	1,140	790	745	5,590	8,290	5,750	1,760	765
14	826	790	655	895	1,140	790	745	5,590	8,290	6,140	1,760	765
15	891	745	745	895	1,140	790	792	6,450	8,760	5,750	1,680	940
16	891	768	745	895	1,140	790	840	6,720	10,200	5,470	1,600	1,010
17	891	790	790	895	1,140	790	840	6,990	10,800	5,190	1,510	940
18	891	895	790	922	1,140	790	840	7,950	10,800	5,010	1,430	1,010
19	858	2,050	840	950	1,140	790	840	7,950	10,800	4,830	1,430	945
20	826	1,750	840	950	950	745	790	6,990	10,400	4,650	1,330	880
21	826	1,650	925	1,010	950	768	790	6,630	9,990	4,830	1,330	880
22	826	1,550	1,010	840	1,010	790	840	6,270	9,740	4,650	1,280	940
23	826	1,500	1,070	745	1,070	790	840	5,930	10,800	4,480	1,240	940
24	826	1,460	1,210	700	1,070	790	895	5,590	10,500	4,140	1,160	940
25	891	2,500	1,210	700	1,010	790	842	5,270	9,000	3,900	1,160	1,010
26	891	2,380	1,210	700	895	790	790	4,950	8,060	3,660	1,080	1,040
27	891	1,760	1,210	700	895	790	840	4,650	7,620	3,510	1,080	1,080
28	858	1,140	1,210	745	895	790	895	4,650	7,170	3,360	1,010	1,160
29	826	1,070	1,210	790	868	790	1,140	4,650	7,610	3,210	1,010	1,160
30	826	1,100	1,210	1,010	.....	745	1,850	4,500	8,760	3,060	1,010	1,160
31	826	.....	1,290	895	.....	790	.....	4,350	.....	2,920	1,080	.....

NOTE.—Gage not read Oct. 6, 12, 18-21, Oct. 26 to Nov. 24, Nov. 27, 28, Dec. 1, 8, 15, 22, 24, 25, 29, 1918; Jan. 1, 5, 19, 26, Feb. 2, 9, 12, 16, 22, 23, Mar. 2, 9, 16, 23, 30, Apr. 1-4, 7-10, 13-18, 20, 23-29, May 4, 6, 8, 11, 30, and July 13, 1919; gage read practically every day except Sundays and holidays thereafter. Discharge Oct. 26 to Nov. 24, 1918, estimated by comparison with record of flow of Similkameen River near Oroville; discharge for remaining breaks in record interpolated. Dischsrge Dec. 9 and 11, 1919, interpolated because of ice effect. Braced figures show mean discharge for periods included.

Monthly discharge of Okanogan River at Okanogan, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	.....	770	1,020	62,700
November	.....	770	1,080	64,300
December	1,100	660	890	54,700
January	1,920	610	936	57,600
February	1,020	710	857	47,600
March	1,720	710	904	55,600
April	7,360	986	2,380	142,000
May	18,000	6,240	10,100	621,000
June	14,900	9,200	11,700	696,000
July	8,980	2,410	5,340	328,000
August	2,410	1,100	1,760	108,000
September	1,410	826	1,070	63,700
The year	18,000	610	3,180	2,300,000
1919–20.				
October	891	826	853	52,400
November	2,590	745	1,160	69,000
December	1,290	615	903	55,500
January	1,180	700	868	53,400
February	1,290	868	1,100	63,300
March	840	745	788	48,500
April	1,350	745	844	50,200
May	7,950	1,650	4,740	291,000
June	10,800	4,050	8,290	493,000
July	9,990	2,920	5,750	354,000
August	2,780	1,010	1,690	103,000
September	1,160	765	946	56,300
The year	10,800	615	2,330	1,690,000

SIMILKAMEEN RIVER NEAR OROVILLE, WASH.

LOCATION.—In SE. ¼ sec. 13, T. 40 N., R. 26 E., at Okanogan Valley Power Co's. plant, 4 miles above Oroville, Okanogan County, and 5 miles above mouth; below all tributaries.

DRAINAGE AREA.—3,450 square miles (measured on topographic and Canadian railway belt maps).

RECORDS AVAILABLE.—May 14, 1911, to September 30, 1920.

GAGE.—Vertical staff in seven sections on left bank; three sections 15 feet above tailrace and four sections nailed to power house; read by A. W. and C. T. Mitchell, and Mace Reed, jr.

DISCHARGE MEASUREMENTS.—Made by wading or from highway bridge at Oroville, 4 miles below gage.

CHANNEL AND CONTROL.—Narrow canyon at gage and control; fairly permanent. Banks high, not subject to overflow. Lower falls (25 feet high) 150 feet upstream from gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 17.7 feet at 8 a. m. May 29 (discharge, 19,600 second-feet); minimum discharge estimated at 262 second-feet January 5 and 6 when stage-discharge relation was affected by ice.

Maximum stage recorded during year ending September 30, 1920, 11.7 feet at 4 p. m. June 22 (discharge, 10,200 second-feet); mimimum discharge uncertain, but estimated at 325 second-feet, December 13 and 14, when stage-discharge relation was affected by ice.

1911–1920: Maximum stage recorded, 18.3 feet at 7 a. m. June 19, 1916 (discharge, 20,600 second-feet); minimum discharge uncertain, but estimated at 230 second-feet January 31, 1917, when stage-discharge relation was affected by ice.

ICE.—Stage-discharge relation seriously affected by ice; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Some water is diverted for irrigation from tributaries above the station. The principal diversion is made from the river above the gage by the West Okanogan Irrigation District, and has increased from about 75 second-feet to about 120 second-feet since irrigation season of 1916.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed gradually from April 1 to May 12, 1920, on account of construction work at site of new power plant; also affected by ice. Rating curves well defined. Gage read twice daily to hundredths. Daily discharge ascertained by applying daily mean gage height to rating table; shifting-control method used April 1 to May 12, 1920. Records excellent except for periods of ice effect and for period of change in control.

COOPERATION.—Gage-height record furnished by the Okanogan Valley Power Co.

Discharge measurements of Similkameen River near Oroville, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Ft.*	*Sec.-ft.*	1919.		*Ft.*	*Sec.-ft.*
Oct. 7	D. J. F. Calkins	1.44	462	Aug. 19	G. L. Parker	2.10	781
7	do	1.44	449	Dec. 17	L. D. Carson	[a] 2.47	429
1919.				1920.			
Jan. 20	L. D. Carson	1.88	671	Jan. 16	John McCombs	[a] 2.10	646
21	do	1.86	668	May 13	do	7.81	5,130
May 10	R. B. Kilgore	9.32	7,090	June 6	Lesley Lee	9.70	7,340
				Sept. 16	R. B. Kilgore	1.54	429

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Similkameen River near Oroville, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	390	901	583	320	510	390	558	7,350	11,300	6,980	1,450	487
2	400	845	558		442		633	7,740	10,600	6,860	1,450	487
3	442	845	583	361	361		790	7,220	10,700	6,740	1,380	510
4	442	845	583		442	490	958	6,740	10,400	6,860	1,380	487
5	442	845	558		442	490	1,020	6,150	10,700	6,740	1,450	442
6	464	845	583	280	487	490	1,200	5,710	11,000	6,740	1,710	442
7	464	790	845		464	421	1,200	5,600	10,700	6,740	1,580	487
8	464	736	790		464	442	1,200	6,040	9,860	5,490	1,450	442
9	464	684	790		487	442	1,200	6,740	9,580	5,160	1,260	487
10	442	658	684		464	442	1,200	7,100	9,300	5,050	1,200	487
11	442	736	658		510	442	1,260	7,100	8,780	4,740	1,140	487
12	442	736	608	490	487	442	1,380	6,980	8,660	4,540	1,080	534
13	1,140	684	558		487	442	1,320	6,500	7,610	4,140	1,020	608
14	958	658	583		464	442	1,380	6,040	8,000	3,870	958	901
15	790	684	684	583	464	442	1,320	6,260	8,780	3,780	958	736
16	736	684		534	464	442	1,320	7,740	8,650	3,780	901	684
17	684	658	670	558	487	442	1,320	8,000	8,520	3,780	845	633
18	658	633		633	487	464	1,450	7,740	8,780	3,420	790	583
19	633	608	608	684	464	442	1,710	7,740	9,300	2,990	790	558
20	658	608	633	658	487	442	1,850	9,170	10,800	2,750	736	510
21	736	608	633	658	464	442	2,060	10,400	12,200	2,590	736	510
22	684	583	583	684		442	2,060	11,900	11,800	2,430	736	487
23	658	558		736		442	2,060	14,000	11,600	2,430	658	487
24	633	510		633		442	2,130	14,000	10,700	2,270	633	464
25	608	464		633	370	464	2,670	14,000	10,100	2,130	633	442
26	583	361		608		487	3,330	15,000	9,720	1,920	583	421
27	583	464	370	583		487	4,140	16,900	10,100	1,920	558	421
28	583	487		558		487	5,930	19,100	9,580	1,850	558	400
29	958	487		558	.....	487	6,740	19,100	8,520	1,640	510	400
30	1,140	534		534	.....	510	6,980	16,900	7,740	1,580	534	400
31	1,020	.....		534	.....	534	.....	13,400	.....	1,520	510	.....

Daily discharge, in second-feet, of Similkameen River near Oroville, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	400	442		736	1,200	534	532	1,520	3,600	8,860	1,550	575
2	421	442		534	1,200	534	506	1,380	3,870	9,000	1,550	530
3	442	442		464	1,200	558	482	1,380	4,140	8,020	1,410	490
4	442	464			1,140	558	480	1,370	5,550	7,490	1,270	470
5	442	442	550		1,080	558	478	1,510	6,970	6,970	1,270	450
6	442	421		450	1,020	558	433	1,710	7,360	6,470	1,150	450
7	442	464			1,140	534	475	2,170	7,230	5,770	1,150	432
8	421	442			1,140	534	451	3,460	7,490	5,440	1,090	378
9	400	442			1,020	534	471	4,840	7,620	5,120	1,030	378
10	400	421			958	534	448	5,230	7,230	4,920	1,030	378
11	442	401			958	534	446	5,230	7,360	4,920	910	378
12	442	381			845	534	445	5,120	7,360	4,520	860	378
13	442	361			845	558	464	5,330	7,230	5,120	810	413
14	464	343	400		736	534	506	5,770	7,490	4,720	810	710
15	510	400		550	736	658	550	5,990	8,860	4,620	760	620
16	487	487			736	658	502	6,470	9,700	4,140	710	710
17	487	958			736	633	522	6,710	9,420	3,870	665	710
18	464	1,780		790	684	583	543	7,620	9,700	3,780	665	665
19	464	1,520		958	684	608	454	6,710	9,420	3,600	665	665
20	464	1,260		901	684	583	494	6,230	9,140	3,600	620	620
21	442	1,080		583	684	608	537	5,990	8,860	3,600	620	620
22	442	958		510	658	608	534	5,550	9,560	3,440	575	575
23	464	1,200	800		633	658	510	5,120	9,700	3,120	530	620
24	558	2,130			608	658	486	4,720	8,580	2,800	530	710
25	534	2,060			583	633	484	4,420	7,490	2,640	510	760
26	487	1,580		600	608	633	525	4,140	6,970	2,480	510	860
27	442				608	608	661	4,050	6,470	2,240	490	910
28	442	800	1,080		608	583	967	4,050	6,590	2,160	530	910
29	442		1,140		583	534	1,670	3,960	7,360	2,000	530	970
30	442		1,200	845	.....	534	1,600	3,780	8,020	1,840	575	910
31	442	.....	958	1,140	.....	534	.....	3,690	.....	1,760	620	.....

NOTE.—Discharge for following periods estimated because of ice from discharge measurements, observer's notes and weather records: Dec. 16–18, 23–31, 1918, Jan. 1–2, 4–14, Feb. 22–28, Mar. 1–3, Nov. 11, 12, 27–30, Dec. 1–27, 1919, Jan. 4–17 and 23–29, 1920. Braced figures show mean discharge for periods included.

Monthly discharge of Similkameen River near Oroville, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	1,140	380	636	39,100
November	901	361	658	39,200
December	845	.....	563	34,600
January	736	.....	500	30,700
February	510	.....	444	24,700
March	534	.....	444	27,300
April	6,980	558	2,080	124,000
May	19,100	5,600	9,820	604,000
June	12,200	7,610	9,780	582,000
July	6,980	1,520	3,980	245,000
August	1,710	510	973	59,800
September	901	400	514	30,600
The year	19,100	.....	2,540	1,840,000
1919–20.				
October	558	400	453	27,900
November	2,130	343	817	48,600
December	.....	.....	649	39,900
January	1,140	.....	602	37,000
February	1,200	583	838	48,200
March	658	534	578	35,500
April	1,670	433	589	35,000
May	7,620	1,370	4,360	268,000
June	9,700	3,600	7,540	449,000
July	9,000	1,760	4,480	275,000
August	1,550	490	839	51,600
September	970	378	608	36,200
The year	9,700	.....	1,860	1,350,000

SINLAHEKIN CREEK AT BLUE LAKE, NEAR LOOMIS, WASH.

LOCATION.—In NE. ¼ NW. ¼ sec. 21, T. 37 N., R. 25 E., 1,000 feet above Wilder ranch house, three-fourths mile northwest of Blue Lake, and 9½ miles southwest of Loomis, Okanogan County.

DRAINAGE AREA.—42.9 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 1 to October 31, 1920, when station was discontinued.

GAGE.—Vertical staff in two sections on left bank 150 feet above head of Barnes ditch; read by W. A. Barnes and R. A. Wilder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Bed of stream composed of boulders. Gradient steep. High-water control formed by large boulders and outcrop of bedrocks; permanent; low-water control composed of boulders near gage; may change during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 2.3 feet at 2.15 p. m. June 8 (discharge, 12 second-feet); minimum stage recorded, 1.50 feet on August 16 (discharge, 0.7 second-foot); may have been lower August 17, when gage was not read.

ICE.—None during period of record.

REGULATION.—None.

DIVERSION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined. Gage read to hundredths once or twice a week until October 6, after which it was read daily. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

COOPERATION.—Station maintained in cooperation with State Reclamation Service.

Discharge measurements of Sinlahekin Creek at Blue Lake, near Loomis, Wash., during the period June 8 to Oct. 6, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 8	Lasley Lee	2.28	10.8	Sept. 2	R. B. Kilgore	1.65	1.6
9	do	2.25	10.9	Oct. 6	John McCombs	1.93	4.2
25	John McCombs	2.10	6.1	6	do	1.93	3.1
July 30	do	1.74	2.3				

Daily discharge, in second-feet, of Sinlahekin Creek at Blue Lake, near Loomis, Wash., for the period June 1 to Oct. 31, 1920.

Day.	June.	July.	Aug.	Sept.	Oct.	Day.	June.	July.	Aug.	Sept.	Oct.
1		6.5	1.7	1.8	3.2	16	9.2	4.3	0.7	2.2	3.3
2		6.1	1.6	1.6	3.3	17	8.8	4.0	.7	2.1	3.2
3		5.7	1.5	1.4	3.5	18	8.4	3.7	.8	2.0	4.3
4	7.5	5.3	1.4	1.3	3.7	19	7.9	3.6	.8	1.8	4.3
5		4.9	1.3	1.1	3.9	20	7.5	3.4	.8	2.3	3.7
6		4.9	1.3	1.1	4.1	21	8.0	3.3	.8	2.8	3.4
7		4.9	1.2	1.1	4.3	22	8.5	3.2	.8	3.2	3.7
8	11	4.9	1.2	1.1	4.3	23	6.9	3.1	.8	3.7	3.7
9	10	4.5	1.1	1.1	3.7	24	6.7	2.9	1.0	3.4	3.7
10	9.2	4.1	1.0	1.3	3.5	25	6.5	2.8	1.2	3.1	3.7
11	8.5	3.7	1.0	1.6	3.3	26	6.5	2.6	1.4	2.8	3.9
12	8.0	4.6	.9	1.8	6.5	27	6.5	2.5	1.6	2.8	4.1
13	7.5	5.6	.8	2.0	4.9	28	8.0	2.4	2.5	2.8	4.1
14	9.0	6.5	.8	2.2	4.3	29	10	2.4	3.4	2.8	3.9
15	10	5.4	.8	2.4	4.1	30	10	2.3	4.3	3.0	3.7
						31	.....	2.0	3.0	.....	3.7

NOTE.—No gage-height record June 1–7, 10, 12, 14–15, 17–19, 21–22, 24, 26, 28–30, July 2–4, 6–7, 9–10, 12–13, 15, 17, 19–21, 23–24, 26, 28–29, 31, August 2–4, 6–7, 9, 11–15, 17–19, 21–22, 24–26, 28–29, 31, September 3–4, 6–8, 10–11, 13–14, 16–18, 20–22, 24–25, 27–28, 30, and October 1–3, 5, and 31. Discharge June 1–7, 14, 15, 21, 22, 28–30, and October 31, estimated by comparison with Toats Coulee Creek: Discharge for other days of no gage-height record determined by interpolation. Braced figures show mean discharge for periods included.

Monthly discharge of Sinlahekin Creek at Blue Lake, near Loomis, Wash., for the period June 1 to Oct. 31, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June			8.17	486
July	6.5	2.0	4.07	250
August	4.3	.7	1.36	83.6
September	3.7	1.1	2.12	126
October	6.5	3.2	3.90	240
The period				1,190

TOATS COULEE CREEK NEAR LOOMIS, WASH.

LOCATION.—In SE. ¼ sec. 33, T. 39 N., R. 25 E., just below Deer Creek, 800 feet above intake of Whitestone Irrigation District flume, and 3 miles northwest of Loomis, Okanogan County.

DRAINAGE AREA.—132 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 1 to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank at head of falls, installed June 3, 1920; inspected by C. H. Vander Meer and Dolores Douglas. May 11 to June 2, 1920, temporary staff gage at same site but at different datum; read by W. J. Holmes. All readings prior to installation of water-stage recorder reduced to datum of present gage.

DISCHARGE MEASUREMENTS.—Made from footbridge just above intake of irrigation flume or by wading.

CHANNEL AND CONTROL.—Bed composed of large boulders and gravel; one channel at all stages. Banks high and wooded. Control head of 20-foot falls several feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage during period of record, from water-stage recorder, 3.05 feet on June 15 (discharge, 183 second-feet); minimum stage, from recorder, 1.09 feet August 24–25 (discharge, 4 second-feet).

ICE.—None during period of record.

REGULATION.—None.

DIVERSION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Except as noted in footnote to table of daily discharge, gage read one or more times daily until June 2; operation of water-stage recorder fair. Daily discharge to June 2 ascertained by applying daily gage height to rating table; after June 2, by applying to rating table the daily mean gage height determined from gage-height graph by inspection. Records good except for periods for which no gage-height record was obtained.

COOPERATION.—Station maintained in cooperation with State Reclamation Service and Whitestone Irrigation District.

Discharge measurements of Toats Coulee Creek near Loomis, Wash., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 11	John McCombs	2.39	55.1	July 2	McCombs and Vander Meer	2.36	54.8
12	do	2.41	57.2	29	do	1.67	12.3
June 5	Lasley Lee	2.51	77.3	31	John McCombs	1.63	11.1
7	do	2.45	63.4	Sept. 3	R. B. Kilgore	1.36	6.5
24	John McCombs	2.48	73.0	3	do	1.35	6.3
26	do	2.42	60.8				

Daily discharge, in second-feet, of Toats Coulee Creek near Loomis, Wash., for the year ending Sept. 30, 1920.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1		44	64	11.0	8.8	16	134	152	41	4.6	10.7
2		47	55	10.2	7.2	17	132	130	37	4.6	9.8
3		51	52	9.8	6.5	18	132	116	36	4.6	8.1
4		67	48	9.1	6.1	19	128	102	33	4.8	7.2
5		72	44	8.4	5.9	20	124	100		4.8	
	46										
6		70	42	8.0	5.9	21	120	104	30	4.6	
7		66	39	7.4	5.4	22	114	116		4.3	
8		96	35	6.6	5.4	23	56	92		4.2	12
9		82	33	6.5	5.3	24	54	72	20	4.0	
10		72	31	6.2	5.2	25	53	62	19	4.6	
11	55	74	33	6.0	5.4	26	51	56	18	5.9	
12	58	70	39	5.6	6.0	27	50	56	16	7.2	10.7
13	126	74	52	5.4	7.8	28	48	62	14.8	8.5	
14	130	96	62	5.1	10.0	29	46	67	13.1	10.0	11
15	132	173	52	5.0	10.7	30	42	67	12.1	12.2	
						31	42	.....	11.5	10.7	.....

NOTE.—No gage-height record May 1–10, 15, 19, 24–27, July 20–23, and September 20–26 and 28–30; discharge determined by comparison with records of flow of near-by streams and from general information except for May 15 and 19, which was interpolated. Braced figures show mean discharge for periods included.

Monthly discharge of Toats Coulee Creek near Loomis, Wash., for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
May	134	.....	73.8	4,540
June	173	44	83.6	4,970
July	64	11.6	34.6	2,130
August	12.2	4.0	6.77	416
September	.....	5.2	8.84	526
The period	.....	.....	.....	12,600

NOTE.—Discharge for April, based upon comparison with records for Methow River at Twisp, probably less than 25 second-feet.

SALMON CREEK NEAR CONCONULLY, WASH.

LOCATION.—In sec. 18, T. 35 N., R. 25 E., half a mile below Conconully reservoir, Okanogan project of United States Reclamation Service, 2 miles south of Conconully, and 14 miles above Okanogan, Okanogan County.

DRAINAGE AREA.—121 square miles at present site; 164 square miles at former location at Jones ranch (revised measurements on topographic maps).

RECORDS AVAILABLE.—July 6, 1910, to September 30, 1920. From April 12, 1903, to March 31, 1912, records were obtained at Jones ranch in sec. 31, T. 34 N., R. 26 E., about 3 miles above Okanogan.

GAGE.—Vertical staff half a mile below reservoir indicates head on weir; read by Allen Honey.

DISCHARGE MEASUREMENTS.—Made from footbridge near gage or by wading.

CHANNEL AND CONTROL.—20-foot rectangular sharp-crested weir with two end contractions; prior to October 1, 1912, a 20-foot Cippoletti weir.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 1.96 feet from 10.30 a. m. to 1 p. m. June 11 (discharge, 200 second-feet); minimum stage recorded, 0.04 foot during November to December 31, February 3 to March 8, and September 13–20 (discharge, 0.3 second-foot).

Maximum stage recorded during year ending September 30, 1920, 0.98 foot August 4–9 (discharge, 68 second-feet); no flow November 20 and 21.

1903-1920: Maximum stage recorded, 3.63 feet at old site April 29, 1904 (discharge, 577 second-feet); no flow 4 p. m. October 3 to 6 p. m. October 11, 1910, and November 20–21, 1920, when water was being stored in Salmon Lake and Conconully reservoirs.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—Flow controlled by storage in Salmon Lake reservoir (capacity, 2,600 acre-feet) and Conconully reservoir (capacity, 13,000 acre-feet). Monthly summaries of flow for 1912–1918 have been corrected for storage; monthly summaries for years ending September 30, 1919 and 1920, not corrected for storage.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once daily; oftener when head was changed. Daily discharge ascertained by applying daily gage height to rating table or, for days when head was changed, by taking weighted mean of results obtained by applying to rating table the gage heights for the various periods of constant head. Records excellent.

COOPERATION.—Gage-height record and storage determinations furnished by United States Reclamation Service.

Discharge measurements of Salmon Creek near Conconully, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 5	D. J. F. Calkins	0.41	18.5	Sept. 27	L. D. Carson	0.86	56.2
5	do	.41	17.2	1920.			
1919.				June 11	Lasley Lee	.70	38.9
June 11	Carson and Honey	1.90	186	Sept. 2	R. B. Kilgore	.40	17.3
11	L. D. Carson	1.41	116				

Daily discharge, in second-feet, of Salmon Creek near Conconully, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	15	0.8	0.8	1.0	1.0	0.8	1.3	1.9	12	31	124	14
2	16	.8	.8	1.0	1.0	.8	1.3	1.9	12	37	118	12
3	16	.8	.8	1.0	.8	.8	1.3	1.9	11	36	115	9.4
4	16	.8	.8	1.0	.8	.8	1.3	1.9	16	33	101	9.4
5	18	.8	.8	1.0	.8	.8	1.3	1.9	15	36	81	9.4
6	18	.8	.8	1.0	.8	.8	1.3	8.8	15	58	21	8.6
7	18	.8	.8	1.0	.8	.8	1.3	20	15	101	15	4.3
8	17	.8	.8	1.0	.8	.8	1.3	51	18	122	9.5	4.3
9	12	.8	.8	1.0	.8	1.0	1.3	60	37	125	7.4	4.3
10	8.4	.8	.8	1.0	.8	1.0	1.3	64	97	125	7.3	3.1
11	7.3	.8	.8	1.0	.8	1.0	1.3	64	127	122	7.2	1.5
12	5.0	.8	.8	1.0	.8	1.3	1.3	65	125	121	10.4	1.5
13	4.3	.8	.8	1.0	.8	1.3	1.3	62	124	116	10.9	1.4
14	4.3	.8	.8	1.0	.8	1.3	1.3	63	122	112	14	.8
15	4.3	.8	.8	1.0	.8	1.3	1.3	69	124	104	16	.8
16	4.3	.8	.8	1.0	.8	1.3	1.3	77	121	100	19	.8
17	7.3	.8	.8	1.0	.8	1.3	1.3	81	116	95	39	.8
18	29	.8	.8	1.0	.8	1.3	1.3	81	112	59	86	.8
19	30	.8	.8	1.0	.8	1.5	1.3	86	109	19	122	.8
20	27	.8	.8	1.0	.8	1.3	1.3	90	109	28	132	4.3
21	18	.8	.8	1.0	.8	1.3	1.3	95	98	30	125	12
22	7.9	.8	.8	1.0	.8	1.3	1.3	104	20	29	106	19
23	5.4	.8	.8	1.0	.8	1.3	1.3	105	18	22	91	75
24	4.7	.8	.8	1.0	.8	1.3	1.3	90	10.4	8.2	81	87
25	5.8	.8	.8	1.0	.8	1.3	1.5	16	8.3	10.8	68	78
26	5.4	.8	.8	1.0	.8	1.3	1.5	19	7.9	12	27	66
27	2.1	.8	.8	1.0	.8	1.3	1.5	14	7.9	14	21	52
28	2.1	.8	.8	1.0	.8	1.3	1.5	12	9.4	33	24	17
29	2.1	.8	.8	1.0	.....	1.3	1.7	14	13	101	23	14
30	2.1	.8	.8	1.0	.....	1.3	1.7	12	25	131	18	8.4
31	2.1	.....	.8	1.0	.....	1.3	.....	12	.....	128	15	.....

Daily discharge, in second-feet, of Salmon Creek near Conconully, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	1.9	0.8	0.8	0.8	0.8	1.0	3.4	1.3	46	61	4.7	9.4
2	.8	.8	.8	.8	.8	1.0	.8	1.3	45	63	10.0	9.4
3	.8	.8	.8	.8	.8	1.0	.8	1.3	45	62	36	12.8
4	.8	.8	.8	.8	.8	1.0	.8	1.3	48	61	64	14.0
5	.8	.8	.8	.8	.8	1.0	.8	1.4	48	54	68	13.4
6	.8	.8	.8	.8	.8	1.0	.8	3.1	45	44	68	11.0
7	.8	.8	.8	.8	.8	1.0	.8	4.4	44	46	68	11.6
8	.8	.8	.8	.8	.8	1.0	.8	5.4	38	53	68	11.6
9	.8	.8	.8	.8	.8	1.0	.8	2.6	17.8	52	65	12.2
10	.8	.8	.8	.8	.8	1.0	.8	3.2	23	45	51	12.2
11	.8	.8	.8	.8	.8	1.0	.8	4.6	39	36	42	11.0
12	.8	.8	.8	.8	.8	1.0	.8	6.1	45	17.0	21	8.4
13	.8	.8	.8	.8	.8	.8	.8	8.1	44	13.6	14.0	6.8
14	.8	.8	.8	.8	.8	.8	.8	9.8	41	18.8	20	9.4
15	.8	.8	.8	.8	.8	.8	.8	10.3	28	6.1	17.0	9.4
16	.8	.8	.8	1.0	.8	.8	.8	9.4	32	5.1	15.8	9.4
17	.8	.8	.8	1.0	.8	.8	.8	9.4	29	4.5	15.2	11.0
18	.8	.8	.8	1.0	.8	.8	.8	9.4	30	3.2	14.0	11.6
19	.8	.8	.8	1.0	.8	.8	.8	9.4	24	14.0	14.6	14.0
20	.8	.0	.8	.8	.8	.8	.8	9.4	19.5	35	15.8	15.2
21	.8	.0	.8	.8	.8	.8	2.6	9.4	15.0	53	18.4	16.4
22	.8	.8	1.3	.8	.8	.8	3.6	9.4	5.1	61	19.8	15.8
23	.8	.8	.8	.8	.8	.8	3.6	10.6	5.1	61	17.0	17.0
24	.8	.8	.8	.8	.8	.8	4.3	14.2	5.4	59	21	17.7
25	.8	.8	.8	.8	.8	.8	1.8	22	5.8	50	15.8	17.7
26	.8	.8	.8	.8	.8	.8	1.0	27	7.9	47	14.6	17.7
27	.8	.8	.8	.8	1.0	1.1	1.0	30	7.9	21	13.4	17.7
28	.8	.8	.8	.8	1.0	2.8	1.0	34	15.3	2.1	14.0	17.7
29	.8	.8	.8	.8	1.0	2.8	1.0	42	32	2.9	14.6	17.7
30	.8	.8	.8	.8	.....	2.8	1.0	45	52	4.7	16.4	17.7
31	.8	.....	.8	.8	.....	3.8	.....	48	.....	5.4	17.7	.....

Monthly discharge of Salmon Creek near Conconully, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1919–20.				
October	30	2.1	10.8	664
November	.8	.8	.80	47.6
December	.8	.8	.80	49.2
January	1.0	1.0	1.00	61.5
February	1.0	.8	.81	45.0
March	1.5	.8	1.15	70.7
April	1.7	1.3	1.35	80.3
May	105	1.9	46.6	2,870
June	127	7.9	55.2	3,280
July	131	8.2	67.7	4,160
August	132	7.2	53.4	3,280
September	87	.8	17.4	1,040
The year	132	.8	21.6	15,600

Monthly discharge of Salmon Creek near Conconully, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1919-20.				
October	1.9	0.8	0.84	51.6
November	.8	.0	.75	44.6
December	1.3	.8	.82	50.4
January	1.0	.8	.83	51.0
February	1.0	.8	.82	47.2
March	3.8	.8	1.18	72.6
April	4.3	.8	1.32	78.6
May	48	1.3	13.0	799
June	52	5.1	29.4	1,750
July	63	2.1	34.2	2,100
August	68	4.7	28.2	1,730
September	17.7	6.8	13.2	786
The year	68	0.	10.4	7,560

NOTE.—Information is not available for determining monthly regulation from storage in Conconully and Salmon Lake reservoirs. Therefore, correction for storage, as published in previous reports, is not possible. It is estimated that during the year ending Sept. 30, 1919, storage in Salmon Lake reservoir decreased about 40 acre-feet, and in Conconully reservoir increased about 50 acre-feet; hence the net storage at the end of the year was about 10 acre-feet greater than that at the beginning. During the year ending Sept. 30, 1920, storage in Salmon Lake reservoir was greatly depleted, but data is inadequate for determining the amount.

METHOW RIVER BASIN.

METHOW RIVER AT TWISP, WASH.

LOCATION.—In sec. 17, T. 33 N., R. 22 E., at highway bridge at Twisp, Okanogan County, a quarter of a mile below mouth of Twisp River.

DRAINAGE AREA.—1,330 square miles (measured on topographic and Forest Service maps).

RECORDS AVAILABLE.—June 1, 1919, to September 30, 1920.

GAGE.—Chain gage on upstream side of highway bridge installed June 14, 1920. June 13 to July 25, 1919, vertical staff in two sections on right bank 40 feet above highway bridge, at present datum; July 26 to August 12, 1919, temporary vertical section for low water at same site but different datum; August 13 to October 2, 1919, vertical section on left bank, 25 feet below bridge, at different datum; October 3, 1919, to June 13, 1920, chain gage on bridge, at different datum. All gage heights have been referred to datum of present gage.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading nearby.

CHANNEL AND CONTROL.—One channel at all stages; straight for long distance above and below gage; bed composed of boulders and gravel. Control consists of large boulder riffle about 300 feet below gage; may shift during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period June 13, 1919, to September 30, 1920, 7.7 feet at 10 a. m. June 22, 1919 (discharge, 7,610 second-feet); minimum discharge estimated at 144 second-feet December 13–15, when stage-discharge relation was affected by ice.

ICE.—Stage-discharge relation seriously affected by ice; flow estimated from discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Numerous diversions above station for irrigation.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; affected by ice November 28 to December 21. Rating curve well defined below 6,000 second-feet. Gage read to hundredths twice daily, except December 7, 1919, to March 11, 1920, when diurnal fluctuation was slight and gage was read once daily. Daily discharge ascertained by applying mean daily gage height to rating table. Open-water records excellent.

COOPERATION.—Station maintained in cooperation with Washington State Reclamation Service.

Discharge measurements of Methow River at Twisp, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919		*Feet.*	*Sec.-ft.*
Oct. 1	Lee and Bartholet	1.80	249	Dec. 23	L. D. Carson	1.96	320
1919.				24	do	2.04	326
June 12	L. D. Carson	5.72	3,940	1920.			
13	do	5.80	4,040	June 13	Lasley Lee	4.94	2,850
Aug. 8	G. L. Parker	3.04	852	29	John McCombs	5.21	3,290
14	do	2.70	639	Aug. 25	R. B. Kilgore	1.93	291
Oct. 1	L. D. Carson	2.07	351	Sept. 25	John McCombs	2.30	459

Daily discharge, in second-feet, of Methow River at Twisp, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1919.					1919.				
1		4,160	1,020	405	16	4,160	3,200	593	449
2		4,160	1,020	384	17	4,160	2,900	568	427
3		4,160	950	384	18	4,650	2,220	568	427
4		4,480	950	384	19	5,510	1,980	543	427
5		4,820	1,020	384	20	7,210	1,870	519	405
6	5,000	4,480	950	384	21	7,210	1,760	495	384
7		3,840	883	405	22	7,210	1,650	495	384
8		3,360	819	405	23	6,630	1,650	472	384
9		3,360	788	405	24	5,870	1,450	449	363
10		3,680	758	405	25	5,510	1,350	427	363
11		3,520	729	427	26	6,060	1,260	405	343
12		3,520	700	495	27	6,060	1,090	405	343
13	4,160	3,050	672	519	28	5,510	1,090	405	343
14	4,480	2,900	645	495	29	4,820	1,020	384	343
15	4,480	2,900	619	472	30	4,480	1,020	384	343
					31		1,020	384	

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	343	323		203	249	203	233	472	1,260	4,000	593	304
2	343	304		203	249	217	233	484	1,350	3,520	568	304
3	323	304		203	233	217	233	495	1,550	2,620	543	304
4	304	304		203	233	217	233	519	2,220	2,900	519	285
5	304	304	200	267	217	217	233	543	2,760	2,900	495	285
6	304	304		233	217	217	233	619	2,760	2,350	495	285
7	285	304		217	217	217	233	883	2,760	2,220	472	285
8	285	285		203	217	217	233	1,350	2,760	2,100	495	285
9	267	304		233	203	217	233	1,650	2,480	2,220	449	267
10	267	285		217	177	233	217	1,870	2,480	2,100	449	267
11	285	285		233	177	233	217	1,870	2,620	2,100	449	267
12	285	249		217	217	217	233	1,980	2,620	1,980	427	285
13	285	285		217	217	233	233	2,100	2,760	2,100	405	304
14	285	285		217	189	267	233	2,350	2,900	2,220	384	323
15	285	285		217	189	249	233	2,350	4,160	1,980	384	343
16	285	304	200	233	189	249	233	2,620	4,320	1,760	363	343
17	285	343		233	189	249	233	2,620	4,320	1,620	343	363
18	285	343		285	217	249	233	2,620	4,000	1,550	343	363
19	267	343		285	217	249	249	2,220	3,840	1,450	323	384
20	267	343		217	217	249	249	2,100	3,680	1,350	323	384
21	267	323		203	217	267	233	1,980	4,000	1,260	323	384
22	267	323	285	217	203	267	217	1,760	4,320	1,090	304	405
23	267	343	304	165	189	267	217	1,550	3,840	1,020	304	427
24	267	363	323	217	189	267	217	1,550	3,050	950	304	449
25	267	343	267	249	203	267	217	1,450	2,620	819	285	449
26	267	323	267	217	217	249	249	1,350	2,350	788	304	449
27	267	267	267	217	217	249	267	1,350	2,350	729	304	427
28	285		267	233	203	249	304	1,850	2,480	700	304	427
29	304	250	249	267	203	249	363	1,350	3,200	672	304	427
30	285		249	267	.....	249	449	1,260	3,840	645	304	449
31	304	.....	217	249	.....	249	.....	1,260	.....	619	304	.....

NOTE.—Discharge, June 1–12, 1919, ascertained from comparison with records of Methow River at Pateros. Braced figures show mean discharge for periods included.

Combined monthly discharge of Methow River, Risley ditch, and Methow Valley Irrigation District's canal at Twisp, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 1,330 square miles.]

Month.	Discharge in second-feet.							Combined run-off.	
	River.			Risley ditch [a] (mean).	Methow Valley Irrigation District's canal [a] (mean).	Combined.		Inches.	Acre-feet.
	Maximum.	Minimum.	Mean.			Mean.	Per square mile.		
1919.									
June	7,210	.....	5,270	6	49	5,320	4.00	4.46	317,000
July	4,820	1,020	2,670	5	47	2,720	2.05	2.36	167,000
August	1,020	384	646	8	47	701	.527	.61	43,100
September	519	343	403	10	34	447	.336	.37	26,600
1919–20.									
October	343	267	287	5	10	302	.227	.26	18,600
November	363	.....	304	.....	.....	304	.229	.26	18,100
December	323	.....	222	.....	.....	222	.167	.19	13,600
January	285	165	227	.....	.....	227	.171	.20	14,000
February	249	177	209	.....	.....	209	.157	.17	12,000
March	267	203	240	.....	.....	240	.180	.21	14,800
April	449	217	246	4	10	260	.195	.22	15,500
May	2,620	472	1,550	5	40	1,600	1.20	1.38	98,400
June	4,320	1,260	2,990	6	49	3,040	2.29	2.56	181,000
July	4,000	619	1,750	5	47	1,800	1.35	1.56	111,000
August	593	285	392	8	47	447	.336	.39	27,500
September	449	267	351	10	34	395	.297	.33	23,500
The year	4,320	.....	731	.....	.....	754	.567	7.73	548,000

[a] Estimates of discharge of Risley ditch and Methow Valley Irrigation District's canal based upon discharge measurements published under miscellaneous measurements at end of this volume, and actual gage-height record over period June to September, 1920.

METHOW RIVER AT PATEROS, WASH.

LOCATION.—In sec. 2, T. 29 N., R. 23 E., three-fourths mile above highway bridge at Pateros, Okanogan County, and 1 mile above mouth.

DRAINAGE AREA.—1,810 square miles (revised measurement on topographic and Forest Service maps).

RECORDS AVAILABLE.—June 17, 1903, to September 30, 1920, when station was discontinued.

GAGE.—Inclined and vertical staff gage on left bank three-fourths mile above highway bridge; read by Mrs. W. J. Coy and Mrs. Bertha L. Merritt.

DISCHARGE MEASUREMENTS.—Made from cable 1,000 feet above gage or by wading.

CHANNEL AND CONTROL.—Bed of stream composed of large boulders and gravel; shifts at extremely high stages. One channel at all stages. Right bank high and not subject to overflow; left bank not subject to overflow below gage height of 12 feet. Stage of zero flow, according to measurements made September 20, 1920, gage height 1.3 feet ± 0.1 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 10.0 feet on May 27 and 28 (discharge, 9,510 second-feet); minimum discharge estimated at 204 second-feet January 5 and 6 when stage-discharge relation was affected by ice.

Maximum stage recorded during year ending September 30, 1920, 7.6 feet on June 18 and 22, and July 1 (discharge, 4,550 second-feet); minimum discharge estimated at 235 second-feet December 12–16 when stage-discharge relation was affected by ice.

1903–1920: Maximum stage recorded, 11.6 feet May 11, 1910 (discharge, 14,900 second-feet); minimum discharge probably occurred January 5 and 6, 1919.

ICE.—Stage-discharge relation seriously affected by ice; flow estimated from gage-height record, discharge measurements, observers' notes, and weather records.

DIVERSION.—Many ditches divert water for irrigation above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water on May 27–28, 1919, and on June 22, 1920; also affected by ice. Rating curves well defined. Except as stated in footnote to table of daily discharge, gage read to hundredths twice daily during year ending September 30, 1919, and once daily during year ending September 30, 1920. Daily discharge ascertained by applying mean daily gage height to rating table. Open-water records excellent except for periods when gage was not read.

Discharge measurements of Methow River at Pateros, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 1	D. J. F. Calkins	3.83	315	Oct. 7	L. D. Carson	4.06	415
2	do	3.78	278	Dec. 21	do	[a] 4.66	433
1919.				26	do	[a] 4.37	444
Jan. 10	L. D. Carson	[a] 4.21	379	1920.			
17	do	4.19	437	Jan. 18	John McCombs	[a] 4.76	592
18	do	4.27	465	June 18	Lasley Lee	7.55	4,390
June 7	do	8.37	6,110	Aug. 23	R. B. Kilgore	3.93	344
14	do	7.64	4,570	30	do	3.97	364
Aug. 7	G. L. Parker	5.03	1,050	Sept. 20	John McCombs	4.11	441
15	do	4.62	725	20	do	4.10	436
Sept. 29	L. D. Carson	4.10	467	26	do	4.26	513

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Methow River at Pateros, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.
1918-19.												
1	295	450	366		300		665	4,530	5,480	4,200		472
2	295	450	366		300		805	4,350	5,580	4,030		472
3	312	450	366		295		1,060	3,990	5,680	3,860		460
4	329	428	366				1,250	3,480	5,880	3,860	1,160	449
5	329	428	366	250			1,350	3,160	6,080	3,860		
6	329	428	366				1,460	3,160	6,080	3,700		
7	348	428	366			300	1,460	3,480	6,080	3,540	1,060	
8	366	428		214	300		1,350	3,480	5,520	3,540		475
9	366	428					1,350	3,480	4,970	3,380		
10	348	428					1,460	3,480	4,420		870	
11	366	406					1,460	3,480	3,860			
12	366	406	400				1,570	3,160	4,030			572
13	366	406		400		295	1,570	3,010	4,200	3,300		
14	386	428				329	1,460	2,860	4,550		713	
15	406	428				406	1,570	3,160	4,290		713	575
16	428	428				366	1,920	3,160	4,030		670	
17	450	428	498	450	310	366	2,300	3,320	4,200		626	
18	474	428	498	474		329	2,430	3,480	4,550		612	545
19	474	428	450	498		366	2,570	3,820	4,910		598	520
20	474	428	450	474		366	2,570	4,170	7,540		598	508
21	450	428	450	450		366	2,710	5,690	7,540	2,100	598	495
22	450	406	450	450	295	366	2,860	8,410	7,330		572	472
23	450	406	450	450	295	366	3,010	8,850	7,330		545	449
24	450	406	450	406	295	366	3,160	7,970	6,490		545	449
25	428	406	450			386	3,160	7,550	6,490	1,530	520	449
26	428	386	428		300	386	3,320	9,070	6,280		495	449
27	428	366	428	340		406	3,480	9,510	6,280		490	449
28	428	366	406			450	3,820	9,510	5,480	1,270	486	449
29	428	366	386		.....	450	4,170	8,190	4,730		481	449
30	450	366	386		.....	498	4,350	6,280	4,200		477	449
31	450	.....	366		.....	578	.....	5,680	.....		472	.....

Daily discharge, in second-feet, of Methow River at Pateros, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20												
1	449	406	400	384	500	329	348	472	1,420	4,550	845	362
2	449	428	406	295	472	329	348	572	1,420	4,370	776	362
3	449	406	312		449	348	348	572	1,760	3,860	713	362
4	449	428			428	348	329	406	2,250	3,380	653	362
5	442	428			406	348	348	406	2,650	3,080	624	340
6	435	449		300	386	366	348	684	2,120	2,800	596	340
7	428	428			376	312	366	884	2,650	2,510	541	340
8	428	449	250		367	348	366	1,310	2,790	2,380	541	340
9	428	406			358	348	348	1,880	2,790	2,380	541	320
10	406	366			348	366	312	2,000	2,650	2,380	514	320
11	406	406			348	366	295	2,120	2,650	2,250	486	320
12	406	428			366	348	312	2,120	2,650	2,250	486	320
13	406	449			348	366	348	2,250	2,930	2,380	486	340
14	406	449			348	406	366	2,380	3,230	2,790	460	340
15	406	428		350	348	366	348	2,650	4,200	2,380	433	362
16	406	428	250		348	386	348	2,650	4,200	2,250	408	384
17	406	449			348	348	329	2,930	4,370	2,000	408	384
18	406	495			366	348	329	2,930	4,550	1,880	362	384
19	406	495		598	329	366	329	2,790	4,200	1,760	384	408
20	406	472		520	329	366	348	2,790	4,030	1,640	384	433
21	386	449		472	329	386	348	2,250	4,030	1,420	362	433
22	406	449		406	329	406	366	2,120	4,550	1,420	301	460
23	406	495			348	386	348	2,000	4,200	1,260	320	460
24	406	495			348	386	329	1,880	3,700	1,110	362	486
25	406	472	450		348	386	312	1,530	2,930	922	384	486
26	406	495		400	348	366	329	1,640	2,650	922	362	514
27	406	495			348	366	329	1,530	2,380	845	384	514
28	406	449			329	366	366	1,640	2,650	776	362	541
29	406	406			329	365	406	1,640	3,540	776	362	541
30	406	400	520		.....	348	495	1,530	4,200	744	384	568
31	386	.....	472		.....	329	.....	1,530	.....	713	384	.....

NOTE.—Discharge estimated, because of ice, for following periods: Jan. 1-7, 9-16, 25-31, Feb. 4-21, 25-28, Mar. 1-12, Nov. 30, Dec. 1 and 24-29, 1919, Jan. 3-18, 23-31, Feb. 1, and 7-9, 1920. Gage not read during following periods: Dec. 1-3 and 5, 1918, June 2, 6, 8-10, and 15, Aug. 16, 18, 25, and 27-30, Sept. 1, 3, 20, 24-26, and 28, Oct. 5, 6, 12, and 16, 1919, Jan. 1, Mar. 30, Apr. 23, July 6, and Aug. 5, 1920 (discharge interpolated); Dec. 8-16, 1918, July 10-24, 26-31, Aug. 1-6, 8-13, Sept. 5-11, and 13-17, 1919 (discharge estimated by comparison with records of Methow River at Twisp and adjacent streams). Braced figures show mean discharge for periods included.

Monthly discharge of Methow River at Pateros, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918-19.				
October	474	295	398	24,500
November	450	366	415	24,700
December	.....	.....	410	25,200
January	498	.....	361	22,200
February	.....	.....	302	16,800
March	578	.....	356	21,900
April	4,350	665	2,190	130,000
May	9,510	2,860	5,060	311,000
June	7,540	3,860	5,470	325,000
July	4,200	.....	2,680	165,000
August	.....	472	756	46,500
September	.....	449	492	29,300
The year	9,510	.....	1,580	1,140,000

Monthly discharge of Methow River at Pateros, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1919-20.				
October	449	386	414	25,500
November	495	366	443	26,400
December	520	.....	336	20,700
January	.....	.....	370	22,800
February	500	329	366	21,100
March	406	312	361	22,200
April	495	295	348	20,700
May	2,930	406	1,740	107,000
June	4,550	1,420	3,140	187,000
July	4,550	713	2,070	127,000
August	845	301	471	29,000
September	568	320	404	24,000
The year	4,550	.....	873	633,000

CHEWACK CREEK BELOW BOULDER CREEK, NEAR WINTHROP, WASH.

LOCATION.—In sec. 35, T. 36 N., R. 21 E., at sawmill of Chewuck Lumber Co., 200 feet above intake of Sky Line ditch, 400 feet below Boulder Creek, and 7½ miles north of Winthrop, Okanogan County.

DRAINAGE AREA.—475 square miles (measured on map of Okanogan National Forest, edition of 1918).

RECORDS AVAILABLE.—June 1 to September 30, 1920.

GAGE.—Vertical and inclined staff on left bank, read by Mr. and Mrs. Mortimer Carroll.

DISCHARGE MEASUREMENTS.—At low stages, made by wading at gage; at medium stages, by wading at ford 2 miles above gage; and at high water, from highway bridge 1,000 feet above gage and above Boulder Creek. The flow of Boulder Creek is measured by wading and added to the discharge when measured at the bridge or ford.

CHANNEL AND CONTROL.—Bed composed of boulders. Gradient steep. Right bank high, left bank low but not subject to overflow. Control not well defined; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period June 16 to September 30, 7.40 feet June 16 (discharge, 1,160 second-feet); minimum stage recorded, 4.63 feet at 10 a. m. September 9 (discharge, 56 second-feet).

ICE.—Stage-discharge relation probably seriously affected by ice.

DIVERSIONS.—Jones ditch diverts small amount from Boulder Creek above station; no other important diversions above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage-height to rating table. Records excellent except for periods for which discharge was estimated by comparison with records for other streams.

COOPERATION.—Maintained in cooperation with Washington State Reclamation Service.

Discharge measurements of Chewack Creek below Boulder Creek, near Winthrop, Wash., during the year ending Sept. 30, 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 17	Lasley Lee	7.34	1,100	Aug. 25	R. B. Kilgore	4.68	60.5
17	....do	7.30	1,070	27	....do	4.73	66.6
30	John McCombs	6.72	625	Sept. 24	John McCombs	5.02	106

Daily discharge, in second-feet, of Chewack Creek below Boulder Creek, near Winthrop, Wash., for the year ending Sept. 30, , 1920.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		650	120	71	16	1,160	294	69	85
2		592	120	70	17	1,060	278	69	83
3		540	104	69	18	1,020	264	63	83
4		515	104	63	19	890	251	63	83
5		446	104	62	20	890	251	63	82
6		404	101	60	21	852	228	63	79
7		383	98	58	22	852	228	63	89
8	530	364	104	57	23	815	218	59	104
9		328	90	56	24	468	208	59	104
10		310	85	57	25	404	198	58	112
11		294	85	60	26	364	189	63	85
12		328	79	60	27	328	171	68	94
13		364	79	78	28	364	162	75	100
14		383	74	96	29	404	154	85	104
15		310	69	85	30	620	137	89	112
					31	.....	128	85	.....

NOTE.—Gage not read June 1-15; mean discharge estimated by comparison with record of Methow River at Twisp, Wash.

Monthly discharge of Chewack Creek below Boulder Creek, near Winthrop, Wash., for the year ending Sept. 30, 1920.

[Drainage area, 475 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches	Acre-feet.
April	.....	.....	52	0.109	0.12	3,090
May	.....	.....	320	.674	.78	19,700
June	1,160	.....	615	1.29	1.44	36,600
July	650	128	309	.651	.75	19,000
August	120	58	81.0	.171	.20	4,980
September	112	56	79.9	.168	.19	4,750
The period	.....	.....	.....	.....	.....	88,100

NOTE.—Discharge, Apr. 1 to June 15, estimated by comparison with record of Methow River at Twisp, Wash.

CHELAN RIVER BASIN.

LAKE CHELAN AT CHELAN, WASH.

LOCATION.—In sec. 13, T. 27 N., R. 22 E., at Forest Service boat landing at Chelan, Chelan County, a quarter of a mile above highway bridge at outlet.

DRAINAGE AREA.—950 square miles (measured on topographic and Forest Service maps).

RECORDS AVAILABLE.—September 1 to October 15, 1897; January 1, 1898, to December 31, 1899; January 1 to June 30, 1905; December 5, 1910, to September 30, 1920.

GAGE.—Vertical staff on pile at landing; installed December 5, 1910; datum 1,076.15 feet above sea level. Gage used from 1897 to 1899 was at Lakeside, about a mile west of Chelan; datum 1,070.18 feet above sea level. In 1905 gage was on a bent of upper bridge at Chelan; elevation not determined. Gage read by Forest Service employees and H. E. Farley.

EXTREMES OF STAGE.—Maximum stage recorded during year ending September 30, 1919, 5.48 feet on June 30; minimum stage recorded 2.95 feet on September 22.

Maximum stage recorded during year ending September 30, 1920, 5.6 feet July 3 and 10; minimum stage recorded, 1.65 feet March 16.

1898–99 and 1911–1920: Maximum stage recorded, 7.2 feet June 18, 1916; minimum stage recorded, 6.60 feet (elevation, 1,076.78 feet) January 27–28, and December 2–5, 1898.

REGULATION.—The lake level is controlled at low water by operation of flashboard dam at outlet in the interest of navigation.
ACCURACY.—Gage read to hundredths about once a week. Record reliable.
COOPERATION.—Record furnished in part by United States Forest Service.

Daily gage height, in feet, of Lake Chelan at Chelan, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1												3.40
2			3.03		3.28				5.31			
3						3.00						
4											3.84	
5								4.01				
6	3.50			3.12								
7							3.30			5.33		
8												3.23
9			3.35						5.02			
10		3.43			3.38	2.97						
11											3.93	
12								3.68				
13	3.54			3.20								
14							3.39			5.10		
15												3.10
16			3.62						4.54			
17					3.15							
18		3.19									3.83	
19				3.40				3.44				
20	3.48											
21							3.69			4.75		
22			3.50									2.95
23					3.03				5.32			
24						3.99						
25		3.10									3.69	
26												
27	3.42			3.62				4.92				
28					3.05		3.91			4.08		
29			3.54									
30									5.48			
31	3.30		3.32			3.16				4.13	3.40	
1919-20.												
1	2.81	2.45	3.17			2.70			2.38			
2					3.35							
3		2.40								5.60		
4												
5				3.15					2.97			
6	2.80											
7											4.25	
8			3.10			1.95		2.72				
9					3.25							
10		2.38								5.60		
11												
12				3.14			2.05		3.85			
13	2.70											
14												
15			3.50					3.00				
16				3.15	3.35	1.65						
17		2.55								5.45		
18							1.85					3.70
19				3.20								
20	2.55											
21											3.65	
22			3.15			1.95		3.20				
23					3.30							
24										5.05		
25		3.10										3.70
26				3.35					5.00			
27	2.54											
28												
29			3.15		2.90			2.78				
30						2.75			5.20			3.65
31	2.44			3.42						4.40	3.45	

CHELAN RIVER AT CHELAN, WASH.

LOCATION.—In sec. 13, T. 27 N., R. 22 E., at lower bridge at Chelan, Chelan County, 800 feet below flashboard dam at outlet of Chelan Lake and 4 miles northwest of Chelan Falls.

DRAINAGE AREA.—950 square miles (measured on topographic and Forest Service maps).

RECORDS AVAILABLE.—November 1, 1903, to September 30, 1920.

GAGE.—Vertical staff on fourth bent of left approach to lower bridge; read by W. E. Naylor, G. H. Wenner, and H. E. Farley.

DISCHARGE MEASUREMENTS.—Made from uppper bridge 1,000 feet above gage or by wading.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel; shifting at extremely high water. Channel curved above gage, but practically straight below. Banks high; not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 10.0 feet May 29 (discharge, 7,600 second-feet); minimum stage recorded, 4.8 feet March 17 (discharge, 547 second-feet).

Maximum stage recorded during year ending September 30, 1920, 9.0 feet July 4 (discharge, 5,580 second-feet); minimum stage recorded, 3.1 feet March 18–20 (discharge, 211 second-feet).

1903–1920: Maximum stage recorded, 11.48 feet June 20, 1916 (discharge, 9,780 second-feet). Practically no flow for at least part of day on January 30, 1917; because outlet to lake was blocked solid with floating ice so that no water could flow over dam.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Several irrigation ditches divert from tributaries a very small proportion of the run-off.

REGULATION.—Flashboard dam 800 feet above gage controls lake level at low water in the interest of navigation. Monthly summaries of flow have been corrected for storage.

ACCURACY.—Stage-discharge relation for medium and high stages changed during high water on May 29–30, 1919. Rating curves well defined; revised slightly October 1, 1919. Gage read once daily to hundredths except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying daily gage height to rating table. Records excellent except December, 1919, to June, 1920, for which they are fair.

COOPERATION.—Gage-height record furnished by United States Forest Service.

Discharge measurements of Chelan River at Chelan, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Jan. 8	L. D. Carson	5.28	819	Jan. 20	John McCombs	4.89	608
22	....do	5.66	1,020	20	....do	4.89	559
23	....do	5.70	1,120	June 19	Lasley Lee	7.70	3,530
June 6	....do	9.62	6,780	July 27	John McCombs	7.84	3,710
16	....do	9.00	5,570	Aug. 21	R. B. Kilgore	6.50	1,910
Aug. 2	G. L. Parker	7.56	3,310	23	....do	6.50	1,880
5	....do	7.36	2,990	Sept. 19	John McCombs	5.88	1,230
Oct. 5	L. D. Carson	5.22	746				

Daily discharge, in second-feet, of Chelan River at Chelan, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	980	910	662	910	980	630	730	4,450	6,760	6,930	3,400	1,850
2	980	845	678	910	912	630	845	4,450	6,760	6,760	3,400	1,740
3	980	878	678	910	845	630	910	4,450	6,590	6,760	3,400	1,630
4	980	910	730	785	845	630	1,340	4,950	6,590	6,760	3,400	1,630
5	980	910	730	758	845	678	2,880	4,780	6,420	6,760	3,100	1,630
6	980	845	730	730	845	630	3,810	4,610	6,590	6,930	2,360	1,520
7	980	845	785	730	785	586	3,490	4,450	6,590	6,760	2,360	1,630
8	980	845	815	785	785	630	3,490	4,450	6,420	6,590	2,500	1,520
9	910	845	845	730	815	630	3,330	4,450	6,420	6,590	2,500	1,520
10	980	845	785	730	845	630	2,880	4,450	6,420	6,420	2,430	1,500
11	980	845	845	730	785	586	1,150	4,290	6,080	6,420	2,360	1,490
12	1,150	845	845	730	730	586	730	4,290	5,910	6,760	2,500	1,470
13	1,200	785	845	730	785	586	785	4,290	5,910	6,590	2,360	1,450
14	1,240	730	910	678	845	586	785	4,130	5,740	6,420	2,230	1,440
15	1,150	730	1,030	730	845	586	785	4,130	5,740	6,420	2,230	1,420
16	1,240	845	1,150	730	788	566	845	4,130	5,570	6,590	2,230	1,420
17	1,150	788	1,150	845	730	547	845	3,970	5,570	6,590	2,230	1,420
18	1,340	730	1,150	730	730	586	910	3,970	5,410	6,420	2,230	1,320
19	1,150	785	1,200	855	730	586	980	3,970	5,410	6,250	2,230	1,320
20	1,100	730	1,240	980	730	586	1,060	3,970	5,910	5,910	2,230	910
21	1,060	730	1,150	785	730	586	1,900	3,970	6,250	5,740	2,230	845
22	980	730	1,100	1,060	697	630	3,030	4,450	6,590	5,740	2,230	845
23	980	730	1,060	1,060	663	586	2,880	4,780	6,760	5,570	2,100	845
24	980	730	1,060	980	630	586	2,580	5,290	6,930	5,570	2,100	845
25	910	730	1,020	1,060	630	586	2,580	5,460	6,930	5,410	2,100	816
26	845	678	980	1,100	630	630	3,180	5,900	7,100	5,250	2,100	788
27	912	678	980	1,150	630	630	2,880	6,340	7,270	4,930	1,970	759
28	980	654	980	980	730	630	3,030	6,880	7,270	4,770	1,970	730
29	980	630	945	910	.....	630	3,650	7,600	7,270	4,610	1,850	730
30	845	646	910	1,060	.....	730	3,810	7,270	7,100	4,450	1,748	730
31	845	.....	910	980	.....	730	.....	7,270	.....	4,150	1,740	.....
1919–20.												
1	730	427	586	563	730	2,760	379	2,050	2,630	4,930	2,900	1,060
2	730	427	580	555	730	2,480	416	2,140	1,660	5,250	2,900	1,060
3	730	427	575	547	730	2,500	453	2,220	1,740	5,250	2,760	1,060
4	730	427	569	547	730	2,320	490	2,300	1,810	5,580	2,630	1,060
5	730	427	564	547	758	2,130	527	2,380	1,890	5,410	2,630	1,060
6	730	427	558	547	785	2,010	563	2,460	1,810	5,250	2,630	980
7	678	427	553	547	730	1,950	600	2,550	1,740	5,250	2,630	980
8	730	427	547	547	730	1,890	637	2,630	1,660	5,250	2,500	980
9	630	427	547	547	730	1,770	674	2,710	1,780	5,250	2,500	980
10	630	427	547	547	730	1,660	711	2,790	1,890	5,250	2,630	980
11	630	427	547	530	678	1,550	748	2,870	2,010	5,250	2,500	980
12	630	427	547	512	678	1,450	785	2,950	2,130	5,410	2,500	1,060
13	630	427	547	512	678	1,340	818	3,030	2,250	5,250	2,500	1,060
14	586	416	547	512	678	1,100	850	3,110	2,380	5,410	2,460	1,240
15	586	404	547	530	678	867	882	3,190	2,500	5,410	2,410	1,150
16	586	392	553	547	678	630	915	3,210	2,900	5,250	2,370	1,150
17	547	381	538	547	630	420	948	3,230	3,190	5,250	2,250	1,240
18	512	403	564	638	630	211	980	3,250	3,340	5,250	2,130	1,240
19	512	427	569	730	630	211	1,060	3,280	3,490	5,250	2,010	1,240
20	512	440	575	586	630	211	1,140	3,300	5,570	5,090	2,010	1,240
21	512	452	580	586	630	223	1,220	3,320	3,650	4,930	1,890	1,240
22	512	480	586	586	630	235	1,310	3,340	4,130	4,610	1,890	1,240
23	480	502	586	586	630	244	1,390	3,260	4,290	4,450	1,890	1,240
24	480	525	586	586	630	252	1,480	3,190	4,290	4,290	1,890	1,240
25	480	547	586	632	630	261	1,560	3,120	4,290	4,130	1,770	1,240
26	452	560	586	678	630	270	1,640	3,040	3,970	3,810	1,770	1,240
27	452	573	586	730	630	279	1,720	3,040	3,970	3,650	1,660	1,240
28	452	586	586	730	3,040	288	1,800	3,040	3,970	3,650	1,550	1,240
29	444	586	586	730	2,900	296	1,890	2,900	4,290	3,490	1,449	1,150
30	435	586	578	730	.....	305	1,970	2,810	4,610	3,040	845	1,150
31	427	.....	570	730	.....	342	.....	2,720	.....	2,900	910	.....

NOTE.—Gage not read Sundays or holidays until after Mar. 16, 1919; gage not read Nov. 23, 30, Dec. 19 and 31, 1918, Mar. 19, May 26, Aug. 10, Sept. 10–14, 25–27, 29, 30, Oct. 29, 30, Nov. 9, 11, 14–16, 20, 23–24, 26–27, 29–30, Dec. 2–7, 9–14, 16–21, 23–28, 30–31, 1919, Jan. 1–2, 4, 7, 9, 11, 15, 18, 21–23, 25, Feb. 1, 5, 8, 12–13, 15, 21–22, 24, 29, Mar. 2, 4, 7, 11–12, 14–15, 17, 19, 21, 23–29, 31, Apr. 1–11, 13–17, 19–30, May 1–7, 9–14, 16–21, 23–25, 30–31, June 3–4, 6–7, 9, 13–14, 20, 27, Aug. 14 and 15, 1920; discharge interpolated.

Monthly discharge of Chelan River at Chelan, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 950 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
1918-19.									
October	1,340	845	1,020	62,700	−6,500	56,200	914	0.962	1.11
November	910	630	781	46,500	−9,000	37,500	630	.663	.74
December	1,240	662	932	57,300	+9,600	66,900	1,090	1.15	1.33
January	1,150	678	866	53,200	+2,400	55,600	904	.952	1.10
February	980	630	769	42,700	−10,500	32,200	580	.611	.64
March	730	547	615	37,800	+3,300	41,100	668	.703	.81
April	3,810	730	2,070	123,000	+26,200	149,000	2,500	2.63	2.93
May	7,600	3,970	4,900	301,000	+41,500	342,000	5,560	5.85	6.74
June	7,270	5,410	6,410	381,000	+4,300	385,000	6,470	6.81	7.60
July	6,930	4,150	6,060	373,000	−41,900	331,000	5,380	5.66	6.52
August	3,400	1,740	2,380	146,000	−22,900	123,000	2,000	2.11	2.43
September	1,850	730	1,260	75,000	−18,000	57,000	958	1.01	1.13
The year	7,600	547	2,350	1,700,000	−21,500	1,680,000	2,320	2.44	33.08
1919-20.									
October	730	427	578	35,500	−11,300	24,200	394	.415	.48
November	586	381	460	27,400	+22,100	49,500	832	.876	.98
December	586	547	568	34,900	−300	34,600	563	.593	.68
January	730	512	595	36,600	+6,000	42,600	693	.729	.84
February	3,040	630	839	48,300	−13,500	34,800	605	.637	.69
March	2,760	211	1,050	64,600	−6,500	58,100	945	.995	1.15
April	1,970	379	1,020	60,700	−10,000	50,700	852	.897	1.00
May	3,340	2,050	2,880	177,000	+4,350	181,000	2,940	3.09	3.56
June	4,610	1,660	2,930	174,000	+83,200	257,000	4,320	4.55	5.08
July	5,580	2,900	4,790	295,000	−24,500	270,000	4,390	4.62	5.33
August	2,900	845	2,170	133,000	−29,800	103,000	1,680	1.77	2.04
September	1,240	980	1,130	67,200	+6,500	73,700	1,240	1.31	1.46
The year	5,580	211	1,590	1,150,000	+26,200	1,180,000	1,620	1.71	23.29

NOTE.—Storage estimated from gage-height record of Lake Chelan and capacity of lake determined from areas measured on topographic maps.

ENTIAT RIVER BASIN.

ENTIAT RIVER AT ENTIAT, WASH.

LOCATION.—In sec. 18, T. 25 N., R. 21 E., one-eighth mile below power plant of Wenatchee Valley Gas & Electric Co., three-fourths mile west of Entiat, Chelan County, and 1 mile above mouth.

DRAINAGE AREA.—419 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 5, 1910, to September 30, 1920.

GAGE.—Inclined staff on left bank one-eighth mile below power plant; read by L. G. Asher.

DISCHARGE MEASUREMENTS.—Made from private bridge 200 feet below power plant or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders; shifting. One channel at all stages. Left bank high; not subject to overflow; right bank slopes gradually.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 3.9 feet May 28 (discharge, 2,950 second-feet); minimum stage recorded, 0.70 foot November 25 (discharge, 64 second-feet).

Maximum stage recorded during year ending September 30, 1920, 2.55 feet June 19, 22, and 23 (discharge, 1,030 second-feet); minimum discharge estimated at 50 second-feet on December 14, when stage-discharge relation was affected by ice.

1910–1920: Maximum stage recorded, 5 feet June 17, 1916 (discharge, 5,150 second-feet); minimum discharge probably occurred December 14, 1919.

ICE.—Stage-discharge relation affected by ice; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Several diversions above station for irrigation. Entiat Irrigation Co.'s high-line canal (capacity about 15 second-feet) carries water past station.

REGULATION.—Flow affected by changes in load at power plant.

ACCURACY.—Stage-discharge relation permanent except as affected by ice. Rating curve well defined. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table. Records good except during periods when stage-discharge relation was affected by ice.

COOPERATION.—Gage-height record furnished by Wenatchee Valley Gas & Electric Co.

Discharge measurements of Entiat River at Entiat, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Jan. 7	L. D. Carson	[a] 3.00	125	Oct. 9	L. D. Carson	0.94	116
24	do	1.28	224	Dec. 11	do	[a] 1.93	125
24	do	1.28	220				
June 3	do	3.10	1,740	1920.			
17	do	2.85	1,360	Jan. 21	John McCombs	[a] .94	81.7
Aug. 1	G. L. Parker	1.93	506	June 19	Lasley Lee	2.54	1,050
6	do	1.72	416	Aug. 20	R. B. Kilgore	1.00	134
Oct. 8	L. D. Carson	.92	118	Sept. 18	John McCombs	1.22	206

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Entiat River at Entiat, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	114	132	132		106	111	404	1,030	2,290	1,680	550	200
2	116	138	129			111	404	1,030	1,760	1,540	550	193
3	127	138	138	120		109	431	984	1,680	1,540	518	187
4	132	138	138		105	111	458	984	1,830	1,480	488	180
5	138	132	149			114	458	893	1,830	1,480	488	174
6	138	127	161		122	119	458	768	1,900	1,480	404	174
7	132	127	144		149	111	404	728	1,900	1,410	404	193
8	138	122	138	140	135	106	404	808	1,830	1,290	404	193
9	135	119	132		132	104	404	938	1,760	1,350	404	180
10	310	122	132		127	106	380	984	1,680	1,410	404	167
11	583	127	127		129	111	355	984	1,540	1,410	380	180
12	260	127	129		138	111	355	984	1,410	1,410	355	193
13	215	124	161	140	129	111	355	938	1,410	1,350	355	187
14	180	129	355		122	114	355	808	1,480	1,290	332	174
15	158	132	289		127	111	332	808	1,540	1,290	289	167
16	132	127	211	122	127	111	332	850	1,410	1,290	289	167
17	193	127	193	122	122	122	355	893	1,350	1,290	268	167
18	161	135	174	132	119	127	380	893	1,410	1,130	268	174
19	155	129	177	187	127	138	404	1,030	1,680	1,080	268	167
20	149	127	161	138	122	141	404	1,080	1,980	984	268	161
21	149	122	161	141	111	146	404	1,130	1,980	850	268	161
22	132	116	132	215	111	149	404	1,410	2,290	808	260	144
23	132	111	119	229	109	155	404	2,130	2,780	728	256	144
24	135	97	106	222	106	158	488	2,130	2,450	600	252	132
25	132	64	106	187	111	237	488	2,290	2,130	653	237	138
26	127	66	111	119	127	200	583	2,290	2,290	653	229	132
27	138	74		167	127	204	653	2,780	2,290	583	222	132
28	193	92		161	122	222	690	2,950	2,290	550	207	129
29	167	127	110	155	.....	268	808	2,780	2,290	518	200	129
30	161	129		146	.....	310	984	2,290	2,130	518	193	127
31	138	.....		129	.....	355	.....	2,290	.....	518	193	.....

Daily discharge, in second-feet, of Entiat River at Entiat, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	138	111		138	180	119	119	310	488	984	268	127
2	132	132		132	180	106	116	310	488	984	260	119
3	129	111			146	111	116	310	583	984	237	116
4	129	111			141	114	116	310	728	984	222	116
5	127	92	110		138	116	119	310	728	984	222	114
6	122	88		120	138	111	119	355	728	850	222	106
7	122	83			132	111	116	518	728	850	215	101
8	114	92			127	111	116	518	768	808	218	101
9	114	106			111	114	111	728	728	728	211	101
10	109	111			83	111	122	808	728	583	207	101
11	106	106			79	111	127	808	728	583	200	104
12	106	106			90	111	127	768	728	583	193	260
13	106	104	80	140	106	116	127	850	728	583	193	193
14	104	106			127	127	122	893	768	618	190	229
15	106	106			127	135	124	893	984	618	187	211
16	106	138			106	132	127	893	984	618	187	193
17	101	187		193	124	127	127	893	984	618	177	193
18	104	229		200	127	116	127	893	984	583	161	200
19	106	193		193	127	106	132	938	1,030	583	138	222
20	106	187			127	127	138	893	984	550	132	193
21	104	180	130		122	132	141	893	984	458	132	207
22	106	177			111	132	138	350	1,030	404	132	211
23	106	174			104	132	138	768	1,030	355	127	218
24	104	167			111	129	141	583	984	332	127	229
25	101	161		100	122	127	187	550	893	310	122	222
26	97	132	161		127	127	260	518	850	310	124	215
27	97	106	155		119	127	289	518	850	310	132	193
28	97	111	152		124	127	310	488	808	289	138	193
29	101	111	149		127	127	355	488	893	289	146	180
30	104	114	146		.....	129	332	488	938	289	144	167
31	101	.....	138	174	.....	122	.....	458	.....	268	129	.....

NOTE.—Stage-discharge relation affected by ice Dec. 28, 1918, to Jan. 15, Feb. 2–5, Dec. 1–25, 1919, Jan. 3–16, and 20–30, 1920. Braced figures show mean discharge for periods included.

Monthly discharge of Entiat River at Entiat, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	583	114	170	10,500
November	138	64	119	7,080
December	355	.....	150	9,220
January	229	.....	147	9,040
February	149	.....	121	6,720
March	355	104	152	9,350
April	984	332	458	27,300
May	2,950	728	1,380	84,800
June	2,780	1,350	1,890	112,000
July	1,680	518	1,100	67,600
August	550	193	328	20,200
September	200	127	165	9,820
The year	2,950	64	517	374,000
October	138	97	110	6,760
November	229	83	131	7,800
December	.....	.....	114	7,010
January	200	.....	127	7,810
February	180	79	124	7,130
March	135	106	121	7,440
April	355	111	158	9,400
May	938	310	639	39,300
June	1,030	488	829	49,300
July	984	268	590	36,300
August	268	122	177	10,900
September	260	101	171	10,200
The year	1,030	.....	275	199,000

WENATCHEE RIVER BASIN.

WENATCHEE RIVER NEAR LEAVENWORTH, WASH.

LOCATION.—In SW. ¼ sec. 12, T. 26 N., R. 17 E., 1,500 feet below highway bridge at Plain, half a mile below Beaver Creek, and 14 miles north of Leavenworth, Chelan County.

DRAINAGE AREA.—591 square miles (measured on topographic maps).

RECORDS AVAILABLE.—November 27, 1910, to September 30, 1920.

GAGE.—Since September 6, 1913, vertical and inclined staff gage on left bank, 1,500 feet below highway bridge; read by P. H. Hertzog. November 28, 1910, to September 5, 1913, vertical staff 15 feet downstream at same datum.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths mile above gage or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Control likely to shift during extremely high water. One channel at all stages. Banks high and not subject to overflow. Stage of zero flow, according to measurements made September 27, 1918, gage height 1.2 feet ±0.2 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 8.6 feet May 28 (discharge, 11,500 second-feet); minimum stage recorded, 2.9 feet September 30 (discharge, 540 second-feet).

Maximum stage recorded during year ending September 30, 1920, 6.7 feet July 1 (discharge, 6,470 second-feet); minimum stage recorded 2.70 feet October 19–21 and 29 (discharge, 405 second-feet).

1910–1920: Maximum stage recorded, 11.1 feet December 30, 1917 (discharge, 18,700 second-feet); minimum discharge, 316 second-feet, September 29 and 30, 1915, and October 11 and 12, 1915.

ICE.—Stage-discharge relation affected by ice during severe winters; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—The Wenatchee Park Land & Irrigation Co. diverts a maximum of about 12 second-feet from Chiwawa River during irrigation season.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by ice or logs. Rating curve well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records excellent.

COOPERATION.—Gage-height record furnished by Quincy Valley Irrigation District.

Discharge measurements of Wenatchee River near Leavenworth, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Jan. 5	Carson and Cooke	3.19	769	June 21	Lasley Lee	6.02	4,790
June 18	L. D. Carson	6.34	5,770	Aug. 19	R. B. Kilgore	3.16	746
Oct. 10	do	2.77	440	Sept. 17	John McCombs	4.48	2,200

Daily discharge, in second-feet, of Wenatchee River near Leavenworth, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	580	1,420	745	790	1,080	700	1,920	6,230	5,770	5,770	2,760	980
2	540	1,360	930	790	1,080	700	2,180	5,570	5,770	5,770	2,760	930
3	620	1,300	1,660	835	1,030	745	2,460	4,900	6,710	6,000	2,460	880
4	580	1,190	2,460	790	1,080	700	2,760	4,490	6,230	6,710	2,320	835
5	620	1,240	3,070	790	1,080	700	2,760	4,300	6,710	7,200	2,180	790
6	790	1,080	2,460	880	980	700	2,610	3,740	7,200	6,710	2,180	790
7	745	980	2,180	790	980	660	2,610	3,920	6,710	6,000	2,180	880
8	700	930	1,920	790	980	620	2,460	4,300	6,000	5,330	2,180	790
9	580	930	1,660	745	980	620	2,180	4,690	5,770	5,330	2,060	790
10	660	980	1,540	790	930	620	2,460	4,490	5,330	6,000	1,920	745
11	745	1,030	1,420	790	930	660	2,460	4,690	4,900	6,230	1,920	790
12	2,050	980	1,420	790	880	660	2,320	4,110	4,690	6,230	1,920	1,030
13	1,480	980	2,050	790	880	620	2,320	3,560	4,900	6,000	1,790	930
14	1,140	1,140	5,110	790	835	620	2,180	3,740	5,330	6,230	1,660	835
15	930	1,190	4,490	790	835	620	2,180	4,110	5,330	6,710	1,540	790
16	930	1,190	3,390	790	835	620	2,180	4,300	5,330	6,230	1,540	790
17	930	1,080	2,910	980	880	660	2,180	4,110	5,330	6,470	1,540	790
18	835	1,030	2,460	1,660	790	700	2,610	4,110	5,550	4,900	1,660	790
19	790	980	2,180	1,660	790	790	3,070	4,300	6,710	4,110	1,540	790
20	745	930	1,920	1,540	790	790	3,070	5,330	8,490	4,110	1,540	700
21	700	930	2,320	1,420	700	790	2,910	6,230	8,760	4,110	1,480	660
22	745	880	1,920	1,420	700	790	2,910	8,230	9,030	4,300	1,420	660
23	660	835	1,540	1,920	700	790	2,910	8,230	8,490	3,920	1,360	620
24	660	790	1,420	1,790	700	835	3,230	7,970	7,710	3,560	1,280	620
25	660	745	1,300	1,660	700	835	3,390	7,200	7,200	3,560	1,190	620
26	620	790	1,190	1,660	700	880	3,740	9,030	7,710	3,230	1,190	620
27	835	790	1,190	1,480	700	880	4,690	10,700	7,710	2,910	1,140	620
28	2,050	745	1,190	1,420	745	1,030	5,330	11,500	6,950	2,760	1,030	580
29	1,920	745	1,190	1,360	.....	1,140	5,770	10,400	6,470	2,760	980	580
30	1,660	745	980	1,300	.....	1,420	6,230	8,490	5,330	2,760	980	540
31	1,540	.....	880	1,240	.....	1,660	.....	9,300	.....	2,760	1,030	.....
1919–20.												
1	580	470	1,190	1,420	2,180	835	1,030	2,460	2,320	6,470	1,420	790
2	540	745	980	1,300	1,920	835	980	2,320	2,610	6,000	1,300	745
3	505	660	835	1,140	1,660	790	980	2,320	3,070	5,330	1,240	700
4	470	620	745	1,030	1,660	790	930	2,320	3,740	5,330	1,190	700
5	457	580	745	1,080	1,540	790	1,080	2,460	4,300	4,900	1,140	660
6	457	540	745	980	1,420	790	1,030	2,760	2,460	4,490	1,190	620
7	450	505	790	930	1,420	790	980	3,070	4,110	4,110	1,190	620
8	470	470	700	835	1,300	790	980	4,490	4,300	3,920	1,190	620
9	470	470	660	835	1,300	790	980	4,900	4,110	3,920	1,240	580
10	450	438	620	790	1,190	790	980	4,900	3,740	4,110	1,140	580
11	464	457	620	790	1,190	790	980	4,690	3,740	3,740	1,080	620
12	470	424	}	835	1,190	790	1,080	4,300	3,740	3,560	1,140	2,050
13	505	470	} 550	790	1,080	1,300	1,080	4,490	3,740	3,390	1,140	2,400
14	505	438	}	790	1,080	1,480	1,080	4,490	4,300	4,110	1,080	2,760
15	470	540		930	1,080	1,360	1,080	4,300	4,490	3,740	1,080	2,460
16	457	3,070	620	1,190	1,080	1,240	1,080	4,490	5,550	3,560	1,030	2,320
17	438	3,740	660	1,920	1,080	1,300	1,080	4,690	5,330	3,070	980	2,180
18	418	3,390	1,080	2,760	1,030	1,080	1,080	5,110	5,330	3,070	980	2,180
19	405	2,760	1,190	3,390	1,080	1,080	1,190	4,690	4,900	3,070	745	1,920
20	405	2,180	1,080	2,610	1,030	1,080	1,190	4,110	4,900	2,610	700	1,790
21	405	1,920	1,190	2,180	980	1,080	1,140	4,110	4,900	2,460	745	1,660
22	464	2,180	1,420	1,920	980	1,140	1,160	3,390	5,550	2,050	790	2,460
23	470	2,460	1,480	1,660	930	1,190	1,190	3,070	4,900	1,920	790	2,180
24	457	2,320	1,660	1,660	880	1,190	1,190	2,760	4,110	1,920	790	2,050
25	438	2,180	1,660	1,360	930	1,080	1,300	2,610	3,560	1,920	700	1,920
26	431	1,920	1,540	1,360	880	1,080	1,660	2,460	3,390	1,540	700	1,790
27	424	1,660	1,660	1,360	880	1,080	1,920	2,460	3,390	1,360	660	1,920
28	412	1,540	1,660	1,540	880	1,080	2,320	2,460	4,110	1,540	1,030	1,790
29	405	1,420	1,660	2,320	880	1,030	2,610	2,460	4,900	1,540	1,080	1,660
30	418	1,300	1,660	2,460	.....	1,080	2,610	2,320	5,770	1,480	980	1,540
31	438	.....	1,660	2,320	.....	1,080	.....	2,920	.....	1,480	880	.....

NOTE.—Discharge estimated because of ice Dec. 12–15, 1919, and by logs Sept. 15–30, 1920. Gage not read Apr. 22, Sept. 13 and 24, 1920; discharge interpolated. Braced figures show mean discharge for period included.

Monthly discharge of Wenatchee River near Leavenworth, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 591 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918-19.						
October	2,050	540	937	1.59	1.83	57,600
November	1,420	745	998	1.69	1.89	59,400
December	5,110	745	1,970	3.33	3.84	121,000
January	1,920	745	1,140	1.93	2.22	70,100
February	1,080	700	868	1.47	1.53	48,200
March	1,660	620	792	1.34	1.54	48,700
April	6,230	1,920	3,000	5.08	5.67	179,000
May	11,500	3,560	6,010	10.2	11.76	370,000
June	9,030	4,690	6,470	10.9	12.16	385,000
July	7,200	2,760	4,990	8.44	9.73	307,000
August	2,760	980	1,700	2.88	3.32	105,000
September	1,030	540	759	1.28	1.43	45,200
The year	11,500	540	2,480	4.20	56.92	1,800,000
1919-20.						
October	580	405	456	.772	.89	28,000
November	3,740	424	1,400	2.37	2.64	83,300
December	1,660		1,060	1.79	2.06	65,200
January	3,390	790	1,500	2.54	2.93	92,200
February	2,180	880	1,200	2.03	2.19	69,000
March	1,480	790	1,020	1.73	1.99	62,700
April	2,610	930	1,260	2.13	2.38	75,000
May	5,110	2,320	3,480	5.89	6.79	214,000
June	5,770	2,320	4,180	7.07	7.89	249,000
July	6,470	1,360	3,280	5.55	6.40	202,000
August	1,420	660	1,010	1.71	1.97	62,100
September	2,760	580	1,540	2.61	2.91	91,600
The year	6,470	405	1,780	3.01	41.04	1,290,000

YAKIMA RIVER BASIN.

KEECHELUS LAKE NEAR MARTIN, WASH.

LOCATION.—At outlet of lake, 1¼ miles northeast of Meadow Creek railroad station, 3½ miles northwest of Martin, Kittitas County, and 9½ miles northwest of Easton.

DRAINAGE AREA.—55 square miles (measured on topographic maps).

RECORDS AVAILABLE.—January 12, 1906, to September 30, 1920.

GAGE.—Water-stage recorder installed March 20, 1919. Vertical staff attached to pier of bridge to gage house; read by A. L. Flint, E. C. Randt, and C. O. Shupe.

Position of gage changed frequently during 1914 and 1915 to accommodate work on construction of new dam. Since August 19, 1914, gages have been set to sea-level datum; prior to that date at height of gate sill in temporary crib dam—elevation, 2,457 feet.

EXTREMES OF STORAGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 2,491.98 feet at 7.50 p. m. July 15 (storage, 100,070 acre-feet); minimum stage recorded, 2,430.74 feet at 6.30 p. m. October 11 (storage, 7,190 acre-feet).

Maximum stage recorded during year ending September 30, 1920, 2,515.32 feet at 9 a. m. June 16 (storage, 153,500 acre-feet); minimum stage from recorder, 2,431.35 feet at 5.15 p. m. October 31 (storage, 7,960 acre-feet).

1906–1920: Maximum stage recorded on June 16, 1920; minimum stage recorded on October 11, 1918.

STORAGE.—Capacity of reservoir, 152,000 acre-feet; elevation of gate sill, 2,425 feet, and of spillway crest, 2,515 feet. Record of storage or release each month used to determine discharge without storage at gaging station below dam.

ACCURACY.—Gage read twice daily to hundredths prior to March 20, 1919; also January 1 to March 20 and June 1 to September 30, 1920. Water-stage recorder in

gate tower referred to staff gage once daily and used when gates were closed March 20 to December 31, 1919, and March 21 to May 31, 1920. When gates were open staff gage read twice daily to hundredths. Records excellent.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Storage, in acre-feet, in Keechelus Lake near Martin, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	7,740	18,590	7,890	10,190	29,390	27,300	34,520	62,010	79,750	96,450	98,410	74,530
2	7,670	18,020	8,270	9,820	29,800	27,540	35,170	63,660	79,770	97,190	98,210	73,520
3	7,600	17,370	11,430	9,580	30,180	27,760	35,900	65,000	80,130	98,050	98,010	71,960
4	7,440	16,610	13,880	9,350	30,520	27,980	36,990	66,050	81,500	98,980	97,750	70,390
5	7,410	15,670	14,910	9,150	30,310	28,180	38,160	66,860	83,180	99,890	97,550	67,960
6	7,380	15,060	14,950	8,940	30,070	28,390	39,010	67,730	84,900	100,010	97,330	65,510
7	7,370	15,410	14,640	8,760	29,860	28,590	39,780	68,280	86,190	99,810	97,130	63,690
8	7,320	15,720	14,170	8,610	29,520	28,790	40,380	68,770	87,370	99,790	96,930	61,920
9	7,270	15,890	13,680	8,480	29,240	28,980	41,000	69,270	88,690	99,750	96,690	59,870
10	7,200	16,730	13,200	8,330	28,980	29,120	41,960	69,740	89,900	99,750	96,490	57,710
11	7,190	17,260	12,350	8,180	28,710	29,310	42,980	70,110	90,880	99,910	96,230	55,850
12	7,820	17,630	12,250	8,140	28,420	29,460	43,590	70,580	91,810	99,950	95,930	54,220
13	8,120	16,530	13,400	8,100	28,130	29,590	44,270	71,220	92,800	100,010	95,650	52,570
14	8,310	15,700	18,540	8,030	27,580	29,750	44,860	71,960	93,880	100,010	95,380	50,970
15	8,460	14,990	19,190	8,040	25,870	29,910	45,400	72,820	94,780	100,070	95,140	49,160
16	8,690	14,600	18,900	8,350	25,190	30,100	45,900	73,840	95,160	100,070	94,860	47,550
17	9,070	13,660	18,410	9,580	25,290	30,310	46,590	74,780	95,460	100,010	94,600	46,180
18	9,320	12,870	17,710	11,320	25,420	30,520	47,380	75,620	95,890	99,970	94,290	44,930
19	9,600	12,150	16,880	12,920	25,560	30,760	48,310	76,550	96,170	100,010	93,680	43,800
20	9,840	11,440	16,110	13,700	25,760	30,960	49,210	77,800	96,270	99,990	92,840	42,960
21	10,110	10,820	15,360	14,660	25,900	31,150	50,030	78,460	96,230	99,990	91,830	41,840
22	10,330	10,240	14,640	16,390	26,030	31,350	50,810	78,760	96,150	99,950	90,490	40,960
23	10,630	9,680	13,900	20,880	26,190	31,560	51,660	78,920	96,090	99,870	89,060	39,970
24	11,130	9,240	13,250	23,740	26,350	31,750	52,510	78,830	95,990	99,810	87,560	38,960
25	11,820	8,920	12,660	25,770	26,510	31,960	53,390	78,540	96,010	99,970	85,910	38,000
26	12,230	8,690	12,150	26,420	26,670	32,150	54,420	79,320	96,050	99,500	84,380	37,030
27	13,610	8,420	11,780	27,090	26,900	32,370	55,730	80,330	95,930	99,340	82,720	36,110
28	17,630	8,260	11,430	27,650	27,100	32,640	57,240	80,760	95,890	99,160	81,140	35,100
29	18,960	8,050	11,020	28,170	.....	32,900	58,750	80,630	95,850	98,980	79,580	34,170
30	19,320	7,940	10,720	28,620	.....	33,340	60,350	80,400	96,210	98,800	78,010	33,170
31	19,060	.....	10,420	29,000	.....	33,910	.....	79,930	.....	98,620	76,460	.....
1919-20.												
1	31,960	3,560	28,060	46,290	76,410	85,400	97,890	110,560	139,080	147,940	71,470	21,150
2	30,680	9,830	28,310	46,830	77,060	85,530	98,230	111,120	139,780	148,540	69,120	19,440
3	29,280	10,210	28,630	47,300	72,620	85,720	98,490	111,700	140,630	149,070	66,880	17,810
4	27,940	10,470	28,820	47,800	78,550	85,960	99,020	112,150	141,580	149,540	64,730	16,380
5	26,270	10,570	29,160	48,170	78,880	86,190	99,810	112,690	142,780	149,340	62,150	14,990
6	24,870	10,590	29,430	48,520	79,470	86,390	100,320	113,410	143,840	148,070	60,120	13,670
7	23,490	10,570	29,520	48,730	79,990	86,540	100,810	114,540	144,870	145,780	58,070	12,580
8	22,040	10,490	29,620	49,110	80,290	86,660	101,140	115,990	145,980	143,420	55,630	11,680
9	20,570	10,420	29,710	49,440	80,580	86,860	101,460	117,800	147,100	140,630	53,250	10,940
10	19,240	10,200	29,860	49,710	80,810	87,030	101,750	119,270	147,970	137,490	51,460	10,400
11	18,020	10,110	29,880	49,940	81,010	87,220	101,960	120,480	148,900	134,360	49,580	10,110
12	16,860	10,010	29,910	50,200	81,340	87,500	102,280	121,480	149,740	131,220	47,700	10,220
13	15,670	9,870	30,020	50,910	81,660	88,790	102,680	122,460	150,570	127,910	45,760	10,500
14	14,560	9,830	30,020	51,560	81,970	90,360	103,030	123,460	151,560	124,740	43,990	11,660
15	13,510	10,200	30,020	52,080	82,190	91,250	103,460	124,420	152,740	121,370	42,260	12,800
16	12,510	14,340	30,100	53,090	82,370	91,870	103,820	125,400	153,100	117,910	40,530	13,490
17	11,640	16,680	31,040	55,320	82,500	92,340	104,130	127,030	152,040	114,410	38,790	13,980
18	10,950	18,270	31,780	58,990	82,760	92,740	104,630	128,630	151,780	111,120	37,420	14,420
19	10,260	19,810	32,150	62,880	83,090	93,140	104,820	129,910	151,860	107,400	35,930	14,840
20	9,780	21,070	32,780	64,830	83,400	93,490	105,230	131,030	151,960	103,780	34,460	15,140
21	9,460	21,960	33,260	65,920	83,730	93,840	105,590	132,040	152,040	100,110	33,100	15,320
22	9,220	22,820	34,070	66,540	83,950	94,190	105,880	132,790	152,190	97,130	31,790	14,690
23	8,980	23,640	36,060	66,930	84,320	94,580	106,130	133,640	151,860	94,290	30,380	14,040
24	8,730	24,630	38,110	67,360	84,360	95,020	106,470	134,310	151,460	91,290	29,220	13,380
25	8,510	25,290	40,250	68,990	84,500	95,460	106,740	134,920	150,900	88,440	28,180	12,720
26	8,310	25,810	41,380	69,820	84,730	95,770	107,140	135,470	150,550	85,550	27,240	12,160
27	8,160	26,140	42,480	70,710	84,970	96,150	107,690	136,120	150,350	83,360	26,640	12,060
28	8,120	26,640	43,380	71,780	85,060	96,450	108,490	136,790	149,320	81,320	26,510	12,610
29	8,120	27,170	43,990	73,280	85,230	96,850	109,280	137,460	147,870	78,790	25,900	12,920
30	8,040	27,680	44,790	74,500	.....	97,250	109,920	138,020	147,400	76,320	25,120	12,320
31	7,980	.....	45,600	75,500	.....	97,550	.....	138,550	.....	72,370	23,110	.....

YAKIMA RIVER NEAR MARTIN, WASH.

LOCATION.—Below dam at outlet of Keechelus Lake, 1½ miles east of Meadow Creek railroad station, 3½ miles northwest of Martin, and 9½ miles northwest of Easton, Kittitas County.

DRAINAGE AREA.—55 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 18 to November 14, 1903; January 28, 1904, to September 30, 1920.

GAGE.—Inclined staff gage in paved section on left side of outlet works, installed December 2, 1916; read by A. L. Flint, E. C. Randt, and C. O. Shupe. Previous gage vertical staff just above cable, 1½ miles below dam, installed May 4, 1915. For description of former gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable 700 feet below dam or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel; shifts at high stages. Logs and brush sometimes lodge on riffle control below gage and affect stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 8.5 feet from 6.30 p. m. September 4 to 3 p. m. September 6 (discharge, 1,400 second-feet); minimum stage recorded, 0.82 foot from 6.15 p. m. October 20 to 7.40 a. m. October 23 (discharge, 0.2 second-feet).

Maximum discharge during year ending September 30, 1920, 2,370 second-feet at 6.05 p. m. July 19 (discharge computed from gage openings); no flow September 14–20 and 28 when reservoir gates were closed.

1904–1920: Maximum discharge, 7,370 second-feet at 10.45 a. m. March 26, 1915, when temporary crib dam was washed out (gage destroyed; discharge computed from hourly gage readings of lake surface and estimated natural inflow to lake); practically no flow when gates in Keechelus reservoir dam are closed.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—Flow partly controlled by storage and release of water at Keechelus reservoir. Monthly discharge without storage determined from records of stage at reservoir.

ACCURACY.—Stage-discharge relation changed during low-water period in April and May, 1919; also June 15 to September 20, 1920. Rating curves well defined; no curve developed for period June 15 to September 20, 1920. Gage read twice daily to hundredths. Daily discharge October 1, 1919, to June 14, 1920, and September 21–30, 1920, ascertained by applying mean daily gage height to rating table or by shifting-control method; June 15 to September 20, 1920, by use of reservoir gate openings and coefficient determined by current-meter measurements. Records good except for April and May, 1919, for which they are only fair, as date of change in control is uncertain.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Yakima River near Martin, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Dis. charge.	Date.	Made by—	Gage height.	Dis. charge.
1919.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Feb. 14	C. W. Bishop	7.20	1,090	Aug. 27	F. E. Moxley	6.90	858
15	do	7.78	1,290				
15	Bishop and Moxley	6.75	925	1920.			
16	do	5.75	625	Apr. 15	do	2.08	23.2
16	do	2.50	54.7	May 25	do	2.20	30.6
May 28	F. E. Moxley	8.04	1,240	June 24	do	7.40	517
Aug. 5	do	4.00	189	July 13	do	9.80	1,620

Daily discharge, in second-feet, of Yakima River near Martin, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	98	698	289	308	3	44	15	14	585	124	189	858
2	107	684	328	289	3	42	15	15	547	24	189	858
3	123	727	547	271	3	41	15	17	293	24	189	858
4	122	787	727	253	153	40	15	18	18	24	189	1,230
5	120	847	787	236	348	39	15	18	18	24	189	1,400
6	111	314	787	228	348	36	15	74	18	547	189	1,090
7	134	8	757	212	348	34	16	245	19	441	189	952
8	152	.4	712	204	348	33	16	336	19	408	189	1,020
9	140	.4	670	197	348	33	15	345	20	408	189	1,080
10	130	.4	614	183	338	32	15	355	20	365	189	1,080
11	31	.4	573	175	328	31	15	365	21	326	189	984
12	28	549	547	172	328	31	15	307	22	307	189	984
13	29	879	600	150	328	30	15	134	22	289	189	984
14	23	879	979	125	776	30	15	114	22	289	189	984
15	12	817	1,010	116	1,010	29	15	116	241	386	189	920
16	9	817	1,010	118	377	28	15	118	355	317	189	768
17	8	757	945	133	53	28	15	120	355	220	189	680
18	4	727	879	156	50	27	15	122	452	196	189	680
19	2	670	817	181	48	26	15	124	798	189	464	612
20	.4	628	757	112	47	25	15	260	828	189	510	547
21	.2	573	727	4	45	24	15	984	798	189	666	547
22	.2	521	670	4	45	24	15	952	738	189	768	547
23	.2	470	614	4	45	22	16	984	709	189	798	547
24	.7	412	547	4	45	20	15	984	666	189	828	547
25	.6	379	508	4	44	18	15	889	612	189	828	547
26	.4	348	458	4	44	16	14	952	709	189	858	547
27	28	328	434	4	44	16	14	1,020	639	189	858	547
28	521	308	412	3	44	15	14	1,220	510	189	858	547
29	547	289	368	3	.....	15	14	1,080	295	189	858	547
30	646	280	338	3	.....	15	14	920	326	189	858	639
31	698	.....	308	3	.....	15	.....	867	.....	189	858	.....
1919–20.												
1	738	152	4	4	18	21	24	32	24	30	1,430	1,870
2	828	220	4	4	18	21	24	31	24	30	1,420	1,840
3	904	271	4	4	19	21	24	30	24	30	1,360	1,800
4	889	228	4	4	19	21	24	30	24	89	1,430	1,730
5	889	189	4	4	19	21	24	30	25	511	1,310	1,670
6	858	189	4	4	20	21	24	30	25	1,080	1,240	1,620
7	889	189	4	4	20	21	24	30	25	1,320	1,210	1,590
8	889	189	4	4	20	21	24	30	25	1,370	1,180	1,530
9	858	186	4	4	20	21	24	30	49	1,830	1,160	1,470
10	889	189	4	4	20	21	24	29	49	1,810	1,160	1,420
11	828	189	4	4	20	22	24	29	49	1,800	1,170	1,400
12	798	182	4	4	21	22	24	29	40	2,010	1,160	1,400
13	768	192	4	4	21	22	24	30	32	1,900	1,130	618
14	666	189	4	4	21	22	24	32	30	1,940	1,110	0
15	652	189	4	4	21	22	24	35	42	2,040	1,090	0
16	585	253	4	4	21	22	24	30	902	2,030	1,050	0
17	498	182	4	5	21	22	24	30	767	2,030	959	0
18	419	100	4	5	21	23	24	30	390	2,100	876	0
19	355	89	4	9	21	23	24	30	336	2,200	895	0
20	307	84	4	10	21	23	24	30	336	2,340	885	0
21	262	86	4	11	21	24	24	30	336	1,910	874	738
22	236	86	4	11	21	23	24	30	403	1,620	864	738
23	217	91	4	11	21	22	24	30	470	1,700	811	694
24	192	91	4	12	21	22	24	30	470	1,680	716	652
25	172	89	4	13	21	24	25	30	429	1,660	619	598
26	168	73	4	15	21	24	27	30	302	1,550	563	572
27	152	57	4	15	21	24	29	27	535	1,460	206	102
28	141	20	4	15	21	24	30	24	901	1,440	371	0
29	130	5	4	16	21	24	32	24	905	1,450	570	73
30	122	5	4	17	.....	24	32	24	226	1,450	1,440	547
31	118	.....	4	18	.....	24	.....	24	.....	1,430	1,960	.....

Monthly discharge of Yakima River near Martin, Wash., for years ending Sept. 30 1919 and 1920.

[Drainage area, 55 square miles].

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
1918–19.									
October	698	0.2	123	7,590	+11,200	18,800	306	5.56	6.41
November	879	.4	490	29,200	−11,100	18,100	304	5.53	6.17
December	1,010	289	636	39,100	+2,480	41,600	677	12.3	14.18
January	308	3	124	7,650	+18,600	26,200	426	7.75	8.94
February	1,010	3	212	11,800	−1,900	9,900	178	3.24	3.37
March	44	15	27.7	1,700	+6,810	8,510	138	2.51	2.89
April	16	14	14.9	887	+26,400	27,300	459	8.35	9.32
May	1,220	14	451	27,700	+19,600	47,300	769	14	16.14
June	828	18	356	21,200	+16,300	37,500	630	11.5	12.83
July	547	24	231	14,200	+2,410	16,600	270	4.91	5.66
August	858	189	433	26,600	−22,200	4,400	71.6	1.30	1.50
September	1,400	547	804	47,800	−43,300	4,500	75.6	1.37	1.53
The year	1,400	.2	325	235,000	+25,300	261,000	360	6.55	88.94
1919–20.									
October	904	118	530	32,600	−25,200	7,400	120	2.18	2.51
November	271	5	142	8,440	+19,700	28,100	472	8.58	9.57
December	4	4	4	246	+17,900	18,100	294	5.35	6.17
January	18	4	7.97	490	+29,900	30,400	494	8.98	10.35
February	21	18	20.4	1,170	+9,730	10,900	190	3.45	3.72
March	24	21	22.3	1,370	+12,300	13,700	223	4.05	4.67
April	32	24	25	1,490	+12,400	13,900	234	4.25	4.74
May	35	24	29.4	1,800	+28,600	30,400	494	8.98	10.35
June	905	24	273	16,300	+8,850	25,200	424	7.71	8.60
July	2,340	30	1,480	90,900	−75,000	15,900	259	4.71	5.43
August	1,960	206	1,040	63,900	−49,300	14,600	237	4.31	4.97
September	1,870	0	822	48,900	−10,800	38,100	640	11.6	12.94
The year	2,340	0	369	268,000	−20,900	247,000	340	6.18	84.02

YAKIMA RIVER AT CLE ELUM, WASH.

LOCATION.—In sec. 27, T. 20 N., R. 15 E., at highway bridge at Cle Elum, Kittitas County, just above Roslyn Creek, 3 miles below mouth of Cle Elum River, and 6½ miles above Teanaway River.

DRAINAGE AREA.—500 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 24, 1906, to September 30, 1920.

GAGE.—Friez water-stage recorder on right bank under highway bridge, installed July 12, 1911; inspected by T. J. Denny and J. G. Giddings. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and cobblestones. Control shifts during floods. One channel at all stages. Control at low water formed by broad riffle about 1,200 feet below gage; riffle drowned out at high water.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 6.9 feet at 8 a. m. May 28 (discharge, 8,690 second-feet); minimum stage, from recorder, 1.64 feet at 8 a. m. October 22 (discharge, 511 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 5.21 feet at 1 p. m. January 19 (discharge, 4,870 second-feet); minimum stage, from recorder 1.62 feet at 10 a. m. October 26 (discharge, 501 second-feet).

1906–1920: Maximum stage, measured from high-water marks, 12.5 feet November 14, 1906 (discharge, about 25,600 second-feet); minimum stage recorded, 1.11 feet at 6 p. m. September 30, 1915 (discharge, 192 second-feet).

ICE.—Stage-discharge relation seriously affected by ice during severe winters; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—None.

REGULATION.—Flow partly regulated by storage and release of water at Keechelus, Kachess, and Cle Elum reservoirs. Monthly discharge without storage determined from records of stage at reservoirs.

ACCURACY.—Stage-discharge relation permanent; affected by ice December 3–21, 1919; may have been slightly affected by ice for other periods during January to March, 1920. Rating curve well defined. Water-stage recorder inspected daily; gage-height record excellent. Daily discharge ascertained by applying daily mean gage height to rating table. Records good December, 1919, to March, 1920, otherwise excellent.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Yakima River at Cle Elum, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Feb. 11	Bishop and Moxley	2.70	1,300	Jan. 12	F. E. Moxley	1.78	570
May 27	F. E. Moxley	6.53	7,910	Feb. 17	do	2.04	742
Aug. 4	do	3.97	2,740	Mar. 16	do	2.72	1,330
Oct. 3	do	2.36	979	25	do	2.34	1,020
Dec. 22	do	2.39	1,010	June 24	do	3.50	2,210
				July 13	do	4.07	2,930

Daily discharge, in second-feet, of Yakima River at Cle Elum, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	1,240	1,130	827	973	1,290	750	2,380	4,380	4,200	2,380	2,380	2,450
2	1,020	1,100	1,070	871	1,180	777	2,640	4,200	3,680	2,120	2,710	2,380
3	1,000	1,060	2,640	849	1,090	791	2,920	3,760	3,130	2,060	2,780	2,190
4	997	1,130	3,680	827	1,060	791	3,360	3,200	3,130	2,120	2,780	2,190
5	901	1,240	3,930	791	1,340	791	3,590	2,850	3,280	2,260	2,850	2,060
6	886	1,200	3,430	750	1,390	878	3,280	2,640	3,430	2,640	2,780	1,940
7	878	764	2,920	730	1,340	956	2,990	2,710	3,280	2,580	2,520	1,550
8	820	647	2,520	710	1,340	917	2,780	2,990	2,990	2,320	2,450	1,440
9	820	611	2,260	672	1,290	863	2,580	3,430	2,850	2,190	2,520	1,490
10	665	647	2,000	641	1,240	820	2,580	3,590	2,710	2,260	2,580	1,550
11	611	750	1,820	611	1,290	965	2,710	3,510	2,520	2,190	2,580	1,490
12	617	717	1,710	599	1,290	965	2,640	3,280	2,320	2,190	2,710	1,440
13	623	1,240	2,380	593	1,240	874	2,520	2,850	2,260	2,060	2,710	1,440
14	629	1,550	5,270	593	1,240	629	2,380	2,580	2,380	2,000	2,710	1,390
15	623	1,660	6,530	582	1,880	685	2,320	2,920	2,380	1,940	2,710	1,390
16	623	1,760	5,070	599	1,600	764	2,260	3,360	2,580	2,060	2,710	1,290
17	617	1,660	3,930	791	1,110	878	2,260	3,590	2,640	2,320	2,640	1,200
18	599	1,550	3,280	1,600	925	1,040	2,580	3,680	2,710	2,190	2,580	1,110
19	582	1,440	2,850	2,190	1,940	1,200	2,780	3,680	3,130	2,000	2,580	1,060
20	582	1,340	2,520	2,190	1,350	1,290	2,990	4,110	3,930	1,880	2,710	965
21	593	1,240	2,260	1,880	917	1,340	2,920	5,270	4,200	1,940	2,710	925
22	516	1,150	2,000	2,310	834	1,340	2,710	6,530	4,110	2,060	2,710	894
23	516	1,080	1,820	4,020	820	1,390	2,710	6,970	3,840	2,260	2,780	871
24	532	1,020	1,660	4,290	805	1,440	2,640	6,530	3,680	2,260	2,780	856
25	571	956	1,490	2,060	834	1,440	2,850	6,110	3,430	2,260	2,850	841
26	543	909	1,390	2,780	827	1,490	2,990	6,320	3,430	2,260	2,780	820
27	611	871	1,340	2,320	805	1,490	3,510	7,440	3,510	2,260	2,780	813
28	1,390	834	1,240	1,940	791	1,550	4,290	8,430	3,280	2,260	2,710	805
29	1,390	827	1,160	1,710	.....	1,660	4,480	7,920	2,850	2,190	2,710	798
30	1,170	805	1,080	1,550	.....	1,880	4,480	6,750	2,520	2,190	2,710	784
31	1,150	.....	1,000	1,440	.....	2,260	.....	5,270	.....	2,120	2,450	.....

Daily discharge, in second-feet, of Yakima River at Cle Elum, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	878	659	1,200	1,290	1,820	577	871	1,880	1,340	1,880	2,640	2,710
2	940	813	1,150	1,200	1,710	554	878	1,760	1,390	1,820	2,640	2,380
3	981	849	1,110	1,080	1,550	549	834	1,820	1,600	1,760	2,580	2,320
4	1,020	834	1,060	1,010	1,390	532	813	1,780	1,820	1,600	2,450	2,190
5	973	798	1,020	965	1,290	538	1,190	1,540	1,820	1,660	2,710	2,120
6	965	777	981	925	1,240	554	1,240	1,550	1,550	2,060	2,710	2,000
7	956	757	925	917	1,240	560	1,160	2,060	1,550	2,520	2,780	2,000
8	956	750	863	917	1,090	565	1,100	2,780	1,760	2,520	2,780	2,000
9	973	743	827	886	1,050	582	1,010	3,430	1,820	2,710	2,710	2,060
10	948	737	791	813	973	593	956	3,510	1,880	2,850	2,710	2,380
11	956	743	771	757	878	599	925	3,280	1,820	2,850	2,640	2,520
12	909	710	750	605	856	635	917	2,920	1,820	2,850	2,710	2,640
13	909	691	723	582	841	917	989	2,710	1,760	2,990	2,780	2,640
14	878	672	743	582	827	1,290	1,040	2,640	1,760	2,780	2,780	2,520
15	863	730	750	635	791	1,440	1,050	2,580	2,000	2,920	2,710	2,380
16	820	1,030	764	846	777	1,340	1,020	2,520	2,320	2,850	2,710	2,260
17	791	1,140	777	2,120	771	1,240	978	2,640	3,060	2,710	2,780	2,190
18	678	1,390	805	3,130	784	1,130	1,240	2,920	2,710	2,710	2,920	2,120
19	641	2,190	834	4,580	820	1,060	1,300	2,710	2,450	2,780	2,920	2,060
20	565	2,260	886	3,840	827	973	1,440	2,520	2,320	2,850	2,920	1,940
21	532	2,120	940	2,850	820	948	1,440	2,320	2,260	2,780	2,920	1,880
22	538	2,060	1,010	2,260	710	948	1,440	2,060	2,320	2,780	2,850	2,000
23	538	2,120	1,110	1,820	665	956	1,390	1,880	2,320	2,850	2,920	1,940
24	522	2,190	1,440	1,550	641	965	1,390	1,710	2,190	2,920	2,990	1,390
25	511	2,190	1,880	1,490	641	973	1,440	1,760	2,060	2,990	2,920	1,290
26	527	2,060	1,760	1,440	617	948	1,490	1,820	1,820	2,990	2,850	1,290
27	571	1,760	1,660	1,440	605	940	1,660	1,760	1,600	2,850	2,850	1,240
28	629	1,550	1,600	1,390	598	894	1,710	1,660	1,940	2,710	3,200	1,180
29	672	1,390	1,550	1,710	588	878	1,820	1,490	2,320	2,710	3,200	1,140
30	593	1,290	1,490	2,000	.....	894	1,880	1,490	2,190	2,710	2,990	1,550
31	588	.....	1,390	1,940	.....	894	.....	1,390	.....	2,640	2,850	.....

Monthly discharge of Yakima River at Cle Elum, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 500 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
1918–19.									
October	1,390	516	784	48,200	+23,300	71,500	1,160	2.32	2.68
November	1,760	611	1,100	65,200	+5,590	70,800	1,190	2.38	2.66
December	6,530	827	2,490	153,000	+33,900	187,000	3,040	6.08	7.01
January	4,290	582	1,430	88,200	+43,600	132,000	2,150	4.30	4.96
February	1,940	791	1,180	65,600	−5,690	59,900	1,080	2.16	2.25
March	2,260	629	1,130	69,200	−4,180	65,000	1,060	2.12	2.44
April	4,480	2,260	2,940	175,000	+36,900	212,000	3,560	7.12	7.94
May	8,480	2,580	4,540	279,000	+36,300	315,000	5,120	10.2	11.76
June	4,200	2,260	3,150	187,000	+46,300	233,000	3,920	7.84	8.75
July	2,640	1,880	2,190	134,000	−11,600	122,000	1,980	3.96	4.56
August	2,850	2,380	2,680	165,000	−124,000	41,000	667	1.33	1.53
September	2,450	784	1,350	80,200	−54,600	25,600	430	.860	.96
The year	8,480	516	2,090	1,510,000	+25,800	1,530,000	2,120	4.24	57.50
1919–20.									
October	1,020	511	768	47,200	−23,500	23,700	385	.770	.89
November	2,260	659	1,270	75,400	+44,900	120,000	2,020	4.04	4.51
December	1,880	723	1,080	66,600	+22,800	89,400	1,450	2.90	3.34
January	4,580	582	1,530	94,400	+54,100	148,000	2,410	4.82	5.56
February	1,820	588	945	54,400	+18,200	72,600	1,260	2.52	2.72
March	1,440	532	854	52,500	+25,900	78,400	1,280	2.56	2.95
April	1,880	813	1,220	72,800	+25,200	98,000	1,650	3.30	3.68
May	3,510	1,390	2,220	136,000	+55,600	192,000	3,120	6.24	7.19
June	3,060	1,340	1,990	118,000	+32,700	151,000	2,540	5.08	5.67
July	2,990	1,660	2,600	160,000	−88,400	71,600	1,160	2.32	2.68
August	3,200	2,450	2,810	173,000	−138,000	35,000	569	1.14	1.31
September	2,710	1,140	2,010	120,000	−51,700	68,300	1,150	2.30	2.57
The year	4,580	511	1,610	1,170,000	−22,200	1,150,000	1,580	3.16	43.07

YAKIMA RIVER AT UMTANUM, WASH.

LOCATION.—In sec. 30, T. 16 N., R. 19 E., at Umtanum, Kittitas County, half a mile above Umtanum Creek and 10 miles south of Ellensburg.

DRAINAGE AREA.—1,620 square miles (measured on topographic maps and Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—August 25, 1906, to May 20, 1907; August 10, 1907, to November 15, 1915; irrigation seasons 1916 to 1920.

GAGE.—Stevens continuous water-stage recorder on right bank 100 feet east of railroad section house at Umtanum; installed July 10, 1914; inspected by G. F. Sterling, P. A. McNichols, and D. B. Sage. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable 100 feet above gage or by wading.

CHANNEL AND CONTROL.—Bed composed of rocks and gravel. Control shifting. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water stage recorder, 7.9 feet from 6 to 10 p. m., May 28 (discharge, 9,960 second-feet); minimum stage, from recorder, 3.68 feet at 3 to 4 p. m., October 23 (discharge, 601 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 5.89 feet at 1.30 p. m. May 10 (discharge, 4,500 second-feet); minimum stage, from recorder 3.80 feet from 2 a. m. to 2 p. m. March 9 (discharge, 800 second-feet).

1906–1920: Maximum stage recorded, 14.2 feet November 15 or 16, 1906 (estimated from high-water marks; discharge, about 41,000 second-feet); minimum stage recorded, 2.86 feet at 7 p. m. October 3, 1915 (discharge, 138 second-feet).

ICE.—Record discontinued during winter.

DIVERSIONS.—Water diverted above gage for irrigation of about 40,000 acres in Kittitas Valley.

REGULATION.—Flow partly regulated by storage and release of water at Keechelus, Kachess, and Cle Elum reservoirs.

ACCURACY.—Stage-discharge relation changed during winters. Rating curves well defined. Water-stage recorder inspected and staff gage read to hundredths twice daily; gage-height record excellent. Daily discharge ascertained by applying daily mean gage height to rating table. Records excellent.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Yakima River at Umtanum, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Feb. 20	C. W. Bishop	5.02	2,560	Feb. 27	F. E. Moxley	3.95	945
Apr. 1	F. E. Moxley	6.25	5,100	Apr. 17	do	4.23	1,310
May 30	do	7.42	8,200	May 14	do	5.22	2,850
Aug. 7	do	5.00	2,220	27	do	4.58	1,790
Oct. 3	do	3.93	906	June 26	do	4.62	1,880
				July 15	do	5.06	2,590

Daily discharge, in second-feet, of Yakima River at Umtanum, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.									
1	1,220	1,620	.....	4,860	5,980	5,280	2,370	1,820	2,120
2	1,190	1,530	.....	5,140	5,700	4,330	2,120	2,120	2,040
3	1,050	1,430	.....	5,560	5,140	3,840	2,040	2,370	1,960
4	1,010	1,340	.....	5,980	4,330	3,480	2,040	2,460	1,890
5	966	1,460	.....	6,400	3,840	3,480	2,040	2,460	1,890
6	864	1,480	.....	5,700	3,480	3,600	2,120	2,460	1,820
7	875	1,340	.....	5,000	3,150	3,600	2,460	2,200	1,620
8	820	996	.....	4,460	3,260	3,370	2,280	2,120	1,390
9	790	875	.....	4,200	3,840	3,150	2,040	2,040	1,350
10	800	820	.....	4,080	4,330	2,940	2,040	2,040	1,380
11	690	908	.....	4,330	4,200	2,840	2,040	2,120	1,440
12	660	963	.....	4,200	3,960	2,550	1,960	2,200	1,500
13	650	930	.....	3,840	3,600	2,370	1,890	2,370	1,440
14	640	1,560	.....	3,600	3,150	2,370	1,820	2,280	1,380
15	650	1,810	.....	3,480	3,040	2,460	1,680	2,280	1,330
16	690	1,940	.....	3,370	3,600	2,550	1,750	2,280	1,260
17	750	1,940	.....	3,370	4,080	2,740	1,890	2,280	1,220
18	720	1,840	.....	3,840	4,200	2,740	1,960	2,200	1,160
19	710	1,640	.....	4,330	4,080	2,840	1,820	2,040	1,080
20	670	1,590	.....	4,460	4,560	3,720	1,680	2,120	1,040
21	680	1,490	.....	4,330	5,560	4,330	1,680	2,200	965
22	690	1,390	.....	4,200	7,120	4,460	1,680	2,200	955
23	630	1,300	.....	4,080	8,020	4,200	1,750	2,200	906
24	640	.....	.....	4,200	7,870	3,960	1,820	2,200	897
25	660	.....	.....	4,590	7,420	3,600	1,820	2,280	877
26	700	.....	.....	4,720	7,270	3,370	1,820	2,370	858
27	670	.....	.....	5,280	8,020	3,480	1,820	2,280	819
28	1,100	.....	.....	6,260	9,620	3,480	1,820	2,280	781
29	1,960	.....	.....	6,680	9,620	3,150	1,820	2,280	819
30	1,710	.....	.....	6,260	8,330	2,740	1,820	2,280	800
31	1,530	.....	.....	.....	6,680	.....	1,750	2,200	.....
1919-20.									
1	819	.....	880	1,150	2,330	1,486	1,970	2,330	2,700
2	936	.....	880	1,130	2,160	1,440	1,560	2,240	2,510
3	975	.....	860	1,090	2,140	1,460	1,520	2,240	2,240
4	1,090	.....	850	1,080	2,240	1,580	1,420	2,110	2,090
5	.....	.....	870	1,190	1,930	1,690	1,350	2,160	1,960
6	.....	.....	890	1,690	1,890	1,640	1,480	2,330	1,880
7	.....	.....	860	1,660	2,420	1,520	1,860	2,330	1,850
8	.....	.....	830	1,540	3,310	1,640	2,160	2,330	1,800
9	.....	.....	820	1,410	4,120	1,800	2,240	2,330	1,830
10	.....	.....	850	1,290	4,380	1,850	2,420	2,240	2,040
11	.....	.....	860	1,240	4,120	1,850	2,420	2,330	2,240
12	.....	.....	980	1,260	3,640	1,800	2,420	2,420	2,510
13	.....	.....	1,070	1,350	3,310	1,810	2,600	2,510	2,700
14	.....	.....	1,930	1,350	3,000	1,830	2,700	2,600	2,800
15	.....	.....	2,160	1,380	2,900	1,990	2,700	2,510	2,800
16	.....	.....	1,990	1,330	2,800	2,240	2,800	2,510	2,600
17	.....	.....	1,770	1,260	2,900	2,800	2,700	2,420	2,420
18	.....	.....	1,600	1,290	3,100	3,000	2,600	2,510	2,330
19	.....	.....	1,480	1,600	3,100	2,600	2,600	2,600	2,160
20	.....	.....	1,390	1,770	2,900	2,330	2,600	2,600	2,080
21	.....	.....	1,370	1,730	2,600	2,240	2,600	2,510	1,990
22	.....	.....	1,390	1,670	2,420	2,130	2,600	2,420	1,970
23	.....	.....	1,460	1,600	2,160	2,130	2,600	2,510	2,140
24	.....	.....	1,480	1,550	2,010	2,090	2,700	2,600	1,800
25	.....	.....	1,460	1,580	1,800	1,970	2,700	2,700	1,480
26	.....	.....	1,380	1,730	1,830	1,830	2,800	2,700	1,420
27	.....	.....	1,330	2,080	1,800	1,770	2,700	2,700	1,440
28	.....	.....	1,260	2,420	1,730	1,490	2,510	3,000	1,440
29	.....	.....	1,210	2,420	1,670	1,830	2,420	3,100	1,370
30	.....	.....	1,170	2,420	1,660	2,090	2,420	3,100	1,340
31	.....	.....	1,180	.....	1,560	.....	2,330	2,900	.....

Monthly discharge of Yakima River at Umtanum, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918-19.				
October	1,960	630	883	54,300
November 1-23	1,940	820	1,400	63,900
April	6,680	3,370	4,690	279,000
May	9,620	3,040	5,390	331,000
June	5,280	2,370	3,370	200,000
July	2,370	1,680	1,920	118,000
August	2,460	1,820	2,230	137,000
September	2,120	781	1,300	77,300
1920.				
March	2,160	820	1,240	76,200
April	2,420	1,030	1,540	91,600
May	4,380	1,560	2,580	159,000
June	3,000	1,440	1,930	115,000
July	2,800	1,350	2,340	144,000
August	3,100	2,110	2,510	154,000
September	2,800	1,340	2,060	123,000
The period				863,000

YAKIMA RIVER NEAR PARKER, WASH.

LOCATION.—In sec. 28, T. 12 N., R. 19 E., below Sunnyside diversion dam, 2 miles below Union Gap, 1½ miles east of Parker, Yakima County, 3½ miles northwest of Wapato, and 11 miles below mouth of Naches River.

DRAINAGE AREA.—3,560 square miles (measured on topographic maps and Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—April 25, 1908, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank about 600 feet below Sunnyside diversion dam; installed August 17, 1915; inspected by H. J. Hanson, E. E. Anderson, F. W. Deveriaux, James Waugh, and H. C. Beardsley. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable 80 feet above gage or by wading.

CHANNEL AND CONTROL.—Bed composed of solid rock, large boulders, and gravel. One channel at all stages. Control formed by diagonal riffle about 250 feet below gage; may shift slightly during extremely high floods.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 9.8 feet at 5.30 p. m. January 23 (discharge, 20,600 second-feet); minimum stage, from recorder, 1.46 feet August 1 (discharge, 54 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 6.41 feet at 3.30 a. m. January 20 (discharge, 6,650 second-feet); minimum stage, from recorder, 1.16 feet at noon July 6 (discharge, 17 second-feet).

1908–1920: Maximum stage recorded 15.0 feet at 1 p. m. December 30, 1917 (discharge, 52,900 second-feet); practically no flow October 26, 1911, August 25 and 28, 1915, and September 14, 1918.

ICE.—Stage-discharge relation slightly affected by ice during severe winters. Flow estimated from discharge measurements and weather records.

DIVERSIONS.—Water diverted above gage for irrigation of about 250,000 acres.

REGULATION.—Flow partly regulated by diversions, and by storage and release of water at Keechelus, Kachess, Cle Elum, and Bumping reservoirs.

ACCURACY.—Stage-discharge relation changed gradually during the period February 25 to March 18, 1920; affected by ice Dec. 7–22, 1919. Rating curves well defined.

Water-stage recorder inspected daily. Daily discharge ascertained by applying daily mean gage height to rating table or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals; shifting-control method used February 26 to March 17, 1920. Records good October, 1918, to January, 1919, and December 1919, to March, 1920; excellent for remainder of period.

COOPERATION.—Complete records furnished by United States Reclamation Service.

Discharge measurements of Yakima River near Parker, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Feb. 4	Bishop and Moxley	5.10	3,636	Jan. 3	F. E. Moxley	a 4.00	1,706
June 5	F. E. Moxley	5.62	4,700	Feb. 25	do	4.11	1,960
July 7	do	4.06	2,320	Mar. 18	do	4.53	2,716
16	do	2.77	694	Apr. 5	do	3.48	1,240
29	do	2.29	332	19	do	2.55	466
Aug. 1	do	1.47	55.6	May 7	do	2.69	546
8	do	1.96	88.3	17	do	4.16	2,126
Oct. 7	Taylor and Moxley	2.72	515	June 10	do	2.86	659
Dec. 18	F. E. Moxley	a 4.14	1,516	July 6	do	1.16	12.6
26	do	a 5.62	4,180	Sept. 27	Parker and Ball	3.30	1,060

a Stage-discharge relation slightly affected by ice.

Daily discharge, in second-feet, of Yakima River near Parker, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	361	2,400	2,400	2,330	4,330	2,230	7,790	7,070	6,650	1,610	63	267
2	402	2,260	1,860	2,260	4,230	2,260	7,790	6,790	5,370	1,320	114	216
3	352	2,260	2,260	2,120	3,730	2,400	8,390	5,730	5,250	1,120	381	247
4	333	2,260	5,860	2,260	3,630	2,400	9,020	4,780	4,330	1,050	501	247
5	319	2,260	7,070	2,260	3,530	2,400	9,350	3,930	4,860	1,440	521	314
6	328	2,190	6,250	2,260	3,630	2,400	8,700	3,240	5,130	1,660	465	314
7	376	2,190	5,610	2,260	3,530	2,550	7,790	2,970	5,010	2,400	314	314
8	542	2,330	4,550	2,260	3,430	2,400	6,980	3,240	4,440	1,990	114	190
9	430	2,400	3,930	2,260	3,430	2,260	5,990	4,030	4,030	1,210	181	205
10	419	1,960	3,530	2,260	3,240	2,330	5,730	4,660	3,720	1,130	109	173
11	414	1,960	3,340	2,260	3,060	2,400	5,860	4,440	3,530	1,300	118	264
12	347	1,900	3,150	2,260	2,970	2,400	5,610	4,130	3,060	1,320	163	585
13	419	1,780	2,880	2,260	2,970	2,330	5,250	3,930	2,400	1,170	223	556
14	397	2,120	4,120	2,120	2,970	2,260	5,010	2,790	2,330	814	290	668
15	408	2,550	10,000	1,920	2,970	2,190	4,660	2,550	2,120	607	232	458
16	345	2,710	9,000	1,860	3,730	2,190	4,130	2,970	2,550	522	223	397
17	869	2,710	7,700	1,860	3,430	2,260	3,930	3,530	2,710	728	255	347
18	888	2,420	6,250	4,550	3,150	2,400	4,440	4,130	2,710	780	216	301
19	814	2,550	5,370	7,790	2,790	2,880	5,370	4,030	2,970	480	98	232
20	814	2,550	4,800	7,070	2,630	3,150	5,610	4,030	4,030	288	85	212
21	711	2,400	4,330	6,120	2,970	3,340	5,250	5,490	5,130	176	126	271
22	728	2,260	4,230	6,360	2,530	3,430	4,890	7,500	6,490	100	157	154
23	745	2,190	3,430	18,600	2,480	3,630	4,440	9,350	5,010	154	154	136
24	728	1,990	3,060	17,600	2,400	3,830	4,230	8,920	4,440	555	201	105
25	728	1,960	2,710	12,800	2,400	3,830	4,890	8,390	4,030	542	212	96
26	1,280	1,960	2,710	9,000	2,400	3,630	4,690	6,700	3,630	695	306	88
27	1,280	1,790	2,630	8,090	2,400	3,830	5,490	10,000	4,030	670	224	70
28	1,370	1,790	2,630	7,070	2,260	4,030	6,950	11,900	5,930	489	247	96
29	2,970	1,730	2,710	6,250	.....	4,550	7,500	12,400	7,280	397	306	83
30	2,880	1,730	2,550	5,490	.....	5,250	7,210	11,200	8,190	301	314	88
31	2,630	.....	2,400	4,780	.....	6,930	.....	6,700	.....	114	376	.....

Daily discharge, in second-feet, of Yakima River near Parker, Wash., during the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1	128	945	1,990	2,630	4,030	1,790	1,650	1,310	64	682	400	798
2	292	1,130	1,720	2,480	3,730	1,790	1,590	772	48	526	295	697
3	483	1,390	1,470	2,260	3,340	1,790	1,470	1,110	150	286	269	439
4	528	1,420	1,420	2,190	3,060	1,730	1,370	1,030	400	156	233	259
5	569	1,330	1,340	2,120	2,880	1,790	1,400	601	772	68	269	106
6	599	1,280	1,320	2,120	2,790	1,730	2,090	394	789	19	445	87
7	501	1,220	1,320	1,990	2,710	1,730	2,020	674	573	37	500	76
8	430	1,190	1,270	1,860	2,630	1,640	1,770	1,770	690	141	500	66
9	419	1,130	1,180	1,860	2,550	1,550	1,590	3,320	780	273	519	68
10	441	1,080	1,130	1,920	2,480	1,550	1,300	3,770	682	277	439	116
11	392	1,100	1,090	1,920	2,400	1,540	1,050	3,590	594	400	384	352
12	366	1,050	1,070	2,190	2,400	1,510	1,110	3,060	507	691	168	622
13	402	965	1,040	2,330	2,480	1,680	1,200	2,640	507	1,410	188	1,120
14	376	955	1,000	2,120	2,400	2,710	1,150	2,090	698	1,470	191	1,470
15	342	1,010	1,040	1,730	2,400	3,150	1,070	1,830	1,390	1,080	230	1,830
16	489	1,430	1,220	1,860	2,400	2,970	940	1,950	2,020	960	168	1,650
17	737	2,550	1,400	2,710	2,400	2,790	630	2,160	2,160	763	109	1,470
18	703	2,550	1,600	4,330	2,400	2,550	383	2,640	2,810	463	150	1,410
19	637	2,630	2,190	5,370	2,330	2,550	513	2,470	2,310	367	304	1,290
20	615	3,060	2,400	6,380	2,330	2,470	697	2,020	1,710	327	342	1,200
21	592	3,150	2,710	5,010	2,190	2,390	714	1,710	1,500	327	334	1,140
22	549	2,970	2,970	4,130	2,120	2,470	622	1,300	1,710	269	304	1,160
23	549	3,060	3,150	3,340	1,990	2,470	507	861	1,710	253	269	1,530
24	549	2,970	3,630	2,880	1,990	2,470	682	559	1,400	257	261	1,590
25	542	3,060	4,550	2,970	1,990	2,390	463	273	1,040	410	352	1,200
26	521	2,970	4,230	3,830	1,990	2,230	422	198	697	566	378	1,070
27	549	2,550	3,830	3,630	1,990	2,160	587	241	332	682	382	1,040
28	622	2,380	3,530	3,340	1,920	2,020	1,280	208	127	500	427	1,180
29	711	2,190	3,240	4,030	1,790	1,950	1,770	141	162	422	950	1,090
30	832	2,190	3,060	4,330	.....	1,830	1,470	135	594	405	1,000	1,020
31	788	.....	2,880	4,230	.....	1,770	.....	81	.....	445	900	.....

Monthly discharge of Yakima River near Parker, Wash., New Reservation, Old Reservation, and Sunnyside canals, for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.							Run-off in acre-feet.	
	River.			New Reservation canal (mean).	Old Reservation canal (mean).	Sunnyside canal (mean).	Total mean.[a]	River.	Total.[a]
	Maximum.	Minimum.	Mean.						
1918–19.									
October	2,970	319	840	109	43.9	499	1,490	51,400	91,600
November	2,710	1,600	2,150	.....	.....	.....	2,150	128,000	128,000
December	10,000	1,860	4,330	.....	.....	.....	4,380	266,000	266,000
January	18,600	1,860	5,140	.....	.....	.....	5,140	316,000	316,000
February	4,330	2,260	3,160	.....	.....	.....	3,160	176,000	176,000
March	6,930	2,190	3,050	.....	.....	114	3,160	188,000	194,000
April	9,350	3,980	6,110	398	146	784	7,440	363,000	443,000
May	12,400	2,550	5,970	1,090	329	1,170	8,560	367,000	526,000
June	6,650	2,190	3,940	996	286	1,160	6,380	235,000	380,000
July	2,400	100	878	934	201	1,240	3,250	54,000	200,000
August	521	63	243	987	186	1,220	2,640	15,000	152,000
September	535	79	249	605	101	889	1,790	14,800	107,000
The year	18,600	63	3,000	.....	.....	.....	4,130	2,170,000	2,990,000
1919–20.									
October	832	128	524	220	17.9	543	1,300	32,200	79,900
November	3,150	945	1,900	.....	.....	30	1,930	113,000	115,000
December	4,550	1,000	2,130	.....	.....	.....	2,130	131,000	131,000
January	6,380	1,730	3,040	.....	.....	.....	3,040	187,000	187,000
February	4,030	1,790	2,490	.....	.....	.....	2,490	143,000	143,000
March	3,150	1,510	2,100	.....	.....	3.6	2,100	129,000	129,000
April	2,090	383	1,120	264	154	787	2,320	66,600	138,000
May	3,770	81	1,450	1,120	252	1,180	4,000	89,200	246,000
June	2,810	48	964	1,000	219	1,140	3,320	57,400	198,000
July	1,470	19	482	1,070	166	1,140	2,860	29,600	176,000
August	1,000	109	374	968	143	1,230	2,720	23,000	167,000
September	1,830	66	905	658	99.6	909	2,570	53,900	153,000
The year	6,380	19	1,450	.....	.....	.....	2,570	1,050,000	1,860,000

[a] Totals are comparable with monthly determinations previously ascertained for Yakima River at Union Gap, near Yakima, Wash.

NOTE.—For records of flow of the three canals see pp. 235–242.

YAKIMA RIVER NEAR PROSSER, WASH.

LOCATION.—In SE. ¼ sec. 36, T. 9 N., R. 24 E., 1¼ miles northeast of Prosser, Benton County, and 40 miles above mouth.

DRAINAGE AREA.—5,340 square miles (authority, United States Reclamation Service).

RECORDS AVAILABLE.—June 1 to October 10, 1904; June 8 to December 30, 1905; February 1 to October 12, 1906; August 4, 1913, to October 31, 1915; irrigation seasons, 1916 to 1918; April 1, 1919, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank, 1¼ miles below Prosser Falls, installed August 4, 1913. June 1, 1904, to December 30, 1905, chain gage on highway bridge 600 feet below Prosser Falls. February 1 to October 12, 1906, inclined staff at approximately same site as present gage but at different datum. Recorder inspected by T. H. Martinson.

DISCHARGE MEASUREMENT.—Made from cable 1,000 feet above gage or from boat.

CHANNEL AND CONTROL.—Bed composed of rock and large boulders; changes only during floods. Control formed by broad riffle about 800 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 8.7 feet at 4 a. m. May 30 (discharge, 13,000 second-feet); minimum stage, from recorder, 1.85 feet from 8 to 10 p. m. August 13 (discharge, 767 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 6.22 feet at noon January 20 (discharge, 6,590 second-feet); minimum stage, from recorder, 1.79 feet from 7 to 12 p. m. July 9 (discharge, 695 second-feet).

1904–1906 and 1914–1920: Maximum flow measured by floats (not referred to gage) at 3 p. m. November 17, 1906 (discharge, 62,800 second-feet); maximum stage occurred at 9 a. m. on same date at stage three-fourths inch above that of measurement; minimum stage recorded, 2.60 feet August 19, 26, 30, 31, and September 30, 1906 (discharge, about 40 second-feet).

ICE.—Stage-discharge relation seriously affected by ice during severe winters; flow estimated from discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Water diverted above gage for irrigation of about 250,000 acres.

REGULATION.—Flow partly regulated by diversions and by storage and release of water of Keechelus, Kachess, Cle Elum, and Bumping reservoirs.

ACCURACY.—Stage-discharge relation permanent; affected by ice December 6–9, 11–13, and 15–22, 1919, and by aquatic plants during summer. Rating curves fairly well defined; revised October 1, 1919. Water-stage recorder inspected daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Yakima River near Prosser, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Feb. 6	Bishop and Moxley	4.95	4,410	Jan. 13	F. E. Moxley	3.64	2,330
Mar. 29	F. E. Moxley	5.38	4,950	Feb. 20	do	3.99	2,920
June 18	do	4.39	3,350	Apr. 27	do	2.16	968
July 2	do	3.75	2,460	June 9	do	2.53	1,310
26	do	2.46	1,130	Aug. 4	do	2.15	938
Sept. 26	Taylor and Moxley	2.16	962	Sept. 28	Ball and Parker	3.23	1,760
Dec. 19	F. E. Moxley	[a] 3.68	2,300				

[a] Stage-discharge relation probably slightly affected by ice.

Daily discharge, in second-feet, of Yakima River near Prosser, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	1,090						7,590	8,270	9,250	3,090	914	1,120
2	1,050						8,040	8,040	7,370	2,560	853	1,090
3	1,050						8,510	7,810	6,320	2,310	824	1,050
4	1,050						9,290	6,960	5,910	2,130	914	1,090
5	1,050						10,000	6,320	5,320	2,010	1,050	1,090
6	1,010						10,000	5,320	5,510	2,190	1,120	1,160
7	1,010						9,250	4,500	5,910	2,370	1,120	1,240
8	1,010						8,510	4,230	5,710	2,020	1,050	1,240
9	1,090						7,590	4,320	5,320	2,680	883	1,200
10	1,130						6,960	4,960	4,770	2,070	858	1,160
11	1,090						6,740	5,510	4,590	1,950	824	1,160
12	1,010						6,740	5,320	4,410	2,070	824	1,160
13	1,010						6,530	4,950	3,900	2,070	795	1,370
14	1,010						6,110	4,230	3,495	1,950	824	1,460
15	1,050						5,710	3,660	3,300	1,610	883	1,420
16	1,090						5,320	3,530	3,370	1,460	883	1,420
17	1,170						5,130	3,740	3,440	1,370	883	1,370
18	1,360						4,950	4,140	3,440	1,420	914	1,280
19	1,460						5,710	4,770	3,520	1,460	914	1,240
20	1,410						6,320	4,410	3,660	1,330	883	1,160
21	1,410						6,530	4,770	4,770	1,160	853	1,120
22	1,360						6,320	6,320	5,710	1,080	824	1,120
23	1,310						5,910	8,510	5,910	1,010	853	1,090
24	1,310						5,510	9,770	5,510	946	853	1,010
25	1,260						5,510	9,770	5,130	1,090	883	979
26	1,360						5,910	9,250	4,590	1,200	914	946
27	1,670						5,910	9,770	4,500	1,280	914	946
28	1,560						6,530	11,400	4,590	1,370	979	914
29	1,950						8,040	12,800	4,230	1,240	1,010	914
30	2,880						8,510	12,800	3,660	1,120	1,090	914
31	2,950							11,600		1,050	1,120	
1919-20.												
1	928	1,620	2,520	3,360	4,790	2,140	2,200	1,790	790	1,180	1,070	1,620
2	920	1,820	2,330	3,140	4,440	2,200	2,140	1,570	760	1,350	1,070	1,520
3	955	1,980	1,980	2,940	4,280	2,200	1,980	1,310	730	1,220	992	1,480
4	1,100	1,980	1,760	2,720	3,960	2,200	1,980	1,390	730	1,070	920	1,350
5	1,180	1,920	1,720	2,590	3,720	2,140	1,920	1,390	760	920	885	1,180
6	1,260	1,920	1,720	2,590	3,570	2,140	1,920	1,100	992	820	885	1,070
7	1,260	1,870	1,760	2,520	3,500	2,140	2,590	885	1,260	790	955	992
8	1,260	1,720	1,760	2,390	3,420	2,090	2,460	955	1,180	730	1,030	955
9	1,180	1,720	1,720	2,200	3,360	1,980	2,330	1,980	1,220	701	1,100	955
10	1,180	1,670	1,720	2,090	3,140	1,980	2,140	3,420	1,390	730	1,100	920
11	1,180	1,670	1,670	2,090	3,080	1,980	1,920	3,800	1,350	760	1,070	920
12	1,180	1,620	1,670	2,090	2,940	1,980	1,760	3,640	1,310	852	1,030	1,030
13	1,140	1,570	1,570	2,200	2,940	2,030	1,870	3,220	1,260	1,520	885	1,260
14	1,140	1,520	1,570	2,260	2,940	2,390	1,870	2,800	1,260	2,030	820	1,720
15	1,140	1,570	1,670	2,090	2,860	3,500	1,870	2,390	1,350	2,140	820	2,140
16	1,100	1,570	1,820	2,140	2,720	3,720	1,820	2,140	1,920	1,980	820	2,460
17	1,100	1,870	1,920	2,330	2,660	3,500	1,670	2,200	2,590	1,620	790	2,390
18	1,260	2,720	2,030	3,420	2,660	3,360	1,390	2,390	2,860	1,390	760	2,200
19	1,310	2,860	2,330	4,620	2,660	3,080	1,220	2,720	3,220	1,180	760	2,200
20	1,260	3,080	2,660	5,940	2,720	2,940	1,180	2,590	2,940	1,070	820	2,140
21	1,260	3,420	3,000	6,140	2,660	2,860	1,310	2,330	2,520	992	885	1,980
22	1,180	3,420	3,280	5,160	2,590	2,860	1,350	2,030	2,260	955	920	1,920
23	1,140	3,360	3,420	4,440	2,460	2,940	1,260	1,720	2,330	955	885	1,980
24	1,140	3,280	3,500	3,720	2,330	2,860	1,140	1,390	2,260	920	885	2,260
25	1,180	3,360	4,120	3,420	2,390	2,860	1,180	1,180	2,030	885	885	2,330
26	1,220	3,280	4,790	3,960	2,390	2,720	1,100	992	1,760	992	920	2,030
27	1,180	3,220	4,440	4,970	2,830	2,590	955	885	1,520	1,140	992	1,920
28	1,180	2,940	4,280	4,280	2,330	2,520	992	852	1,260	1,260	992	1,870
29	1,220	2,726	3,960	4,280	2,260	2,390	1,480	820	1,100	1,180	1,140	1,920
30	1,310	2,660	3,720	4,620		2,330	1,070	760	992	1,100	1,440	1,870
31	1,350		3,500	4,790		2,200		790		1,070	1,620	

Monthly discharge of Yakima River near Prosser, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	2,950	1,010	1,330	81,800
April	10,000	4,950	6,990	416,000
May	12,800	3,520	6,830	420,000
June	9,250	3,300	4,900	292,000
July	3,090	946	1,730	106,000
August	1,120	795	919	56,500
September	1,460	914	1,150	68,300
1919–20.				
October	1,350	920	1,170	71,900
November	3,420	1,520	2,330	139,000
December	4,790	1,570	2,580	158,000
January	6,140	2,090	3,400	209,000
February	4,790	2,260	2,940	175,000
March	3,720	1,980	2,540	156,000
April	2,590	955	1,670	99,300
May	2,900	780	1,850	114,000
June	2,220	730	1,600	95,000
July	2,140	701	1,150	70,400
August	1,620	760	972	59,800
September	2,460	920	1,690	100,600
The year	6,140	701	2,000	1,450,000

KACHESS LAKE NEAR EASTON, WASH.

LOCATION.—In sec. 24, T. 21 N., R. 13 E. (unsurveyed), at lake outlet, 2½ miles northwest of Easton, Kittitas County.

DRAINAGE AREA.—63 square miles (measured on topographic maps).

RECORDS AVAILABLE.—September 20, 1905, to September 30, 1920.

GAGE.—Stevens water-stage recorder installed in gate tower November 25, 1915, for use when gates are closed, and staff gage in three sections (datum, mean sea level). Recorder inspected by I. Pennington and Fred Diener. For description of present staff gage and former gages see Water-Supply Paper 442.

EXTREMES OF STORAGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 2,259.96 feet at 7.30 a. m. July 16 (storage, 229,780 acre-feet); minimum stage, from recorder, 2,228.63 feet on October 26 (storage, 103,660 acre-feet).

Maximum stage during year ending September 30, 1920, from recorder, 2,261.14 feet at 4 p. m. July 21 (storage, 235,090 acre-feet); minimum stage, from recorder, 2,226.21 feet at 7 a. m. September 23 (storage, 95,170 acre-feet).

1906–1920: Maximum stage recorded, July 21, 1920; minimum stage recorded, 2,197.73 feet September 26–27, 1915 (storage, 13,730 acre-feet).

STORAGE.—Capacity of reservoir at crest of spillway, 221,000 acre-feet (revised determination). Elevation of gate sill, 2,192.75 feet; and of spillway crest, 2,258 feet. Record of storage or release each month used for determining discharge without storage at gaging station below dam.

ACCURACY.—Water-stage recorder in gate tower, used when gates were closed; referred to staff gage once daily. When gates were open, staff gage read twice daily to hundredths. Record excellent.

COOPERATION.—Record furnished by United States Reclamation Service.

Daily storage, in acre-feet, of Kachess Lake near Easton, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	112,340	111,800	123,660	154,750	178,920	176,460	163,650	172,150	187,510	219,710	206,720	118,000
2	112,890	112,270	124,770	154,990	179,380	176,550	163,450	173,810	187,630	220,510	208,590	115,960
3	111,660	112,740	127,140	155,230	179,800	176,460	163,320	175,230	188,480	221,220	200,340	114,150
4	110,360	113,180	129,710	155,470	180,260	176,340	163,650	176,340	190,010	222,030	197,110	112,630
5	109,640	113,590	131,440	155,670	180,550	176,380	163,810	177,210	191,540	222,910	194,020	111,870
6	108,750	113,790	132,560	155,940	180,760	176,460	163,770	178,130	193,000	223,710	191,080	111,980
7	107,330	113,900	133,350	156,140	180,800	176,380	163,530	179,090	194,240	224,420	188,570	112,050
8	107,080	114,370	134,070	156,220	180,890	176,210	163,240	180,300	195,440	225,130	186,070	112,130
9	106,330	114,620	134,750	156,420	181,060	176,090	162,920	181,480	196,680	225,800	183,320	112,200
10	105,800	115,380	135,200	156,620	181,220	176,010	162,840	182,740	197,800	226,560	180,470	112,270
11	105,720	115,860	135,620	156,900	181,140	176,010	162,760	184,080	198,620	227,180	177,710	112,420
12	105,720	116,250	136,300	157,300	181,060	175,800	162,600	185,180	199,520	227,810	174,470	112,740
13	105,620	116,690	138,130	157,500	180,970	175,670	162,270	186,150	200,470	228,260	171,330	112,850
14	105,400	117,340	142,460	157,740	180,800	175,380	161,870	186,960	201,460	228,790	168,130	112,920
15	105,150	118,040	145,360	158,060	180,640	175,130	161,390	187,380	202,540	229,380	164,950	113,000
16	105,010	118,300	147,070	158,700	180,550	174,840	160,980	187,630	203,500	229,780	162,030	113,070
17	104,900	119,280	148,080	160,020	180,390	174,390	160,660	187,630	204,540	229,470	158,900	113,140
18	104,760	119,640	148,940	162,030	180,140	173,930	160,500	187,290	205,580	229,020	155,860	113,210
19	104,580	120,010	149,680	163,570	177,590	172,940	160,420	186,910	206,890	228,440	152,740	113,280
20	104,370	120,340	150,420	164,580	176,380	172,110	160,340	186,830	208,370	227,900	149,720	113,360
21	104,200	120,670	150,890	165,600	176,090	171,250	160,260	187,080	209,770	227,050	146,600	113,430
22	103,880	120,890	151,440	167,640	175,960	170,420	160,540	187,760	211,170	225,840	143,350	113,460
23	103,840	121,180	151,910	170,510	176,050	169,520	160,900	188,310	212,310	223,970	140,120	113,540
24	103,800	121,510	152,270	172,650	175,800	168,790	161,710	188,310	213,320	222,110	137,140	113,570
25	103,800	121,810	152,660	174,100	176,300	167,930	162,840	188,180	214,500	220,510	134,110	113,610
26	103,660	122,140	153,020	175,380	176,210	167,150	164,010	188,440	215,650	218,520	131,020	113,610
27	104,550	122,470	153,330	176,170	176,130	166,370	165,600	188,960	216,710	216,710	128,030	113,650
28	107,820	122,810	153,770	176,880	176,130	165,600	167,150	189,420	217,590	214,860	124,840	113,720
29	109,610	123,030	154,120	177,550	.....	164,860	168,740	188,570	218,290	212,920	121,590	113,900
30	110,470	123,360	154,360	178,000	.....	164,340	170,420	187,800	218,910	211,170	119,060	113,860
31	111,190	.....	154,600	178,550	.....	163,890	.....	187,510	.....	209,330	119,970	.....
1919-20.												
1	113,940	114,520	121,000	125,360	149,520	159,460	172,940	187,760	213,400	220,410	218,470	139,200
2	114,010	114,800	121,220	125,770	150,070	159,660	173,480	188,350	213,890	220,900	216,930	137,670
3	114,080	114,990	121,440	126,140	150,620	159,900	173,890	188,910	213,980	221,310	215,120	136,530
4	114,150	114,990	121,480	126,470	151,090	160,180	174,420	189,560	213,930	221,670	213,360	135,390
5	114,150	114,770	121,040	126,770	151,560	160,740	175,180	190,100	214,060	221,890	211,340	134,220
6	114,230	114,440	120,560	127,030	152,110	160,980	175,760	190,950	214,810	222,070	209,290	133,200
7	114,230	114,150	120,040	127,250	152,660	161,150	176,260	192,010	215,690	222,340	207,280	132,040
8	114,330	113,790	119,610	127,430	153,250	161,390	176,670	193,210	216,530	222,570	205,240	131,170
9	114,440	113,460	119,130	127,660	153,650	161,670	177,050	194,880	217,280	222,790	203,200	129,220
10	114,520	113,210	118,660	127,920	154,040	161,830	177,380	196,300	217,940	223,060	200,980	126,990
11	114,660	112,850	118,220	128,140	154,360	161,990	177,670	197,410	218,520	223,290	198,980	124,470
12	114,890	112,490	117,780	128,360	154,750	162,530	177,980	198,450	219,220	223,510	196,810	121,620
13	114,950	112,200	117,340	128,620	155,030	163,490	178,460	199,390	219,880	223,920	194,490	118,620
14	115,040	111,980	116,940	128,850	155,360	164,740	178,920	200,340	220,640	224,160	192,060	115,960
15	115,090	112,020	116,360	129,260	155,630	165,440	179,380	201,250	221,480	224,280	189,760	113,210
16	115,170	114,010	116,040	129,930	155,900	166,090	179,800	202,200	222,280	224,460	187,420	110,360
17	115,240	116,330	116,220	132,490	156,180	166,580	180,090	203,500	223,080	224,590	184,840	107,360
18	115,310	117,130	116,580	134,900	156,580	167,070	180,430	204,760	223,750	224,730	181,810	104,510
19	115,380	117,850	116,760	137,980	156,980	167,400	180,760	205,720	224,330	224,860	178,630	101,720
20	115,460	118,260	117,050	139,130	157,300	167,800	181,180	206,590	224,950	225,060	175,670	99,280
21	115,600	118,550	117,490	140,090	157,580	168,170	181,600	207,320	225,580	225,000	172,610	97,190
22	115,860	118,840	117,880	140,970	157,980	168,580	182,020	208,150	226,340	224,050	169,690	96,000
23	115,960	119,170	118,510	141,390	158,100	168,950	182,400	208,810	226,960	223,750	166,900	95,310
24	116,000	119,570	119,530	142,000	158,340	169,520	182,880	209,330	227,230	223,670	163,930	95,600
25	116,040	119,720	120,780	143,540	158,540	169,970	183,240	209,770	227,580	223,050	160,860	96,140
26	115,860	119,750	121,580	144,430	158,760	170,340	183,660	210,340	227,850	222,520	157,900	96,530
27	115,710	119,790	122,250	145,050	158,860	170,790	184,080	210,900	228,120	222,020	154,750	96,950
28	115,380	120,120	122,990	146,060	159,060	171,250	185,010	211,520	228,750	222,260	151,660	97,370
29	115,020	120,490	123,760	147,220	159,260	171,920	186,070	212,040	229,290	222,530	148,470	97,720
30	114,660	120,780	124,320	148,080	.....	172,030	187,000	212,480	229,870	221,750	145,360	98,140
31	114,520	.....	124,880	148,900	.....	172,490	.....	212,920	.....	220,150	142,270	.....

KACHESS RIVER NEAR EASTON, WASH.

LOCATION.—In sec. 3 T. 20 N., R. 13 E., three-fourths mile below Kachess storage dam, one-fourth mile above mouth, and 2 miles northwest of Easton, Kittitas County.

DRAINAGE AREA.—64 square miles (measured on topographic maps).

RECORDS AVAILABLE.—November 20, 1903, to September 30, 1920.

GAGE.—Stevens water-stage recorder at highway bridge; installed August 15, 1916; inspected by Fred Diener. Original staff gage on left bank a quarter of a mile below Kachess storage dam was replaced by water-stage recorder at same site and datum July 22, 1913.

DISCHARGE MEASUREMENTS.—Made from cable 20 feet below site of old gage or by wading.

CHANNEL AND CONTROL.—Bed composed of light gravel and sand; shifting frequently. One channel at all stages. Control formed by broad riffle 125 feet below gage.

EXTREMES OF DISCHARGE.—Maximum discharge during year ending September 30, 1919, 1,770 second-feet, from 5 p. m. to 11 p. m. August 2 (computed from gate opening); practically no flow on days for which discharge is not shown.

Maximum discharge during year ending September 30, 1920, 2,240 second-feet, August 27 (computed from gate opening); practically no flow on days for which discharge is not shown.

1904–1920: Maximum discharge occurred August 27, 1920; practically no flow when gates in dam are closed.

ICE.—Stage-discharge relation affected by ice; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—None.

REGULATION.—Flow controlled by storage and release of water in Kachess Lake reservoir. Monthly discharge, without storage, determined from records of stage of reservoir.

ACCURACY.—Stage-discharge relation affected by backwater from Yakima River and other causes throughout the period. Therefore daily discharge was computed from stage of Lake Kachess and gate openings. Records excellent.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Kachess River near Easton, Wash., during the year ending Sept. 30, 1919.

Date.	Made by—	Gage height.	Dis. charge.	Date.	Made by—	Gage height.	Dis. charge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 17	Bishop and Moxley	4.13	223	Apr. 28	F. E. Moxley	4.49	316
17	do	5.14	547	28	do	4.92	470
18	do	3.00	35.7	May 29	do	6.27	1,230
18	do	6.14	983	Aug. 5	do	6.34	1,570
19	do	6.72	1,510	27	do	6.47	1,370

Daily discharge, in second-feet, of Kachess River near Easton, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	792					155	490		453		1,510	1,120
2	663					155	495		206		1,330	295
3	660					155	495				1,620	882
4	578				79	154	495				1,670	680
5	511				134	155	495				1,600	74
6	508				135	155	495				1,440	29
7	449				135	155	495				1,350	
8	398				136	155	494				1,360	
9	322				135	155	493				1,420	
10	181				175	155	493				1,450	
11	181				224	155	493				1,540	
12	181				224	195	493				1,629	
13	181				224	177	493				1,580	
14	196				224	230	493	170			1,550	
15	144				224	310	492	420			1,549	
16	144				228	387	491	586		224	1,500	
17	144				238	477	491	708		302	1,520	
18	142				714	506	491	768		392	1,510	
19	144				1,330	505	490	768		392	1,490	
20	144				222	504	490	768		514	1,480	
21	144				200	503	397	768		655	1,460	
22	144				195	502	256	770		901	1,450	
23	144				155	501	155	844		1,020	1,440	
24	144				155	501		905		1,020	1,430	
25	144				159	499		905		1,020	1,420	
26	143				155	499		950		1,010	1,400	
27	79				155	497		1,070		1,010	1,380	
28					155	497	126	1,310		1,000	1,370	
29						496		1,290		1,000	1,360	
30						495		935		998	1,230	
31						495		585		1,110	1,120	
1919–20.												
1		244								913	926	
2		244							165	924	634	
3		244							385	945	587	
4		244	166						490	976	553	
5		244	286						186	1,050	541	
6		244	285							1,100	521	
7		244	284							1,120	631	
8		244	282							1,110	765	
9		244	283							1,100	1,100	
10		243	283							1,100	1,370	
11		242	282							1,100	1,530	
12		242	282							1,160	1,640	
13		242	282							1,210	1,700	
14		242	281							1,250	1,800	
15		242	281							1,240	1,780	
16		244	281							1,260	1,780	
17		246	281							1,370	1,790	
18		247	226							1,520	1,750	
19		247	136							1,400	1,750	
20		248	40							1,390	1,660	
21		248								214	1,380	1,230
22		248								636	1,370	814
23		248								676	1,450	307
24		248								779	1,590	
25	33	249								822	1,580	
26	132	206								928	1,570	
27	204	133								932	1,840	
28	246	61								922	1,920	
29	245									920	1,530	
30	244									917	1,320	
31	244									913	917	

NOTE.—No flow on days for which no figures are given.

Monthly discharge of Kachess River near Easton, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 64 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
1918-19.									
October	792	0	244	15,000	−1,510	13,500	220	3.44	3.97
November	0	0	0	0	+12,200	12,200	205	3.20	3.57
December	0	0	0	0	+31,200	31,200	507	7.92	9.13
January	0	0	0	0	+24,000	24,000	390	6.09	7.02
February	1,330	0	216	12,000	−2,420	9,580	172	2.69	2.80
March	506	155	337	20,700	−12,200	8,500	138	2.16	2.49
April	495	0	360	21,400	+6,530	27,900	468	7.33	8.18
May	1,310	0	471	28,900	+17,100	46,000	748	11.7	13.49
June	453	0	24.9	1,480	+31,400	32,900	553	8.64	9.64
July	1,110	0	408	25,100	−9,580	15,500	252	3.94	4.54
August	1,630	1,120	1,460	90,100	−89,400	700	11.4	.178	.21
September	1,120	0	125	7,440	−6,110	1,330	22.4	.350	.39
The year	1,630	0	307	222,000	+1,210	223,000	308	4.81	65.43
1919-20.									
October	246	0	43.5	2,670	+660	3,330	54.2	.847	.98
November	249	0	217	12,900	+6,300	19,200	323	5.05	5.63
December	286	0	137	8,420	+4,100	12,500	203	3.17	3.66
January	0	0	0	0	+24,000	24,000	390	6.09	7.02
February	0	0	0	0	+10,400	10,400	181	2.83	3.05
March	0	0	0	0	+13,200	13,200	215	3.36	3.87
April	0	0	0	0	+14,500	14,500	244	3.81	4.25
May	0	0	0	0	+25,900	25,900	421	6.58	7.59
June	406	0	38.1	2,260	+17,000	19,300	324	5.06	5.64
July	982	0	279	17,200	−9,720	7,480	122	1.91	2.20
August	1,920	913	1,280	78,700	−77,900	800	13.0	.203	.23
September	1,800	0	902	53,700	−44,100	9,600	161	2.52	2.81
The year	1,920	0	242	176,000	−15,700	160,000	221	3.45	46.93

CLE ELUM LAKE NEAR ROSLYN, WASH.

LOCATION.—In sec. 10, T. 20 N., R. 14 E., at lake outlet, 4 miles northwest of Roslyn, Kittitas County, and 7½ miles northwest of Cle Elum.

DRAINAGE AREA.—202 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 4 to June 9, 1906; October 1, 1906, to September 30, 1920.

GAGE.—Since November 8, 1916, Stevens continuous water-stage recorder referred to vertical staff on left abutment of dam just above gates. This staff used since June 17, 1907; zero at elevation of gate sills, 2,122.75 feet. Considerable fall between lake and dam for stages below 5.0 feet. Auxiliary gages at same datum, about 400 feet above dam; installed October, 1907, and July 16, 1915, used to obtain true elevation of lake at low stages. Prior to June 17, 1907, vertical staff in Lake above outlet, at datum 0.45 foot lower than present gage. Recorder inspected by J. G. Giddings.

EXTREMES OF STORAGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 15.20 feet at 8 a. m. May 28 (storage, 33,320 acre-feet); minimum stage from recorder, 3.00 feet at 3 p. m. September 30 (storage, 6,250 acre-feet).

Maximum stage during year ending September 30, 1920, from recorder, 15.19 feet at 3 p. m. June 18 (storage, 33,290 acre-feet); minimum stage from recorder, 2.80 feet October 5–9 (storage, 5,830 acre-feet).

1907–1920: Maximum stage recorded 19.10 feet at 6 p. m. December 30, 1917 (storage, 43,180 acre-feet); minimum stage estimated at 1.15 feet August 31, 1906 (storage, 2,380 acre-feet).

STORAGE.—Capacity of reservoir at crest of spillway (gage height, 11.3 feet) 24,100 acre-feet. Storage or release each month used for determining discharge without storage for gaging station below dam.

ACCURACY.—Water-stage recorder referred to staff gage twice daily. Gage read to hundredths. Record excellent.

COOPERATION.—Records furnished by United States Reclamation Service.

Daily storage, in acre-feet, of Cle Elum Lake near Roslyn, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	7,170	22,240	25,210	25,370	26,170	25,260	26,820	30,240	29,040	28,240	23,680	10,850
2	7,150	23,180	25,600	25,400	26,040	25,460	27,330	29,950	28,760	28,220	23,270	10,430
3	7,130	23,970	26,870	25,400	25,940	25,490	27,640	29,300	28,500	28,310	22,660	10,210
4	7,090	24,540	28,310	25,280	25,900	25,530	27,870	28,880	29,260	28,550	21,930	9,960
5	7,090	25,100	28,950	25,210	25,880	25,550	28,380	28,360	29,850	28,780	21,100	9,680
6	7,090	25,220	28,410	25,140	25,830	25,490	28,080	28,080	29,920	28,810	20,550	9,500
7	7,420	25,350	27,750	25,170	25,710	25,030	28,010	28,060	29,680	28,500	20,220	9,300
8	7,570	25,300	27,310	25,120	25,670	24,740	27,500	28,410	29,350	28,150	19,650	9,090
9	7,590	25,330	26,890	25,100	26,600	24,380	27,190	28,850	29,090	27,980	19,000	9,030
10	7,850	25,490	26,660	25,080	25,550	24,100	27,220	29,090	28,850	28,080	18,390	8,780
11	8,100	25,530	26,360	25,080	25,510	23,560	27,450	28,930	28,520	28,100	17,740	8,650
12	8,350	25,510	26,340	25,080	25,460	23,000	27,290	28,620	28,270	28,030	17,140	8,400
13	9,090	25,510	27,120	25,120	25,440	22,780	27,150	28,270	28,220	27,910	16,750	8,140
14	9,320	25,600	30,620	25,100	25,420	23,090	26,870	28,010	28,340	27,780	16,300	8,160
15	9,320	25,780	31,290	25,060	25,370	23,180	26,820	28,060	28,500	27,750	15,890	8,180
16	9,390	25,970	29,760	25,190	25,350	23,380	26,780	28,500	28,500	27,910	15,410	8,100
17	9,450	25,880	28,880	25,530	25,330	23,680	26,780	28,620	28,520	27,910	14,660	7,950
18	9,540	25,760	28,010	26,150	25,210	23,990	27,220	28,550	28,640	27,700	14,190	7,800
19	9,660	25,670	27,380	27,380	25,190	24,240	27,560	28,600	29,140	27,380	13,660	7,640
20	9,660	25,580	26,980	27,540	25,100	24,470	27,820	29,160	29,970	27,150	13,120	7,490
21	9,730	25,510	26,750	27,520	25,080	24,560	27,870	30,090	30,240	27,010	12,680	7,340
22	9,790	25,440	26,470	27,820	25,080	24,650	27,780	31,240	30,160	26,910	12,660	7,260
23	9,850	25,330	26,240	28,950	25,100	24,760	27,800	31,610	29,900	26,820	12,660	7,070
24	9,920	25 370	26,060	29,380	25,100	24,850	27,960	31,170	29,640	26,710	12,550	6,920
25	9,980	25,350	25,900	28,740	25,210	25,030	28,310	30,670	29,420	26,540	12,380	6,920
26	10,040	25,400	25,780	28,080	25,170	25,260	28,570	31,080	29,500	26,310	12,170	6,710
27	10,260	25,240	25,690	27,590	25,080	25,330	29,680	32,440	29,570	26,270	11,870	6,500
28	13,660	25,100	25,670	27,190	25,080	25,370	30,210	33,070	29,380	25,300	11,760	6,420
29	17,240	25,240	25,600	26,820	.....	25,600	30,280	32,220	28,850	24,760	11,550	6,310
30	19,110	25,280	25,550	26,590	.....	25,850	30,260	31,000	28,430	24,290	11,420	6,250
31	20,790	.....	25,460	26,450	.....	26,290	.....	29,850	.....	24,040	11,420	.....
1919-20.												
1	6,250	7,830	25,970	26,800	27,010	25,170	25,620	24,380	24,900	32,190	28,080	16,470
2	6,140	8,350	25,830	26,610	26,910	25,170	25,650	24,760	25,030	32,360	27,980	15,020
3	6,040	9,010	25,650	26,450	26,540	25,140	25,510	25,010	25,620	32,290	27,960	15,390
4	5,950	9,410	25,460	26,290	26,400	25,170	25,530	25,330	26,840	32,020	27,960	14,790
5	5,830	9,940	25,400	26,130	26,220	25,170	25,710	26,400	28,340	31,850	27,940	14,510
6	5,830	10,470	25,350	25,940	26,130	25,120	25,710	27,660	29,830	31,710	27,780	13,920
7	5,830	10,790	25,280	25,880	26,080	25,100	25,690	28,760	30,910	31,460	27,590	13,300
8	5,830	11,000	25,210	25,710	25,990	25,080	25,670	29,880	31,660	31,290	27,380	12,550
9	5,830	11,260	25,140	26,620	25,920	25,060	25,650	30,620	32,070	31,080	26,940	11,870
10	5,930	11,530	25,170	25,550	25,830	25,060	25,620	30,670	32,140	31,000	26,570	11,300
11	6,040	11,800	25,120	25,420	25,670	25,120	25,550	30,380	32,120	30,980	26,240	11,000
12	6,140	12,060	25,030	25,420	25,620	25,190	25,620	29,920	32,100	30,860	26,010	11,320
13	6,250	12,300	24,960	25,370	25,620	25,530	25,760	29,710	32,050	30,980	25,740	12,250
14	6,460	12,690	24,870	25,350	25,400	26,290	25,880	29,610	32,190	30,990	25,330	13,470
15	6,580	13,170	24,850	25,350	25,550	26,450	25,880	29,540	32,850	30,740	25,010	14,960
16	6,630	17,010	24,940	25,760	25,550	26,400	25,810	29,540	33,240	30,450	24,620	16,140
17	6,650	22,240	25,190	27,290	25,530	26,220	25,740	29,830	33,270	30,330	24,200	16,920
18	6,670	26,080	26,310	28,850	25,440	26,080	25,210	30,190	33,270	30,260	23,630	17,390
19	6,670	27,450	26,840	29,400	25,400	25,970	24,380	29,900	33,090	30,210	23,070	17,660
20	6,680	27,590	26,750	28,690	25,490	25,880	23,540	29,520	32,920	30,090	22,620	17,930
21	6,690	27,360	26,590	27,910	25,490	25,810	22,710	29,400	32,800	29,920	22,090	18,260
22	6,700	27,190	26,640	27,330	25,440	25,780	21,820	28,810	32,970	29,780	21,480	18,930
23	6,710	27,260	26,890	26,870	25,440	25,830	20,940	28,450	33,050	29,570	20,790	19,870
24	6,790	27,500	27,360	26,590	25,370	25,850	20,020	28,200	32,700	29,230	20,160	20,550
25	6,790	27,450	27,940	26,170	25,370	25,830	19,190	27,800	32,220	28,990	19,480	21,050
26	6,880	27,190	27,890	26,130	25,350	25,780	18,740	26,940	31,860	28,640	18,850	21,540
27	6,960	26,800	27,680	26,400	25,330	25,760	19,260	26,130	31,420	28,500	18,240	21,840
28	7,050	26,500	27,590	26,610	25,260	25,670	21,050	25,710	31,340	28,360	17,630	21,800
29	7,130	26,310	27,420	27,080	25,260	25,620	22,580	25,490	31,560	28,270	17,440	21,120
30	7,210	26,170	27,290	27,280	.....	25,760	23,950	25,240	31,880	28,270	17,200	20,090
31	7,300	.....	27,010	27,190	.....	25,650	.....	25,010	.....	28,220	16,990	.....

CLE ELUM RIVER NEAR ROSLYN, WASH.

LOCATION.—In sec. 10, T. 20 N., R. 14 E., below temporary crib dam at outlet of Cle Elum Lake, 4 miles northwest of Roslyn, Kittitas County, and 7½ miles northwest of Cle Elum.

DRAINAGE AREA.—202 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 10, 1903, to September 30, 1920.

GAGE.—Stevens water-stage recorder on left bank 800 feet below temporary crib dam; installed October 14, 1913; inspected by J. G. Giddings. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable about 350 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and boulders; shifting at high water. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 7.50 feet from 6 a. m. to 8 a. m. May 28 (discharge, 5,230 second-feet); minimum stage, from recorder, 0.82 foot at 4 p. m. September 14 (discharge, 62 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 5.42 feet at 4.15 a. m. January 19 (discharge, 2,700 second-feet); minimum stage, from recorder, 0.51 foot at 9 p. m. November 10 (discharge, 28 second-feet).

1904–1920: Maximum stage recorded, 14.05 feet at 2 p. m. November 15, 1906 (discharge, 18,700 second-feet); minimum stage recorded, zero at 6 p. m. September 28, 1914 (practically no flow).

ICE.—Stage-discharge relation not seriously affected by ice.

DIVERSIONS.—None.

REGULATION.—Flow partly controlled by storage and release of water at Cle Elum Lake reservoir. Monthly discharge without storage determined from records of stage at reservoir.

ACCURACY.—Stage-discharge relation changed some time in March, 1919, probably on March 13 and 14. Rating curves well defined above 200 second-feet, poorly defined below 150 second-feet; revised slightly October 1, 1919. Water-stage recorder inspected daily. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection, or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter periods. Records excellent except for March, October, and November, 1919, for which they are good.

COOPERATION.—Complete records furnished by United States Reclamation Service.

Discharge measurements of Cle Elum River near Roslyn, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Feb. 11	Bishop and Moxley	2.19	441	Feb. 16	F. E. Moxley	2.31	419
Mar. 31	F. E. Moxley	3.00	791	Mar. 17	do	2.92	741
May 27	do	6.87	4,370	25	do	2.58	570
Aug. 4	do	3.20	851	May 26	do	3.71	1,210
25	do	2.20	387	June 25	do	3.71	1,220
Sept. 8	do	1.92	309	July 14	do	3.13	884
Oct. 2	do	1.50	188				

Daily discharge, in second-feet, of Cle Elum River near Roslyn, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	206	279	355	394	688	285	853	2,650	2,000	1,620	785	400
2	206	274	472	379	637	307	1,000	2,650	1,780	1,620	849	400
3	231	262	970	365	578	310	1,320	2,300	1,860	1,660	895	389
4	231	332	1,800	355	559	310	1,540	1,950	2,200	1,780	895	370
5	231	380	2,120	348	550	325	1,660	1,700	2,500	1,900	895	349
6	231	394	1,880	338	522	452	1,500	1,540	2,650	1,950	840	332
7	218	424	1,520	322	487	504	1,320	1,500	2,500	1,780	785	319
8	229	428	1,250	316	465	469	1,120	1,700	2,250	1,540	785	307
9	231	432	1,060	303	448	413	1,030	1,950	2,100	1,420	785	294
10	234	478	910	291	436	428	1,060	2,050	1,950	1,500	785	310
11	237	513	793	294	417	536	1,120	1,950	1,780	1,540	785	316
12	265	491	737	294	398	522	1,090	1,740	1,620	1,540	785	329
13	325	478	1,090	291	383	317	1,000	1,500	1,660	1,460	785	329
14	355	509	2,880	288	373	124	950	1,390	1,740	1,390	785	300
15	362	617	3,630	282	352	134	912	1,460	1,780	1,390	785	319
16	362	662	2,680	297	355	142	895	1,600	1,780	1,460	785	323
17	355	627	1,900	491	348	149	895	1,704	1,780	1,460	732	316
18	342	597	1,560	386	338	164	1,060	1,660	1,860	1,320	630	300
19	332	545	1,290	1,290	322	196	1,250	1,600	2,150	1,150	588	291
20	342	509	1,090	1,290	313	229	1,360	2,050	2,750	1,060	578	285
21	338	461	940	1,150	300	256	1,360	2,650	2,860	978	531	273
22	274	436	851	1,290	297	270	1,320	3,550	2,860	950	393	267
23	274	409	737	2,940	316	285	1,360	3,790	2,650	912	396	259
24	282	398	673	2,260	310	307	1,420	3,550	2,450	895	396	245
25	256	390	617	1,880	348	323	1,580	3,190	2,350	895	400	234
26	248	383	569	1,560	342	332	1,780	3,550	2,400	895	400	229
27	265	373	536	1,250	332	356	2,200	3,310	2,450	895	400	216
28	279	362	518	1,090	303	381	2,650	5,090	2,250	895	396	213
29	268	345	513	940	.....	422	2,860	4,280	1,950	895	400	203
30	248	352	482	822	.....	537	2,750	3,430	1,740	813	400	200
31	256	.....	453	764	.....	732	.....	2,550	.....	785	400	.....
1919–20.												
1	200	39	570	820	1,120	323	477	1,080	820	1,380	398	520
2	195	49	499	765	975	320	481	1,080	820	1,500	364	524
3	193	49	422	686	850	317	445	1,150	792	1,460	305	520
4	188	42	378	598	765	332	449	1,040	820	1,340	305	516
5	164	34	348	552	712	329	516	820	839	1,220	382	516
6	129	48	329	511	661	320	524	1,010	880	1,120	437	565
7	127	47	311	469	661	299	524	1,540	975	1,010	453	607
8	125	47	296	445	686	296	503	2,120	1,220	940	477	593
9	122	49	282	403	598	302	453	2,530	1,300	880	481	529
10	125	35	282	385	560	306	441	2,580	1,340	850	473	465
11	127	33	262	361	529	302	437	2,390	1,300	850	477	361
12	129	33	240	351	511	332	461	2,120	1,260	850	477	335
13	139	33	222	338	481	469	507	1,940	1,220	880	473	332
14	149	34	212	351	473	765	524	1,940	1,300	850	473	326
15	151	35	205	371	457	850	542	1,900	1,540	813	473	342
16	155	44	214	453	441	820	542	1,900	1,700	792	473	358
17	157	72	302	1,010	422	738	565	1,980	1,660	712	492	382
18	157	542	636	1,860	410	636	820	2,160	1,660	661	516	382
19	157	1,180	820	2,580	429	593	910	2,030	1,540	661	520	385
20	155	1,300	820	2,160	437	552	910	1,860	1,460	661	524	395
21	155	1,180	765	1,660	422	534	940	1,700	1,420	603	529	407
22	159	1,080	792	1,300	410	534	940	1,500	1,460	565	524	418
23	161	1,120	910	1,040	395	556	940	1,300	1,460	570	520	445
24	164	1,180	1,160	880	385	565	940	1,150	1,340	565	520	449
25	166	1,150	1,540	880	364	561	940	1,180	1,220	570	520	469
26	168	1,010	1,420	792	351	547	940	1,250	1,080	494	520	486
27	166	820	1,220	765	358	538	910	1,180	940	426	516	570
28	161	738	1,180	820	338	507	850	1,080	940	403	520	850
29	104	661	1,120	1,150	329	481	910	975	1,080	395	520	975
30	44	612	1,010	1,300	.....	481	1,080	880	1,220	403	516	1,010
31	53	.....	940	1,220	.....	481	.....	820	.....	399	520	.....

Monthly discharge of Cle Elum River near Roslyn, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 202 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
1918–19.									
October	362	206	275	16,900	+13,600	30,500	496	2.46	2.84
November	662	262	438	26,100	+ 4,490	30,600	514	2.54	2.83
December	3,630	355	1,190	73,200	+ 180	73,400	1,190	5.89	6.79
January	2,260	282	760	46,800	+ 990	47,800	777	3.85	4.44
February	688	297	411	22,800	− 1,370	21,400	385	1.91	1.99
March	732	124	339	20,800	+ 1,210	22,000	358	1.77	2.04
April	2,860	853	1,410	83,800	+ 3,970	87,800	1,480	7.33	8.18
May	5,090	1,390	2,440	150,000	− 410	150,000	2,440	12.1	13.95
June	2,860	1,620	2,160	128,000	− 1,420	127,000	2,130	10.5	11.71
July	1,950	785	1,300	80,000	− 4,390	75,600	1,230	6.09	7.02
August	895	393	648	39,800	−12,600	27,200	442	2.19	2.52
September	400	200	297	17,700	− 5,170	12,500	210	1.04	1.16
The year	5,090	124	976	706,000	− 920	706,000	975	4.83	65.47
1919–20.									
October	200	44	147	9,010	+ 1,650	10,100	164	.812	.94
November	1,300	33	443	26,400	+18,900	45,300	761	3.77	4.21
December	1,540	205	635	39,100	+ 840	39,900	649	3.21	3.70
January	2,580	338	880	54,100	+ 180	54,300	883	4.37	5.04
February	1,120	329	534	30,700	− 1,930	28,800	501	2.48	2.68
March	850	296	483	29,700	+ 390	30,100	490	2.43	2.80
April	1,060	437	681	40,500	− 1,700	38,800	652	3.23	3.60
May	2,580	820	1,550	95,600	+ 1,060	96,700	1,570	7.77	8.96
June	1,700	792	1,220	72,600	+ 6,870	79,500	1,340	6.63	7.40
July	1,500	395	801	49,200	− 3,660	45,500	740	3.66	4.22
August	529	305	474	29,200	−11,300	17,900	291	1.44	1.66
September	1,010	326	501	29,800	+ 3,190	33,000	555	2.75	3.07
The year	2,580	33	697	506,000	+13,900	520,000	716	3.54	48.28

NACHES RIVER BELOW TIETON RIVER, NEAR NACHES, WASH.

LOCATION.—In sec. 35, T. 15 N., R. 16 E., 600 feet below Tieton River, 500 feet above intake of Wapatox canal, and 5 miles northwest of Naches, Yakima County.

DRAINAGE AREA.—942 square miles (measured on topographic maps and Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—August 4 to October 28, 1905; March 16, 1909, to October 31, 1912; May 10 to September 30, 1915; April 13, 1916, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank, installed December 7, 1916; inspected by Paul Mitchel and S. T. Asberry. Previous gages as follows: August 4 to October 28, 1905, vertical staff nailed to stump on left bank at nearly same site as present gage but at different datum; March 16, 1909, to December 7, 1916, inclined and vertical staff gage in two sections, on left bank, 8 feet above cable; April 3, 1916, vertical staff installed to supplement inclined and vertical sections.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

CHANNEL AND CONTROL.—Bed of stream composed of small boulders and gravel; shifts at extremely high water. One channel except at extremely high stages.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 9.7 feet at 11 a. m. January 23 (discharge, 11,100 second-feet); minimum stage, from recorder, 1.94 feet from 9 to 11 a. m. September 24 (discharge, 312 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 4.80 feet at 6 a. m. May 9 (discharge, 2,860 second-feet); minimum stage from recorder, 1.70 feet at 3 p. m. October 19 (discharge, 214 second-feet).

1905; 1909–1920: Maximum stage recorded, 8.9 feet at 8 a. m. November 24, 1909 (discharge, 18,800 second-feet); minimum stage recorded, 1.62 feet at 5 p. m. November 20, 1917, and 1.67 feet September 23, 1918 (discharge, 202 second-feet).

ICE.—Stage-discharge relation seriously affected by ice during severe winters; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Above all important diversions except Selah Valley and Tieton canals. Mean discharge of Selah Valley canal for July, August, and September, 1920, was respectively 113, 114, and 105 second-feet. For discharge of Tieton canal see page 227.

REGULATION.—Flow partly controlled by storage and release of water at Bumping Lake. See record for Bumping Lake and table of monthly discharge for Bumping River near Nile, Wash.

ACCURACY.—Stage-discharge relation changed October 1–28, 1918; affected by ice November 28 to December 26, 1919, and January 4–13, 1920; possibly affected during periods of low stage by backwater from wing dam at intake of Wapatox canal. Effect of backwater probably slight. Rating curve well defined. Water-stage recorder inspected daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records excellent December, 1918, to July, 1919, and April to June, 1920; good October and November, 1918, August to October, 1919, January to March and July to September, 1920; fair November and December, 1919.

COOPERATION.—Maintained by United States Reclamation Service in cooperation with Pacific Power & Light Co. United States Reclamation Service made discharge measurements and computed discharge.

Discharge measurements of Naches River below Tieton River, near Naches, Wash., during the years ending Sept. 30, 1919 and 1920,

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Mar. 17	F. E. Moxley	2.98	982	Jan. 9	F. E. Moxley	[a] 2.65	685
July 10	do	4.23	2,090	Feb. 14	do	2.94	931
21	do	3.14	1,090	Apr. 12	do	2.73	790
28	do	2.51	636	20	do	2.82	832
Aug. 19	do	2.46	591	May 10	do	4.56	2,550
Sept. 4	do	2.25	448	June 7	do	3.66	1,540
Oct. 7	Moxley and Taylor	2.08	387	July 21	do	2.06	394
Dec. 31	F. E. Moxley	2.87	877				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Naches River, below Tieton River, near Naches, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	442	640	502	661	1,700	970	2,320	3,960	3,150	2,080	551	508
2	429	601	551	764	1,600	985	2,560	3,740	2,950	2,020	502	490
3	481	576	910	866	1,500	985	2,820	3,430	3,080	2,020	456	485
4	443	563	1,340	800	1,550	977	3,150	3,080	3,360	2,140	449	473
5	446	545	1,300	822	1,460	985	3,080	2,760	3,660	2,380	479	479
6	516	502	1,020	873	1,420	962	2,690	2,560	3,880	2,320	526	508
7	530	461	829	764	1,340	932	2,380	2,560	3,580	1,970	595	514
8	517	444	715	764	1,300	925	2,200	2,690	3,290	1,750	576	508
9	477	439	694	873	1,340	910	2,140	2,950	3,080	1,750	569	539
10	454	450	621	873	1,300	910	2,200	2,950	2,820	2,020	582	502
11	483	502	601	925	1,260	910	2,260	2,760	2,560	2,140	601	539
12	547	422	601	836	1,220	910	2,140	2,560	2,320	2,020	621	601
13	551	456	701	800	1,220	903	2,080	2,380	2,260	1,750	614	569
14	526	514	1,420	778	1,220	880	1,920	2,320	2,260	1,600	601	514
15	501	634	1,750	729	1,060	880	1,860	2,380	2,260	1,650	576	461
16	545	614	1,380	694	1,060	873	1,750	2,440	2,320	1,750	582	439
17	603	563	1,140	1,260	1,060	873	1,860	2,380	2,320	1,700	614	433
18	546	551	1,140	3,360	1,020	977	2,500	2,260	2,440	1,380	601	433
19	499	526	1,180	3,810	1,060	985	2,620	2,320	2,820	1,180	595	433
20	468	508	1,140	2,820	1,020	985	2,620	2,820	3,440	1,100	595	417
21	438	496	970	2,380	985	1,060	2,560	3,360	3,810	1,060	614	375
22	436	490	829	4,280	977	1,140	2,500	4,600	3,580	1,060	582	340
23	418	439	798	10,300	970	1,180	2,500	4,600	3,440	1,020	551	340
24	411	385	687	7,220	940	1,220	2,690	4,120	3,220	977	539	322
25	435	401	681	5,240	970	1,220	2,760	3,960	3,080	948	539	326
26	433	390	667	4,120	940	1,220	2,760	4,760	3,290	829	551	326
27	435	365	750	3,360	947	1,300	3,150	5,560	3,080	667	551	331
28	1,100	375	1,020	2,880	970	1,380	3,810	5,560	2,820	601	526	350
29	903	479	935	2,440	.....	1,500	3,810	5,400	2,440	601	508	350
30	771	502	925	2,140	.....	1,860	3,880	4,760	2,140	627	502	365
31	674	.....	708	1,920	.....	2,260	.....	3,810	.....	576	508	.....
1919–20.												
1	444	401	472	786	1,420	778	687	1,260	1,220	1,800	526	417
2	508	545	450	701	1,340	786	715	1,140	1,220	1,300	490	390
3	526	551	430	694	1,260	764	681	1,100	1,550	1,600	514	370
4	502	532	410	701	1,180	786	640	1,060	1,600	1,500	485	350
5	450	490	395	701	1,220	778	925	1,140	1,750	1,340	456	340
6	412	439	382	694	1,220	771	985	1,300	1,550	1,140	490	340
7	380	417	375	694	1,220	661	858	1,700	1,550	1,060	485	340
8	365	390	365	694	1,100	627	807	2,320	1,750	1,060	479	331
9	355	390	362	687	1,020	640	681	2,760	1,550	1,020	467	345
10	326	365	360	681	1,020	621	627	2,560	1,420	1,020	467	350
11	335	360	355	674	1,020	595	667	2,620	1,340	948	496	380
12	350	335	352	661	1,020	595	764	2,440	1,340	843	490	444
13	360	322	350	647	948	1,140	880	2,200	1,300	807	450	531
14	345	326	372	640	955	1,260	836	1,970	1,550	866	433	822
15	331	433	420	681	932	948	786	1,970	2,440	858	439	764
16	290	985	532	866	903	910	736	2,200	2,380	858	444	667
17	252	1,100	661	1,460	888	858	681	2,500	2,260	829	433	608
18	229	948	800	1,340	888	858	694	2,500	2,200	563	401	569
19	225	910	925	1,420	873	822	800	2,200	1,970	508	370	545
20	233	836	985	1,180	858	929	836	2,020	1,860	439	345	508
21	252	764	1,020	1,020	822	903	764	1,860	1,920	375	345	526
22	340	757	1,100	932	743	883	687	1,650	2,260	412	335	681
23	365	771	1,100	760	757	863	627	1,460	2,020	551	326	786
24	360	778	1,180	822	778	843	601	1,380	1,650	667	326	708
25	326	722	1,140	1,260	771	823	661	1,300	1,420	640	326	701
26	326	681	1,140	1,700	793	803	814	1,380	1,300	608	331	708
27	317	514	1,000	1,420	814	783	1,260	1,380	1,140	582	350	778
28	317	590	1,030	1,600	743	764	1,600	1,380	1,260	608	417	800
29	331	522	1,020	1,970	750	715	1,600	1,380	1,460	627	439	694
30	326	495	948	1,700	.....	708	1,460	1,340	1,650	601	444	674
31	326	.....	880	1,600	.....	681	.....	1,340	.....	557	439	.....

Monthly discharge of Naches River below Tieton River, near Naches, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	1,100	411	531	32,600
November	640	365	494	29,400
December	1,750	502	921	56,600
January	10,300	661	2,270	140,000
February	1,700	940	1,190	66,300
March	2,200	873	1,100	67,600
April	3,800	1,750	2,590	154,000
May	5,500	2,260	3,410	210,000
June	3,880	2,140	2,960	176,000
July	2,380	576	1,470	90,000
August	621	449	557	34,200
September	601	322	442	26,300
The year	10,300	322	1,500	1,080,000
1919–20.				
October	526	225	349	21,500
November	1,100	322	589	35,000
December	1,130	350	688	42,300
January	1,970	640	1,010	62,100
February	1,420	743	974	56,000
March	1,260	595	800	49,200
April	1,600	601	845	50,300
May	2,700	1,060	1,770	109,000
June	2,440	1,140	1,660	98,800
July	1,800	375	874	53,700
August	526	326	427	26,300
September	822	331	543	32,300
The year	2,700	225	877	637,000

BUMPING LAKE NEAR NILE, WASH.

LOCATION.—At storage dam at outlet, 12 miles above American River and 19 miles west of Nile, Yakima County.

DRAINAGE AREA.—68 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 27 to November 22, 1909; November 3, 1910, to September 30, 1920.

GAGE.—Vertical staff on gate tower; read by J. H. Nelson. Datum, mean sea level. Prior to November 3, 1910, vertical staff on north shore of lake, one-fourth mile above outlet, at different datum.

EXTREMES OF STORAGE.—Maximum stage recorded during year ending September 30, 1919, 3,429.50 feet at 6.35 a. m. May 31 (storage, 38,400 acre-feet); minimum stage recorded, 3,392.51 feet October 3 (storage, 2,220 acre-feet).

Maximum stage recorded during year ending September 30, 1920, 3,430.28 feet at noon, June 15 (storage, 39,470 acre-feet); minimum stage recorded, 3,392.51 feet on November 2 (storage, 2,220 acre-feet).

1911–1920: Maximum stage recorded on June 15, 1920; minimum stage recorded, 3,391.00 feet February 12–15, 1916 (storage, 1,260 acre-feet).

STORAGE.—Capacity of reservoir at crest of spillway, 33,700 acre-feet. Elevation of gate sill, 3,389 feet, and of spillway crest, 3,426 feet. Storage or release each month used for determining discharge without storage for gaging station below dam.

ACCURACY.—Gage read twice daily to hundredths. Records excellent.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Daily storage, in acre-feet, of Bumping Lake near Nile, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	2,290	5,760	10,450	18,640	30,170	20,450	9,640	15,370	37,600	37,540	36,790	20,800
2	2,260	5,930	10,330	18,280	29,990	20,030	9,480	16,200	37,600	37,470	36,790	20,240
3	2,220	6,160	10,860	17,800	29,750	19,740	9,360	16,890	37,600	37,400	36,790	19,530
4	2,270	6,570	11,590	17,650	29,500	19,500	9,270	17,230	37,740	37,330	36,790	18,840
5	2,320	6,760	12,160	17,210	29,130	19,220	9,210	17,680	37,740	37,400	36,680	18,310
6	2,350	6,900	12,760	16,990	28,910	18,800	9,520	18,130	37,810	37,470	36,490	17,700
7	2,350	7,030	13,310	16,610	28,760	18,360	9,820	18,330	37,740	37,400	36,180	17,130
8	2,350	7,150	14,040	16,180	28,480	17,900	9,780	18,600	37,600	37,470	35,780	16,520
9	2,350	7,360	14,300	15,740	28,040	17,460	9,740	18,840	37,540	37,540	35,380	15,940
10	2,390	7,610	14,530	15,370	27,760	17,090	9,780	19,080	37,440	37,540	34,850	15,370
11	2,420	7,920	14,620	14,990	27,320	16,660	9,820	19,500	37,400	37,540	34,360	14,760
12	2,420	8,070	14,570	14,670	27,080	16,220	9,820	19,920	37,330	37,470	33,800	14,210
13	2,420	8,280	14,870	14,360	26,840	15,840	9,820	20,270	37,330	37,400	33,280	13,620
14	2,420	8,590	15,840	14,070	26,570	15,480	9,740	20,520	37,330	37,330	32,600	13,000
15	2,420	9,000	16,960	13,800	26,170	15,070	9,740	20,720	37,260	37,330	31,970	12,520
16	2,430	9,280	17,520	13,490	25,700	14,620	9,740	21,070	37,330	37,330	31,330	11,970
17	2,550	9,500	18,160	13,670	25,430	14,240	9,800	21,500	37,400	37,330	30,700	11,420
18	2,520	9,590	18,430	15,180	24,970	13,870	9,960	22,000	37,470	37,260	30,140	10,960
19	2,520	9,790	18,740	16,860	24,280	13,600	10,040	22,460	37,470	37,200	29,430	10,410
20	2,520	9,990	19,080	17,720	23,720	13,220	10,210	23,040	37,540	37,130	28,760	9,930
21	2,430	10,190	19,360	18,190	23,410	12,870	10,440	24,000	37,600	37,130	28,040	9,420
22	2,420	10,390	19,620	19,500	23,150	12,570	10,550	25,720	37,670	37,130	27,340	8,920
23	2,420	10,650	19,840	24,620	22,740	12,180	10,780	27,040	37,740	37,060	26,740	8,410
24	2,420	10,780	20,080	27,520	22,570	11,800	11,170	28,330	37,740	37,060	26,100	8,040
25	2,580	10,820	20,180	28,520	22,020	11,480	11,480	30,040	37,740	36,990	25,400	7,610
26	3,180	10,860	20,290	29,590	21,390	11,250	11,990	31,800	37,740	36,990	24,660	7,210
27	3,580	10,910	20,360	30,170	21,100	11,000	12,520	34,100	37,740	36,920	24,020	6,880
28	4,360	10,960	20,030	30,390	20,750	10,740	13,110	36,360	37,740	36,860	23,410	6,390
29	4,950	10,820	19,710	30,490	.....	10,440	13,670	37,810	37,670	36,860	22,710	5,930
30	5,280	10,650	19,390	30,330	.....	10,120	14,570	38,290	37,600	36,860	22,080	5,340
31	5,530	.....	19,030	30,270	.....	9,800	.....	38,360	.....	36,790	21,450	.....
1919-20.												
1	4,850	2,260	11,530	19,720	27,930	26,480	23,390	26,710	30,880	39,140	32,600	15,720
2	4,470	2,220	11,510	19,960	28,540	26,270	23,330	27,100	30,530	39,250	31,980	15,300
3	4,230	2,260	11,230	20,070	29,030	26,050	23,270	27,480	29,980	39,260	31,370	14,700
4	3,990	2,300	10,940	19,960	29,460	25,710	23,240	27,650	29,910	39,180	30,800	14,220
5	3,650	2,950	10,530	19,750	29,670	25,380	23,230	27,840	30,370	39,060	30,260	13,670
6	3,330	3,450	10,090	19,550	29,940	25,020	23,230	28,000	31,200	38,990	29,680	13,100
7	3,150	3,560	9,640	19,330	30,010	24,580	23,290	28,400	32,420	38,930	29,130	12,590
8	3,060	3,600	9,990	19,040	29,960	24,220	23,390	29,390	33,670	38,920	28,580	12,100
9	2,910	3,630	8,980	18,780	29,920	23,880	23,540	30,590	34,650	38,930	28,010	11,610
10	2,780	3,660	8,730	18,430	29,820	23,680	23,670	31,320	35,430	38,900	27,400	11,210
11	2,560	3,690	8,340	18,060	29,720	23,510	23,670	31,590	36,290	38,840	26,800	10,820
12	2,520	3,780	7,990	17,700	29,700	23,390	23,700	31,570	37,170	38,730	26,110	10,480
13	2,450	3,860	7,680	17,720	29,610	23,340	23,700	31,570	38,010	38,730	25,470	10,240
14	2,420	3,920	7,330	17,840	29,410	23,490	23,920	31,570	39,010	38,600	24,900	10,540
15	2,390	4,140	6,870	18,070	29,230	23,740	24,150	31,570	39,470	38,520	24,250	10,640
16	2,390	5,430	6,690	18,390	29,060	23,900	24,320	31,550	39,400	38,140	23,660	10,430
17	3,100	6,370	6,890	18,920	28,870	24,000	24,470	31,680	39,270	38,030	23,100	10,150
18	3,230	7,100	7,260	19,720	28,680	24,070	24,560	32,440	39,070	38,150	22,560	9,860
19	3,260	7,760	8,350	20,670	28,540	24,010	24,690	32,970	38,860	38,370	22,020	9,620
20	3,330	8,280	9,210	21,030	28,340	24,000	24,840	33,440	38,920	38,640	21,480	9,430
21	3,130	8,690	10,070	21,320	28,190	23,890	24,940	33,700	38,990	38,710	20,940	9,350
22	2,840	8,960	10,790	21,620	28,070	23,740	25,040	33,900	39,030	38,600	20,420	9,290
23	2,610	9,410	11,650	21,810	27,890	23,650	25,160	34,100	39,040	38,200	19,870	9,280
24	2,470	9,800	13,370	22,070	27,690	23,620	25,300	34,190	38,940	37,730	19,380	9,340
25	2,390	10,210	14,940	22,470	27,490	23,550	25,470	34,220	38,660	37,130	18,910	9,390
26	2,350	10,550	16,050	22,890	27,280	23,550	25,590	33,770	38,380	36,330	18,410	9,350
27	2,320	11,020	16,910	23,520	27,110	23,490	25,720	33,310	38,410	35,700	17,920	9,380
28	2,290	11,260	17,410	24,340	26,950	23,440	25,860	32,910	38,480	35,090	17,420	9,630
29	2,290	11,450	17,750	25,210	26,760	23,380	26,100	32,460	38,810	34,500	16,980	9,740
30	2,290	11,510	18,090	26,340	.....	23,380	26,440	31,960	38,960	33,900	16,580	9,850
31	2,290	.....	18,910	27,220	.....	23,400	.....	31,310	.....	33,290	16,190	.....

BUMPING RIVER NEAR NILE, WASH.

LOCATION.—A quarter of a mile below spillway of Bumping Lake dam, half a mile below outlet conduit through storage dam, 11½ miles above American River, and 19 miles west of Nile, Yakima County.

DRAINAGE AREA.—68 square miles (measured on topographic maps).

RECORDS AVAILABLE.—June 13 to July 31, 1906; April 27, 1909, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder installed June 17, 1913, on left bank, one-fourth mile below spillway of storage dam; inspected daily by J. H. Nelson. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable about 40 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and of large angular rocks; shifts at extremely high water. Riffle control 60 feet below gage. Stage of zero flow, about gage height 0.6 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 4.4 feet at 4 p. m. May 29 (discharge, 1,280 second-feet); minimum discharge, 2 second-feet, November 18–23.

Maximum stage during year ending September 30, 1920, from recorder, 3.82 feet at 9.45 a. m. June 15 (discharge, 846 second-feet); minimum discharge, 2 second-feet, October 18 and 19.

1906 and 1909–1920: Maximum stage recorded 9.33 feet at 5 p. m. December 29, 1917 (discharge, 5,180 second-feet); practically no flow when gates in outlet conduit are closed.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—Flow partly controlled by storage and release of water at Bumping Lake reservoir. Monthly discharge without storage determined from records of stage at reservoir.

ACCURACY.—Stage-discharge relation changed gradually during the period June 1–17, 1920. Rating curve used prior to change well defined below 1,500 second-feet; curve used after change, well defined, between 150 and 1,000 second-feet; poorly defined below 120 second-feet. Water-stage recorder inspected daily. Daily discharge ascertained by applying daily mean gage height to rating table, or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals; shifting-control method used June 2–16, 1920. Records excellent except for the periods October to December, 1918 and 1919, and April and June to July, 1920, for which they are good.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Bumping River near Nile, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
June 25	F. E. Moxley	3.92	905	June 16	F. E. Moxley	3.60	670
25	do	4.01	972	17	do	3.87	803
26	do	4.15	1,090	Sept. 30	do	2.43	146
Sept. 26	Moxley and Taylor	2.92	315				

Daily discharge, in second-feet, of Bumping River near Nile, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.												
1	51	3	188	303	375	327	243	188	744	597	157	398
2	51	3	131	299	380	327	246	256	705	584	151	403
3	51	3	73	299	380	327	246	322	764	603	142	403
4	49	3	70	295	380	322	250	322	859	647	169	398
5	55	3	70	295	380	318	250	322	970	698	259	403
6	57	3	68	291	375	314	253	322	1,010	660	269	403
7	59	3	67	287	370	310	250	322	935	572	299	398
8	59	3	67	284	370	306	250	327	832	512	318	394
9	59	3	67	280	365	303	250	327	805	536	356	389
10	59	6	67	276	356	299	253	335	711	597	394	394
11	58	5	67	273	356	295	253	335	634	615	403	403
12	59	4	67	269	356	291	250	335	560	554	419	398
13	63	4	75	269	352	287	246	339	578	478	419	403
14	61	4	88	266	348	284	243	339	584	445	419	365
15	59	4	84	263	343	276	240	276	609	445	424	352
16	63	3	83	263	339	273	237	226	609	455	419	348
17	67	3	81	273	331	269	237	226	634	403	445	335
18	67	2	81	291	322	269	240	226	685	343	445	339
19	67	2	81	299	327	266	243	223	866	295	439	343
20	66	2	81	299	327	263	246	223	1,040	269	439	343
21	64	2	81	303	322	259	246	231	1,040	259	429	339
22	63	2	80	343	327	256	246	243	1,040	243	419	310
23	61	7	80	380	327	259	188	256	1,040	237	413	276
24	63	67	80	389	331	259	151	269	1,040	226	408	269
25	42	59	80	394	327	256	151	237	935	214	403	259
26	3	59	131	389	322	256	153	209	900	191	429	253
27	6	59	299	384	314	253	157	220	784	186	429	287
28	5	131	299	380	314	250	166	450	771	178	419	322
29	4	188	295	380	.....	246	181	1,200	647	174	419	322
30	3	188	295	380	.....	243	183	1,120	584	166	403	306
31	3	.....	291	375	.....	243	.....	900	.....	160	408	.....
1919–20.												
1	256	64	96	7	67	223	112	64	554	421	391	319
2	237	73	186	73	65	223	103	65	705	448	386	319
3	223	83	276	189	65	223	103	65	615	421	371	315
4	201	78	310	228	139	223	103	65	339	391	362	315
5	176	41	306	231	234	223	101	65	146	323	353	311
6	155	41	303	231	234	223	64	65	21	265	353	315
7	138	41	295	250	234	223	30	67	21	252	367	315
8	116	41	284	306	234	223	30	70	21	248	362	323
9	100	41	284	306	234	223	29	72	21	245	367	323
10	88	41	276	334	234	220	45	262	21	236	367	315
11	83	30	259	419	234	220	61	429	21	230	371	315
12	78	21	202	258	234	220	42	506	22	223	371	319
13	72	21	146	64	234	223	18	506	24	223	367	328
14	68	21	146	63	234	220	8	501	189	223	367	340
15	64	26	146	61	231	220	8	501	731	220	362	336
16	35	26	146	61	228	217	8	506	685	220	353	328
17	3	6	146	59	226	214	34	378	719	85	344	311
18	2	4	116	58	223	214	63	287	661	23	328	296
19	2	4	54	58	223	211	65	287	483	23	308	289
20	28	4	31	67	220	211	67	287	465	40	304	271
21	103	4	5	67	217	197	68	291	501	139	300	258
22	88	4	5	65	214	176	70	287	568	234	300	258
23	84	4	6	68	214	174	72	287	519	400	293	239
24	75	4	12	157	226	176	70	287	465	416	300	230
25	67	4	9	231	223	174	72	443	443	410	304	230
26	67	4	9	162	223	171	75	566	315	410	315	226
27	64	4	9	65	223	171	76	560	265	405	323	192
28	61	37	8	67	223	155	78	554	265	405	323	144
29	58	96	8	68	220	131	80	548	271	400	323	144
30	55	96	7	68	.....	127	80	603	332	395	319	148
31	55	.....	7	68	.....	127	.....	609	.....	395	315	.....

NOTE.—No gage-height record June 21–23, 1919; discharge interpolated.

Monthly discharge of Bumping River near Nile, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 68 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
1918–19.									
October	67	3	48.3	2,970	+3,310	6,280	102	1.50	1.73
November	188	2	27.6	1,640	+5,120	6,760	114	1.68	1.87
December	299	67	118	7,270	+8,380	15,600	254	3.74	4.31
January	394	263	315	19,400	+11,200	30,600	498	7.32	8.44
February	380	314	347	19,300	−9,520	9,780	176	2.59	2.70
March	327	243	281	17,300	−11,000	6,300	102	1.50	1.73
April	253	151	225	13,400	+4,770	18,200	306	4.50	5.02
May	1,200	209	359	22,100	+23,800	45,900	746	11.0	12.68
June	1,040	560	797	47,400	−760	46,600	783	11.5	12.83
July	698	160	405	24,900	−810	24,100	392	5.76	6.64
August	445	142	366	22,500	−15,300	7,200	117	1.72	1.98
September	403	253	352	20,900	−16,100	4,800	80.7	1.19	1.33
The year	1,200	2	303	219,000	+3,090	222,000	307	4.51	61.26
1919–20.									
October	256	2	93.6	5,760	−3,050	2,710	44.1	.649	.75
November	96	4	32.1	1,910	+9,220	11,100	187	2.75	3.07
December	310	5	132	8,120	+7,400	15,500	252	3.71	4.28
January	419	7	142	8,750	+8,310	17,100	278	4.09	4.72
February	234	65	207	11,900	−460	11,400	198	2.91	3.14
March	223	127	199	12,200	−3,360	8,840	144	2.12	2.44
April	112	8	61.2	3,640	+3,040	6,680	112	1.65	1.84
May	609	64	325	20,000	+4,870	24,900	405	5.96	6.87
June	731	21	347	20,600	+7,650	28,200	474	6.97	7.78
July	448	23	283	17,400	−5,670	11,700	190	2.79	3.22
August	391	293	341	21,000	−17,100	3,900	63.4	.932	1.07
September	340	144	279	16,600	−6,340	10,300	173	2.54	2.83
The year	731	2	204	148,000	+4,510	152,000	210	3.09	42.01

TIETON RIVER AT RIMROCK, WASH.[1]

LOCATION.—On highway bridge at Rimrock, 100 feet above wild Cat Creek, 2 miles below junction of forks of river, 7 miles above headworks of Tieton canal, and 22 miles southwest of Naches, Yakima County.

DRAINAGE AREA.—187 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 28 to November 24, 1908; March 21, 1909, to September 30, 1914; fragmentary. October 1, 1918, to March 31, 1919.

GAGE.—Vertical staff on left abutment of highway bridge; installed June 15, 1918. Gage used 1908–1914 was a vertical staff on left bank at McAllister meadows, one-half mile above mouth of Wild Cat Creek.

DISCHARGE MEASUREMENTS.—Made from highway bridge at gage, by wading, or from cable one-half mile below Wild Cat Creek.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1, 1918, to March 31 1919, 6.40 feet at 7.30 a. m. January 23 (discharge, 2,770 second-feet); minimum daily discharge, 166 second-feet several days in October, November, and December.

1908–1912; 1918–1919: Maximum stage recorded, 6.2 feet at 3.30 p. m. November 23, 1909 (discharge, 4,200 second-feet); minimum stage recorded 1.2 feet January 12, 1910 (discharge, 127 second-feet).

[1] Previously called Tieton River at McAllister Meadows, near Naches, Wash.

ICE.—Stage-discharge relation affected by ice during severe winters. Flow estimated from observer's notes, discharge measurements, and weather records.

DIVERSIONS.—None.

REGULATION.—Flow slightly regulated by storage and release of water of Clear Creek reservoir about 8 miles above gage.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records fair.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Tieton River at Rimrock, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Feb. 7-8	Bishop and Moxley	1.83	388	Jan. 10	Moxley and Mayo	1.42	228
Apr. 23	F. E. Moxley	2.65	602	Feb. 24	F. E. Moxley	1.49	258
June 6	do	3.65	1,150	Mar. 11	do	.62	100
11	do	2.95	808	May 6	do	2.16	459
July 9	do	2.79	706	June 2	do	2.08	428
22	do	2.44	538	11	do	2.72	668
Aug. 14	do	1.79	330	22	do	3.39	989
Sept. 3	do	1.79	336	Sept. 25	Ball and Parker	1.78	336
Oct. 6	Taylor and Moxley	1.20	188				
Dec. 29	F. E. Moxley	1.75	325				

Daily discharge, in second-feet, of Tieton River at Rimrock, Wash., for the period Oct. 1, 1918, to Mar. 31, 1919.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1918-19.							1918-19.						
1	280	307	166	229	496	229	16	254	229	206	638	280	206
2	254	280	185	254	426	254	17	254	229	361	907	280	206
3	280	280	185	254	394	229	18	229	206	361	1,460	254	229
4	254	254	185	185	394	229	19	229	206	385	1,180	254	229
5	307	254	166	185	364	229	20	206	206	385	855	254	229
6	280	229	166	185	364	229	21	185	206	382	1,020	254	229
7	254	206	364	185	335	206	22	185	185	379	1,020	254	241
8	229	185	355	185	335	217	23	166	185	376	2,530	241	254
9	206	185	358	185	349	206	24	166	185	373	1,570	229	254
10	185	185	355	206	321	206	25	166	166	370	1,260	241	254
11	229	185	352	229	307	206	26	166	185	370	1,070	241	254
12	335	185	355	206	307	206	27	166	166	367	987	229	280
13	280	166	166	229	307	206	28	426	166	367	730	229	321
14	254	206	185	638	280	206	29	364	185	370	638	.....	335
15	254	229	206	638	280	206	30	307	185	373	574	.....	335
							31	307	.....	301	554	.....	426

Monthly discharge of Tieton River at Rimrock, Wash., for the period Oct. 1, 1918, to Mar. 31, 1919.

[Drainage area, 187 square miles]

Month.	Discharge in second-feet.			
	Maximum.	Minimum.	Mean.	Run-off in acre-feet.
October	426	166	247	15,200
November	307	166	208	12,300
December	385	166	306	18,800
January	2,530	185	677	41,600
February	496	229	304	16,900
March	426	206	243	15,000

TIETON RIVER AT HEADWORKS OF TIETON CANAL, NEAR NACHES, WASH.

LOCATION.—In sec. 30, T. 14 N., R. 15 E. (unsurveyed), below intake of Tieton canal, 15 miles above mouth, and 16 miles southwest of Naches, Yakima County.

DRAINAGE AREA.—240 square miles (measured on topographic maps).

RECORDS AVAILABLE.—April 17 to September 17, 1906 (fragmentary gage-height record); July 5, 1907, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank about 1,000 feet below intake of Tieton canal; Friez water-stage recorder at same site used July 8, 1911, to 1918. For description of previous gages see Water-Supply Paper 442. Gage inspected by W. E. Wilson and G. G. Willis.

DISCHARGE MEASUREMENTS.—Made from cable about 500 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders; shifts slightly at high water; gradient steep. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 5.15 feet from 11 p. m. to midnight May 27 (discharge, 1,940 second-feet); minimum stage, from recorder, 1.85 feet at 2 p. m. September 13 (discharge, 17 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 4.03 feet at 9 p. m. January 28 (discharge, 850 second-feet); minimum stage, from recorder, 1.55 feet at 6.30 p. m. August 26 (discharge, 5 second-feet).

1907–1920: Maximum stage recorded 7.15 feet at 4 a. m. November 24, 1909 (discharge, 5,400 second-feet); minimum stage recorded that of August 26, 1920

ICE.—Stage-discharge relation affected by ice during severe winters; flow estimated from observer's notes, discharge measurements, and weather records.

DIVERSIONS.—Tieton canal has diverted water above the gage since 1910. Diversions through canal added to mean monthly flow to determine natural monthly discharge.

REGULATION.—Flow slightly regulated by storage and release of water at Clear Creek reservoir about 15 miles above gage. Purpose of regulation to obviate diurnal fluctuations during irrigation season.

ACCURACY.—Stage-discharge relation permanent during years ending September 30, 1919, and 1920; affected by ice November 27 to December 23, 1919. Rating curves fairly well defined above 100 second-feet. Water-stage recorder inspected twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good except during periods of ice effect and low discharge, for which they are fair.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Discharge measurements of Tieton River at headworks of Tieton canal, near Naches, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Feb. 8	Bishop and Moxley	3.32	387	Feb. 18	F. E. Moxley	3.10	298
Apr. 21	F. E. Moxley	3.65	571	Apr. 20	do	2.83	207
July 10	do	3.52	489	26	do	2.57	126
22	do	3.04	290	May 3	do	2.70	154
30	do	2.74	153	June 2	do	2.64	126
Aug. 15	do	2.13	39.9	11	do	3.24	347
Sept. 2	do	2.07	33.7	22	do	3.79	668
Oct. 6	Moxley and Taylor	2.84	179	29	do	3.45	463
Dec. 24	Moxley and Mayo	3.70	591	July 28	do	2.52	111
				Sept. 23	Parker and Ball	2.80	188

Daily discharge, in second-feet, of Tieton River at headworks of Tieton canal, near Naches, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	275	.....	.....	.....	.....	.....	696	825	662	450	116	48
2	267	.....	.....	.....	.....	.....	696	793	630	461	87	38
3	271	.....	.....	.....	.....	.....	753	682	703	466	74	39
4	251	.....	.....	.....	.....	.....	842	623	769	516	67	29
5	292	.....	.....	.....	.....	.....	825	550	868	580	52	30
6	275	.....	.....	.....	.....	.....	745	516	936	539	70	37
7	263	.....	.....	.....	.....	.....	689	522	809	404	94	31
8	229	.....	.....	.....	.....	.....	649	556	689	334	89	36
9	204	.....	.....	.....	.....	.....	630	598	656	371	58	49
10	232	.....	.....	.....	.....	.....	682	580	586	493	53	22
11	244	.....	.....	.....	.....	.....	662	544	522	550	62	33
12	322	.....	.....	.....	.....	.....	623	493	471	493	74	59
13	300	.....	.....	.....	.....	.....	586	434	471	409	59	36
14	.....	.....	.....	.....	.....	.....	580	419	477	380	44	39
15	.....	.....	.....	.....	.....	.....	556	424	493	444	33	49
16	.....	.....	.....	.....	.....	.....	550	429	504	516	48	42
17	.....	.....	.....	.....	.....	.....	630	414	527	493	53	56
18	.....	.....	.....	.....	.....	.....	613	404	568	361	50	67
19	.....	.....	.....	.....	.....	.....	596	444	710	275	52	79
20	.....	.....	.....	.....	.....	.....	579	610	893	267	72	213
21	.....	.....	.....	.....	.....	.....	562	785	927	284	83	94
22	.....	.....	.....	.....	.....	.....	544	1,220	850	259	58	93
23	.....	.....	.....	.....	.....	.....	516	1,170	793	248	43	74
24	.....	.....	.....	.....	.....	.....	556	1,050	724	251	39	83
25	.....	.....	.....	.....	.....	.....	562	1,080	731	244	62	87
26	.....	.....	.....	.....	.....	.....	556	1,510	817	175	60	87
27	.....	.....	.....	.....	.....	.....	642	1,780	761	118	59	89
28	.....	.....	.....	.....	.....	.....	761	1,720	636	111	40	83
29	.....	.....	.....	.....	.....	.....	761	1,360	527	134	35	76
30	.....	.....	.....	.....	.....	.....	809	1,060	466	153	40	72
31	.....	.....	.....	.....	.....	.....	.....	817	.....	131	65	.....
1919-20.												
1	189	194	220	236	527	244	232	175	121	586	52	26
2	255	221	210	207	482	244	232	148	139	550	69	23
3	240	204	198	187	439	244	221	168	207	471	65	23
4	225	197	186	181	409	259	229	148	317	450	50	26
5	211	190	176	197	384	259	330	172	424	361	60	25
6	197	184	163	181	380	251	322	229	404	288	79	23
7	190	175	154	184	375	148	240	330	424	284	58	17
8	187	162	142	181	339	121	207	510	510	284	56	23
9	187	159	140	211	317	121	187	623	419	292	50	23
10	172	159	137	244	313	118	181	636	380	317	65	17
11	178	156	130	322	309	109	194	649	361	267	70	59
12	187	150	129	380	309	123	221	550	375	194	49	109
13	187	153	145	229	309	267	263	309	371	139	49	67
14	181	156	170	229	313	244	251	162	516	145	62	162
15	172	250	192	240	304	172	232	221	731	197	65	85
16	159	409	218	403	300	221	225	419	544	255	53	72
17	156	394	241	461	309	229	204	586	504	240	45	72
18	156	343	272	348	309	229	214	610	504	236	30	83
19	153	334	292	357	300	225	236	493	424	187	38	69
20	148	309	300	304	300	232	225	450	444	159	16	67
21	148	304	330	292	296	271	187	409	477	118	21	85
22	159	326	356	292	288	296	159	330	642	79	11	134
23	159	334	365	283	280	288	118	280	482	91	13	172
24	156	326	389	275	284	271	100	251	343	106	16	187
25	145	304	450	443	288	267	104	207	267	72	14	190
26	153	280	352	689	280	255	139	187	211	58	14	204
27	142	270	326	610	280	251	251	178	244	70	45	275
28	153	260	300	785	267	248	280	165	309	104	45	296
29	153	248	284	769	244	244	248	156	466	118	64	263
30	150	234	267	656	.....	240	248	142	533	94	72	284
31	153	.....	259	592	.....	229	.....	111	.....	53	38	.....

NOTE.—No gage-height record Apr. 18–20, 1919; discharge interpolated.

Combined monthly discharge of Tieton River and canal at headworks of Tieton canal, near Naches, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.						Combined run-off.	
	Combined.		River (mean).	Canal (mean).	Combined.		Depth in inches.	Acre-feet.
	Maximum.	Minimum.			Mean.	Per square mile.		
1918–19								
October					a 260	1.08	1.24	16,000
November					a 220	.917	1.02	13,100
December					a 340	1.42	1.64	20,900
January					a 730	3.04	3.50	44,900
February					a 350	1.46	1.52	19,400
March					a 300	1.25	1.44	18,400
April	1,100	611	648	104	752	3.13	3.49	44,700
May	2,100	717	787	309	1,100	4.58	5.28	67,600
June	1,250	780	673	311	984	4.10	4.57	58,600
July	895	428	352	317	669	2.79	3.22	41,100
August	432	347	61	315	376	1.57	1.81	23,100
September	365	136	62	250	312	1.30	1.45	18,600
The year					534	2.22	30.18	386,000
1919–20								
October	255	142	174		174	.725	.84	10,700
November	409	150	246	3.3	249	1.04	1.16	14,800
December	500	145	242	39.7	282	1.18	1.36	17,300
January	785	229	354	29.4	383	1.60	1.84	23,600
February	527	244	329		329	1.37	1.48	18,900
March	296	109	223		223	.929	1.07	13,700
April	537	221	216	108	324	1.35	1.51	19,300
May	952	414	323	303	626	2.61	3.01	38,500
June	1,030	426	403	303	706	2.94	3.28	42,000
July	889	358	221	303	524	2.18	2.51	32,200
August	386	320	46.3	308	354	1.48	1.71	21,800
September	473	306	105	257	362	1.51	1.68	21,500
The year	1,030	109	240	138	378	1.58	21.45	274,000

a Estimated by comparison with records of flow of Tieton River at Rimrock, Wash.

TIETON CANAL NEAR NACHES, WASH.

LOCATION.—In sec. 30, T. 14 N., R. 15 E. (unsurveyed), below canal intake and 16 miles southwest of Naches, Yakima County.

RECORDS AVAILABLE.—Irrigation seasons 1910 to September 30, 1920.

GAGE.—Float gage installed in a stilling well about 500 feet below canal intake; read by H. E. Andrus and G. G. Willis.

DISCHARGE MEASUREMENTS.—Made from a gaging bridge 30 feet below gage or by wading.

CHANNEL AND CONTROL.—Earth section merging into concrete-lined section 1,000 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 5.08 feet June 13, 1919 (discharge, 319 second-feet); no flow during portion of year.

Maximum stage recorded during year ending September 30, 1920, 5.28 feet September 8, 9, and 11 (discharge, 312 second-feet); no flow during portion of year.

1910–1920: Maximum discharge on June 13, 1919; canal dry during nonirrigating seasons, when water is not being delivered for cistern use.

ACCURACY.—Stage-discharge relation shifts slightly at high stages; practically permanent during each irrigating season. Rating curves well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Record excellent for irrigating season; fair for other periods.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Canal diverts water from right bank of Tieton River in sec. 30, T. 14 N., R. 15 E. Water is used for irrigation.

Discharge measurements of Tieton canal near Naches, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 21	F. E. Moxley	2.78	152	Apr. 21	F. E. Moxley	2.03	95.1
May 3	do	5.25	331	26	do	4.20	241
23	do	4.89	306	May 3	do	5.10	300
23	Paul Taylor	4.89	316	28	do	5.14	307
June 28	F. E. Moxley	5.00	311	June 29	do	5.11	306
July 30	do	5.11	316	July 28	do	5.14	307
Sept. 2	do	5.17	315	Aug. 30	Ball and Taylor	5.22	302
				Sept. 23	Ball and Parker	3.34	179

Daily discharge, in second-feet, of Tieton canal near Naches, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1			96					301	314	315	316	317
2			96					301	314	315	316	316
3			96					301	315	316	315	313
4								303	318	316	315	312
5								307	317	315	315	311
6								307	317	314	315	311
7								314	318	315	315	313
8								315	316	315	315	313
9								315	318	315	315	311
10								314	317	317	315	304
11								314	318	318	316	306
12								314	318	317	315	289
13							45	313	319	318	314	282
14							44	314	317	318	315	282
15							55	315	318	318	314	276
16							66	315	310	318	315	267
17							81	313	299	318	315	256
18							111	313	292	317	315	243
19							135	293	292	318	315	236
20							145	294	292	317	315	123
21							144	304	292	316	316	42
22							183	307	298	317	315	227
23		54					224	306	306	317	316	220
24		77					236	306	313	317	317	206
25		96					251	307	316	316	315	196
26		96					249	314	316	318	314	195
27		96					265	315	315	317	315	187
28		96					288	313	314	317	316	180
29		96					289	314	314	316	317	178
30		96					296	313	314	316	318	179
31								313		316	318	

Daily discharge, in second-feet, of Tieton canal near Naches, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.												
1			90	75				296	305	303	306	309
2			85	70				297	303	302	305	309
3			80	70				300	303	303	305	310
4			75	65				301	303	302	306	311
5			70	65				300	303	303	306	311
6			65	60				303	302	302	307	309
7			60	60			93	303	305	303	307	309
8			50	55			98	305	303	303	306	312
9			40	50			97	305	303	303	306	312
10			35	40			98	307	303	303	307	311
11			30				98	303	303	303	306	312
12			25				98	303	303	303	308	311
13							86	303	303	302	308	311
14							82	303	305	303	308	311
15							82	304	302	303	308	308
16							81	305	302	303	308	301
17							82	305	303	303	307	287
18				75			82	303	303	302	308	272
19				75			83	303	303	303	308	261
20			25	75			85	305	303	303	308	246
21			25	75			99	303	304	303	309	224
22			25				116	303	303	301	309	200
23			50				141	303	302	303	309	179
24			50				173	303	302	303	310	176
25			50				197	302	303	303	309	172
26			50				222	303	303	303	308	166
27			50				226	303	303	303	310	148
28			50				252	303	303	303	310	148
29			50				269	303	303	303	311	147
30		50	50				289	303	304	303	309	124
31		50	50					303		305	309	

NOTE.—Discharge during nonirrigation seasons, estimated roughly.

Monthly discharge of Tieton canal near Naches, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
November 23–30	96	54	88.4	1,400
December 1–3	96	96	96.0	571
April 13–30	296	44	173	6,160
May	315	293	309	19,000
June	319	292	311	18,500
July	318	314	317	19,500
August	318	314	315	19,400
September	317	42	250	14,900
1919–20.				
November	50	0	3.33	198
December	90	0	39.7	2,440
January	75	0	29.4	1,810
April	289	0	108	6,430
May	307	296	303	18,600
June	305	302	303	18,000
July	305	301	303	18,600
August	311	305	308	18,900
September	312	124	257	15,300

NORTH FORK OF AHTANUM CREEK NEAR TAMPICO, WASH.

LOCATION.—In NW. ¼ sec. 2, T. 12 N., R. 15 E., at Prior ranch, 100 feet below Nasty Creek and 3½ miles northwest of Tampico, Yakima County.

DRAINAGE AREA.—69 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 26, 1907, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank, about 300 feet southeast of ranch house; installed April 6, 1919. Previous gages as follows: August 26, 1907, to April 1, 1913, and August 20, 1915, to September 5, 1916, vertical staff at same site and datum as present gage; April 2, 1913, to August 19, 1915, and September 6, 1916, to September 30, 1917, Stevens continuous water-stage recorder; and April 14, 1918, to October 10, 1918, Stevens 8-day water-stage recorder at same site and datum. Recorder inspected by F. B. Hill and F. W. Schott.

DISCHARGE MEASUREMENTS.—Made from gaging bridge 40 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Banks high; not subject to overflow. Concrete control installed in November, 1915, 50 feet below gage. Stage of zero flow at time of construction of control, gage height 1.45 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 3.40 feet at 11 p. m. May 27 (discharge, 354 second-feet); minimum stage from recorder, 1.71 feet October 2 (discharge, 17.5 second-feet); lower stage probably occurred in the winter when record was discontinued.

Maximum stage during year ending September 30, 1920, from recorder, 2.92 feet at 10 p. m. May 8 (discharge, 208 second-feet); minimum stage from recorder, 1.59 feet November 27 (discharge, 12 second-feet); lower stage probably occurred in the winter while record was discontinued.

1907–1920: Maximum stage recorded, 4.60 feet at 9 a. m. June 18, 1916 (discharge, 728 second-feet); minimum stage recorded, 1.60 feet at noon November 12, 1916 (discharge, 7 second-feet).

ICE.—Stage-discharge relation seriously affected by ice; record discontinued during winter.

DIVERSIONS.—Station is above all diversions.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during winter of 1919–20. Rating curves well defined. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder. Records excellent for periods during which recorder was operating.

Discharge measurements of North Fork of Ahtanum Creek near Tampico, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 6	R. B. Kilgore	2.59	126	Mar. 28	John McCombs	1.93	29.4
7	do	2.52	116	29	do	1.93	28.3
May 23	John McCombs	3.02	236	Apr. 23	Raleigh Skillin	2.03	39.3
July 11	Raleigh Skillin	2.27	67.7	June 23	Lasley Lee	2.27	69.4
19	G. L. Parker	2.06	42.4	Aug. 13	R. B. Kilgore	1.75	16.4
				13	do	1.75	16.8

Daily discharge, in second-feet, of North Fork of Ahtanum Creek near Tampico, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.									
1	18.0	.....	.....	.....	216	171	94	31	24
2	17.5	.....	.....	.....	203	178	90	30	23
3	19.0	.....	.....	.....	180	186	87	30	22
4	19.5	.....	.....	.....	166	193	87	32	23
5	25	.....	.....	.....	152	193	87	30	24
6	21	.....	.....	130	145	186	85	30	26
7	19.5	.....	.....	115	154	179	75	29	24
8	19.0	.....	.....	103	166	172	70	28	31
9	19.0	.....	.....	98	171	164	69	28	29
10	19.0	.....	.....	105	159	157	70	28	25
11	.....	.....	.....	100	152	150	68	28	27
12	.....	.....	.....	96	139	143	63	26	26
13	.....	.....	.....	94	130	136	58	26	24
14	.....	.....	.....	89	130	130	56	26	24
15	.....	.....	.....	87	130	122	52	26	23
16	.....	.....	.....	85	130	115	50	24	22
17	.....	.....	.....	113	124	115	48	24	22
18	.....	.....	.....	141	124	122	46	24	22
19	.....	.....	.....	143	141	136	44	23	22
20	.....	.....	.....	136	166	150	42	23	22
21	.....	.....	.....	130	208	150	40	23	22
22	.....	.....	.....	132	253	141	39	23	22
23	.....	.....	.....	141	247	132	38	23	21
24	.....	.....	.....	154	230	124	37	23	21
25	.....	.....	.....	159	250	126	36	23	21
26	.....	.....	.....	154	283	128	36	22	20
27	.....	.....	.....	178	331	124	34	23	21
28	.....	.....	.....	208	308	113	34	23	22
29	.....	.....	.....	203	265	103	34	22	22
30	.....	.....	.....	206	216	96	33	22	22
31	.....	.....	.....	.....	186	.....	32	24	.....
1919–20.									
1	23	25	.....	29	95	69	56	19.5	17.1
2	23	25	.....	29	85	75	51	18.9	15.9
3	22	26	.....	27	70	87	48	18.9	15.9
4	21	26	.....	29	70	103	46	18.9	15.3
5	22	24	.....	37	84	107	42	18.9	14.7
6	22	24	.....	33	102	98	40	18.9	14.7
7	22	24	.....	33	124	102	37	18.3	14.7
8	22	19.0	.....	34	159	98	36	17.7	14.1
9	22	26	.....	32	173	94	35	17.7	14.1
10	22	25	.....	33	154	90	33	17.1	14.7
11	22	24	.....	36		89	32	16.5	14.7
12	21	20	.....	44		100	33	15.9	15.3
13	21	24	.....	50		111	35	15.9	15.9
14	21	25	.....	45	150	122	36	15.3	29
15	21	28	.....	43		107	30	15.3	21
16	21	41	.....	39		96	29	15.9	18.9
17	21	36	.....	39	150	96	29	15.9	17.7
18	22	32	.....	40	139	96	26	17.1	17.1
19	22	31	.....	49	126	91	25	17.1	16.5
20	22	28	.....	47	122	86	25	15.9	17.1
21	22	28	.....	44	107	82	25	15.3	18.3
22	21	28	.....	40	96	77	25	15.3	19.5
23	22	28	.....	39	90	72	24	14.7	21
24	21	28	.....		84	68	23	14.7	20
25	18.5	25	.....		78	59	22	15.3	19.5
26	21	23	.....	70	75	54	22	15.9	18.8
27	19.0	14.5	.....		75	54	21	16.5	18.0
28	24		29		75	60	20	17.7	17.2
29	23	15	30		77	60	19.5	27	16.5
30	26		30		72	57	20	22	15.9
31	25	.....	28	.....	68	.....	20	17.7	.....

NOTE.—Recorder not operating during following periods: Oct. 9, 1918, June 6–12, 1919, May 30, June 12, 13, 19–22, and Sept. 24–28, 1920 (discharge interpolated); Nov. 28–30, 1919, Apr. 24–30, May 1, 2, and 11–16, 1920 (discharge estimated by comparison with records of near-by streams). Braced figures show mean discharge for periods included.

Monthly discharge of North Fork of Ahtanum Creek near Tampico, Wash., for the years ending Sept. 30, 1919 and 1920.

[Drainage area, 69 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1918–19.						
October 1–10	25	17.5	19.6	0.284	0.11	389
April 6–30	208	85	132	1.91	1.78	6,550
May	331	124	189	2.74	3.16	11,600
June	193	96	144	2.09	2.33	8,570
July	94	32	55.9	.810	.93	3,440
August	32	22	25.7	.372	.43	1,580
September	31	20	23.3	.338	.38	1,390
1919–20.						
October	26	18.5	22.0	.319	.37	1,350
November	41	14.5	25.1	.364	.41	1,498
April	.....	27	45.4	.658	.73	2,700
May	173	68	111	1.61	1.86	6,820
June	122	54	85.3	1.24	1.38	5,080
July	56	19.5	31.1	.451	.52	1,910
August	27	14.7	17.3	.251	.29	1,060
September	29	14.1	17.4	.252	.28	1,040

SOUTH FORK OF AHTANUM CREEK AT CONRAD RANCH, NEAR TAMPICO, WASH.

LOCATION.—In W. ½ sec. 23, T. 12 N., R. 15 E., at Conrad ranch, 2½ miles above junction with North Fork and 2¾ miles southwest of Tampico, Yakima County.

DRAINAGE AREA.—26 square miles (measured on topographic maps, and Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—March 15, 1915, to September 30, 1920.

GAGE.—Vertical staff on left bank about 75 feet from ranch house; read by Mrs. W. B. Conrad. Gage datum raised 1.00 foot on August 9, 1918.

DISCHARGE MEASUREMENT.—Made by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and sand. Banks high and wooded. Concrete control 7 feet downstream from gage. Stage of zero flow, according to levels of July 20, 1919, gage height +0.05 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 1.24 feet at 7.30 p. m. May 27 (discharge, 85 second-feet); minimum stage probably occurred during the winter when record was discontinued.

Maximum stage recorded during year ending September 30, 1920, 0.85 foot at 7 a. m. May 9 (discharge, 34 second-feet); stage probably higher than recorded, in March, while records were not being kept; minimum stage recorded, 0.40 foot August 22 and 23 (discharge, 4.3 second-feet).

1915–1920: Maximum stage recorded, 3.1 feet June 19, 1916 (discharge, 216 second-feet); minimum stage recorded 0.60 foot September 25–26, 1915, and 0.40 foot August 22 and 23, 1920 (discharge, 4.3 second-feet).

ICE.—Stage-discharge relation seriously affected by ice; record discontinued during the winter.

DIVERSIONS.—Small ditch diverting above gage supplies water to Conrad's hop fields.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed slightly during winters. Rating curve used for October, 1918, and March to September, 1920, fairly well defined; curve used April 1 to November 1, 1919, well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records good.

Discharge measurements of South Fork of Ahtanum Creek at Conrad ranch near Tampico, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 7	R. B. Kilgore	0.89	38.2	Mar. 28	John McCombs	0.54	10.7
May 23	John McCombs	1.09	66	28	do	.54	10.4
July 11	Raleigh Skillin	.60	12.6	Apr. 23	Raleigh Skillin	.62	13.3
20	G. L. Parker	.59	11.4	June 23	Lasley Lee	.63	13.4
20	do	.58	11.3	Aug. 13	R. B. Kilgore	.42	4.7
				13	do	.42	4.9

Daily discharge, in second-feet, of South Fork of Ahtanum Creek at Conrad ranch, near Tampico, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.								
1	5.9		53	50	46	18.3	8.8	6.8
2	5.6		50	50	45	16.7	8.8	6.8
3	6.2		56	50	40	15.2	8.8	6.8
4	6.2		59	50	42	15.2	8.8	6.8
5	6.8		54	39	44	13.8	8.8	7.1
6	6.5		48	38	40	15.2	8.8	7.4
7	6.8		38	38	40	14.5	8.8	7.4
8	6.2		31	40	38	14.5	8.4	8.0
9	5.9		31	42	35	13.1	8.0	7.4
10	6.2		30	40	35	12.4	8.0	7.1
11	6.2		29	40	34	12.4	7.4	7.7
12	6.2		27	38	31	12.4	7.4	7.4
13	6.2		26.1	35	29	12.4	7.4	6.8
14	6.2		25.2	35	28	12.4	7.4	6.8
15	6.2		24.3	34	29	12.4	7.4	6.8
16	7.5		23.4	35	29	12.4	7.1	6.5
17	6.8		33	34	27	12.4	7.1	6.5
18	6.2		33	33	27	11.7	7.1	6.2
19	6.5		34	35	25.2	11.7	7.1	6.2
20	6.2		33	40	25.2	11.0	7.1	6.2
21	6.2		33	53	25.2	10.4	7.1	6.2
22	6.2		34	54	25.2	9.8	6.8	6.2
23	6.5		33	66	25.2	9.8	7.1	5.6
24	6.5		33	64	23.4	9.8	6.8	5.9
25	6.2		35	72	22.5	11.0	7.1	5.9
26	6.5		35	75	21.6	9.8	6.8	5.9
27	7.5		38	84	19.9	9.8	6.8	6.2
28	7.5		48	73	19.9	8.8	6.8	6.2
29	7.1		49	59	19.1	8.8	6.5	6.2
30	6.5		48	53	18.3	8.8	6.5	6.2
31	6.8			50		8.8	6.8	

Daily discharge, in second-feet, of South Fork of Ahtanum Creek at Conrad ranch, near Tampico, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.								
1	6.2	.....	9.7	25	16.7	10.7	5.4	5.1
2	6.5	.....	9.7	22	17.4	9.7	5.4	5.1
3	6.2	.....	7.8	21	17.4	9.7	5.4	5.4
4	6.2	.....	8.7	19.8	18.2	9.7	5.4	4.8
5	6.2	.....	9.2	19.8	19.8	9.2	5.4	4.8
6	6.2	.....	9.7	22	19.8	8.7	5.4	4.8
7	5.9	.....	9.7	25	19.8	8.7	5.4	4.8
8	6.2	.....	9.2	31	19.8	8.7	5.4	4.8
9	6.2	.....	9.7	33	21	8.7	5.1	5.1
10	6.2	.....	9.7	33	19.8	8.7	4.8	4.8
11	6.2	.....	9.7	29	19.0	8.7	4.8	4.8
12	6.2	.....	10.7	29	18.2	8.7	5.4	4.8
13	6.2	.....	11.7	29	18.2	8.2	5.4	8.7
14	6.2	.....	12.8	29	19.0	9.7	4.8	8.7
15	6.2	.....	12.8	32	18.2	8.2	4.8	5.4
16	6.2	.....	12.8	31	18.2	8.2	4.8	5.1
17	5.9	.....	12.8	32	17.4	7.8	4.8	4.8
18	5.9	.....	12.8	31	16.7	7.4	5.4	4.8
19	5.9	.....	12.8	31	16.7	7.0	5.1	4.8
20	6.2	.....	13.4	30	16.7	7.0	4.8	4.8
21	6.2	.....	12.8	29	15.3	7.0	4.8	4.8
22	6.2	.....	12.8	27	15.3	6.6	4.8	5.1
23	6.8	.....	12.8	25	14.6	6.2	4.5	5.4
24	6.2	.....	12.2	22	14.0	5.8	4.8	5.4
25	6.2	.....	12.8	21	14.0	5.4	4.8	4.8
26	6.5	.....	15.3	19.8	12.8	6.2	4.8	4.8
27	6.2	.....	22	19.8	12.2	6.2	4.8	4.8
28	6.2	9.7	25	19.0	12.8	6.2	5.1	4.8
29	6.2	9.7	26	18.2	12.2	5.4	7.0	4.8
30	6.2	9.7	24	18.2	11.2	6.2	5.4	4.8
31	6.2	9.7	.....	16.7	.....	5.4	5.4	.....

Monthly discharge of South Fork of Ahtanum Creek at Conrad ranch, near Tampico, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	7.5	5.6	6.45	397
April	59	23.4	37.5	2,230
May	84	33	48.4	2,980
June	46	18.3	30.3	1,800
July	18.3	8.8	12.1	744
August	8.8	6.5	7.54	464
September	8.0	5.6	6.64	395
1919–20.				
October	6.8	5.9	6.20	381
April	26	7.8	13.0	774
May	33	16.7	25.5	1,570
June	21	11.2	16.7	994
July	10.7	5.4	7.74	476
August	7.0	4.5	5.14	316
September	8.7	4.8	5.19	309

NEW RESERVATION CANAL AT PARKER, WASH.

LOCATION.—In sec. 20, T. 12 N., R. 19 E., 1 mile below intake of canal, half a mile northwest of Parker, and 5½ miles northwest of Wapato, in Yakima County.

RECORDS AVAILABLE.—Irrigation seasons 1904 to September 30, 1920.

GAGE.—Vertical staff at highway bridge a quarter of a mile below intake; installed before opening of irrigation season in 1917; read by G. M. Baugher. Gages previously used as follows: Prior to April 1, 1911, gage about a mile below intake; April 1, 1911, to April 26, 1916, about three-fourths mile below intake; April 26 to October 14, 1916, at highway bridge about a mile below intake.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of gravel and small stones. Channel at times obstructed by growth of aquatic plants.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 7.1 feet May 29 (discharge, 1,270 second-feet); no flow reported during nonirrigating season.

Maximum stage recorded during year ending September 30, 1920, 7.05 feet, May 26–28 (discharge, 1,300 second-feet); no flow reported during nonirrigating season.

1904–1920: Maximum stage recorded May 26–28, 1920; no flow reported during nonirrigating seasons.

ACCURACY.—Stage-discharge relation affected by manipulating gates to lateral "A" October 1–16, 1918; permanent during 1919 season; changed continuously during 1920. Rating curve for 1919 well defined; standard curve for 1920 season well defined. Gage read to hundredths twice daily. Daily discharge for 1919 season ascertained by applying mean daily gage-height to rating table; shifting-control method used for 1920 season. Records poor for October, 1918; excellent for remainder of period.

COOPERATION.—Complete data furnished by United States Reclamation Service and United States Office of Indian Affairs.

Canal diverts water from right bank of Yakima River in sec. 20, T. 12 N., R. 19 E., about 2 miles above intake of Old Reservation canal. Water is used for irrigation.

Discharge measurements of New Reservation canal at Parker, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 11	R. Skillin	2.48	188	Apr. 10	Moxley and Skillin	2.12	190
26	Henninger and Skillin	3.51	295	19	Fisher and Skillin	4.00	523
1919.				23	F. E. Moxley	4.55	552
Apr. 25	F. E. Moxley	5.35	775	28	R. Skillin	5.37	854
May 6	R. Skillin	6.24	1,070	30	do	5.34	826
13	F. E. Moxley	6.37	1,090	May 11	do	6.72	1,230
14	R. Skillin	6.44	1,110	12	F. E. Moxley	6.67	1,200
17	do	2.45	269	June 1	R. Skillin	6.14	1,040
June 4	Moxley and Skillin	6.23	1,070	3	F. E. Moxley	6.22	1,000
July 3	do	6.48	1,180	4	R. Skillin	6.25	1,020
23	do	5.53	919	18	Moxley and Skillin	6.30	943
Aug. 20	F. E. Moxley	6.13	1,040	18	do	6.30	943
Sept. 5	do	5.50	885	July 1	R. Skillin	6.82	1,160
13	R. Skillin	4.00	569	7	F. E. Moxley	6.77	1,170
19	F. E. Moxley	3.72	496	15	Skillin and Pauguette	6.79	1,200
Oct. 8	Moxley and Skillin	3.38	416	23	F. E. Moxley	6.30	978
1920.				23	R. Skillin	5.59	824
Mar. 9	Brady and Skillin	.45	5.5	Aug. 13	do	6.33	1,030
Apr. 2	F. E. Moxley	.82	30.2	Sept. 8	do	5.66	830
6	R. Skillin	1.02	61.2	17	Ball and Taylor	4.69	614
10	F. E. Moxley	2.12	192	22	R. Skillin	4.32	551
				22	Parker and Taylor	4.37	563

Daily discharge, in second-feet, of New Reservation canal at Parker, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.							
1	213	.....	904	1,210	1,180	890	972
2	225	.....	957	1,200	1,140	909	957
3	237	.....	967	596	1,130	914	950
4	237	.....	967	1,060	1,140	914	919
5	237	.....	991	1,060	1,140	874	890
6	225	.....	1,040	1,060	1,140	924	879
7	225	.....	1,040	1,050	580	950	787
8	250	.....	1,070	1,050	486	962	784
9	237	.....	1,080	1,020	964	974	695
10	225	89	1,080	1,020	1,110	974	656
11	225	230	1,100	660	1,100	950	625
12	225	297	1,110	660	1,090	926	609
13	189	416	1,110	828	1,070	976	554
14	189	512	1,120	938	1,090	1,010	554
15	165	502	1,130	948	1,090	1,030	554
16	63	506	1,150	962	1,080	1,050	530
17	.....	538	1,150	976	1,080	1,020	502
18	.....	546	678	998	1,060	1,030	490
19	.....	548	692	1,050	1,050	1,030	484
20	.....	568	1,150	1,060	1,050	1,040	458
21	.....	576	1,170	1,080	996	1,040	440
22	.....	627	1,180	1,080	950	1,040	440
23	.....	660	1,200	1,090	928	1,040	440
24	.....	701	1,210	1,090	812	1,040	397
25	.....	718	1,210	1,120	747	1,040	393
26	.....	718	1,230	1,170	520	1,040	427
27	.....	757	1,240	819	482	1,020	441
28	.....	775	1,240	742	660	998	460
29	.....	803	1,270	1,130	634	998	460
30	.....	844	1,250	1,140	669	996	441
31	.....	.....	1,240	.....	798	996	.....
1919–20.							
1	474	.....	873	1,140	1,150	835	933
2	456	.....	996	1,000	1,150	835	930
3	425	.....	392	1,000	1,150	835	914
4	403	.....	167	1,000	1,150	835	914
5	389	.....	529	994	1,160	835	911
6	382	58	960	988	1,150	781	868
7	384	80	1,150	988	1,160	789	822
8	420	111	1,180	994	1,160	799	820
9	439	109	1,180	943	1,170	789	815
10	435	144	1,160	971	1,170	895	815
11	435	174	1,210	985	1,180	938	815
12	435	178	1,200	985	1,180	1,020	815
13	435	233	1,170	985	1,190	1,040	820
14	433	245	1,170	985	1,190	1,060	725
15	431	248	1,250	985	1,190	1,050	706
16	431	295	1,230	966	1,190	1,050	627
17	.....	380	1,210	941	1,200	1,050	596
18	.....	416	1,230	938	1,200	1,050	565
19	.....	509	1,240	938	1,080	1,050	572
20	.....	474	1,240	938	1,060	1,050	577
21	.....	382	1,250	941	1,040	1,050	558
22	.....	378	1,280	922	996	1,050	540
23	.....	522	1,280	933	977	1,050	524
24	.....	91	1,280	999	988	1,050	426
25	.....	287	1,290	1,040	906	1,050	405
26	.....	432	1,300	1,080	916	1,050	395
27	.....	482	1,300	1,070	835	1,050	376
28	.....	499	1,300	1,110	835	1,050	331
29	.....	356	1,280	1,150	835	1,020	309
30	.....	835	1,280	1,150	835	1,020	309
31	.....	.....	1,280	.....	835	1,000	.....

Monthly discharge of New Reservation canal at Parker, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October 1–16	250	63	210	6,660
April 10–30	844	89	568	23,700
May	1,270	678	1,090	67,300
June	1,210	596	996	59,200
July	1,180	482	934	57,400
August	1,050	874	987	60,700
September	972	393	605	36,000
1919–20.				
October 1–16	474	382	425	13,500
April 6–30	835	58	317	15,700
May	1,300	167	1,120	69,200
June	1,150	922	1,000	59,600
July	1,200	835	1,070	65,900
August	1,050	781	968	59,500
September	933	309	658	39,100

OLD RESERVATION CANAL AT PARKER, WASH.

LOCATION.—In sec. 28, T. 12 N., R. 19 E., 300 feet below intake and 500 feet above controlling waste of first lateral, 1 mile east of Parker, Yakima County, and 3½ miles northwest of Wapato.

RECORDS AVAILABLE.—Irrigation seasons 1904 to September 30, 1920.

GAGE.—Vertical staff on left side about 10 feet upstream from private farm bridge; read by H. B. Ealy. Prior to June 23, 1908, vertical staff on downstream end of right retaining wall of Northern Pacific Railway bridge, about half a mile below present site of gage and at different datum.

DISCHARGE MEASUREMENTS.—Made from gaging bridge at gage.

CHANNEL AND CONTROL.—Bed of old slough. Velocities high. No obstruction from growth of aquatic plants. Fairly permanent for each irrigating season.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 6.05 feet May 21 (discharge, 386 second-feet); no flow reported during nonirrigating season.

Maximum stage recorded during year ending September 30, 1920, 5.18 feet May 10 (discharge, 350 second-feet); no flow reported during nonirrigation season.

1904–1920: Maximum stage recorded May 21, 1919; no flow reported during nonirrigating seasons.

ACCURACY.—Stage-discharge relation permanent during 1919 season, changed continuously during 1920. Rating curve for 1919, well defined; standard curve for 1920 well defined. Gage read to hundredths daily. Daily discharge ascertained by applying mean daily gage height to rating table; shifting-control method used for 1920 season. Records good.

COOPERATION.—Complete record furnished by United States Reclamation Service and United States Office of Indian Affairs.

Canal diverts water from right bank of Yakima River in sec. 28, T. 12 N., R. 19 E., about half a mile above intake of Sunnyside canal. Water is used for irrigation.

Discharge measurements of Old Reservation canal at Parker, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Apr. 24	Skillin and Clemens	4.94	275	Apr. 6	R. Skillin	2.50	94.1
25	F. E. Moxley	5.17	294	8	do	2.79	116
May 14	do	5.02	277	10	Skillin and Moxley	2.90	120
14	R. Skillin	5.14	298	10	F. E. Moxley	2.90	120
17	do	5.67	347	15	R. Skillin	3.86	212
June 5	Moxley and Skillin	5.22	287	23	F. E. Moxley	3.59	175
July 3	do	4.73	247	30	R. Skillin	4.28	247
23	R. Skillin	4.10	180	May 10	do	5.19	351
23	F. E. Moxley	4.11	176	12	F. E. Moxley	5.06	324
Aug. 13	R. Skillin	3.14	87.3	18	Skillin and Hound	3.72	185
20	F. E. Moxley	3.97	171	June 3	F. E. Moxley	3.67	178
26	R. Skillin	2.86	56.3	18	Skillin and Moxley	4.23	241
Sept. 5	F. E. Moxley	4.03	175	18	do	4.23	241
19	do	3.12	76.9	July 1	R. Skillin	4.08	224
Oct. 8	Skillin and Moxley	2.48	43.5	7	F. E. Moxley	3.45	147
1920.				20	R. Skillin	3.57	167
Mar. 9	Skillin and Brady	.72	6.08	23	F. E. Moxley	3.70	169
29	R. Skillin	1.66	40.0	Aug. 11	R. Skillin	3.28	132
Apr. 2	F. E. Moxley	2.02	58.9	Sept. 8	do	3.16	133
3	R. Skillin	2.02	61.4	17	Ball and Taylor	2.31	77.7
				22	Parker and Taylor	2.47	85.8

Daily discharge, in second-feet, of Old Reservation canal at Parker, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.							
1	78	.....	328	318	274	160	187
2	90	.....	339	307	257	176	187
3	96	.....	339	305	246	192	187
4	90	.....	307	302	250	216	176
5	96	.....	286	305	257	216	162
6	90	.....	276	305	260	211	173
7	84	.....	276	307	320	204	166
8	102	.....	276	295	305	187	145
9	96	.....	286	286	302	176	129
10	84	.....	307	278	255	171	108
11	90	.....	307	268	244	178	118
12	90	.....	318	260	234	173	113
13	90	82	299	250	223	197	74
14	90	82	279	239	213	192	82
15	96	171	276	239	204	187	99
16	.....	171	323	241	205	183	103
17	.....	218	346	247	213	187	99
18	.....	223	347	247	225	187	99
19	.....	239	368	271	208	169	80
20	.....	255	365	292	192	163	74
21	.....	270	386	305	173	176	63
22	.....	270	381	307	166	178	47
23	.....	270	381	307	173	183	47
24	.....	276	381	297	0	181	40
25	.....	286	379	286	97	179	38
26	.....	302	372	281	94	192	51
27	.....	307	349	320	94	192	52
28	.....	312	344	323	94	192	45
29	.....	318	339	299	85	194	40
30	.....	328	330	276	190	194	39
31	.....	.....	320	.....	183	190	.....

Daily discharge, in second-feet, of Old Reservation canal at Parker, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1919–20.							
1	38	39	230	167	219	133	152
2	38	46	218	174	200	133	152
3	38	60	237	179	184	138	153
4	38	59	233	196	163	134	153
5	36	59	219	211	153	139	154
6	35	92	208	207	136	134	154
7	45	117	212	209	147	134	122
8	40	116	301	221	174	134	132
9	40	111	336	225	175	134	131
10	38	118	350	226	175	134	140
11	35	121	349	214	176	136	150
12	32	117	327	215	176	134	152
13	35	112	323	202	177	140	127
14	35	205	306	226	177	144	120
15	32	209	291	246	178	145	78
16	.....	200	286	249	179	145	78
17	.....	195	293	252	180	146	78
18	.....	187	310	241	167	146	78
19	.....	195	300	238	167	147	76
20	.....	202	280	246	171	147	76
21	.....	200	274	246	179	148	75
22	.....	201	264	247	175	148	86
23	.....	179	234	252	170	149	61
24	.....	200	198	239	172	149	55
25	.....	188	175	232	173	149	52
26	.....	186	175	227	142	149	52
27	.....	199	183	182	133	149	39
28	.....	240	185	181	133	150	39
29	.....	238	174	206	133	150	36
30	.....	244	177	218	138	151	38
31	.....	.....	173	.....	133	151	.....

Monthly discharge of Old Reservation canal at Parker, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October 1–15	102	78	90.8	2,700
April 13–30	328	82	243	8,900
May	386	276	329	20,200
June	323	239	286	17,000
July	320	0	201	12,400
August	216	160	186	11,500
September	187	38	101	5,690
1919–20.				
October 1–15	45	32	37.0	1,010
April	244	39	154	9,160
May	350	173	252	15,500
June	252	167	219	13,000
July	219	133	166	10,200
August	151	133	143	8,790
September	154	36	99.6	5,930

SUNNYSIDE CANAL NEAR PARKER, WASH.

LOCATION.—In sec. 28, T. 12 N., R. 19 E., 600 feet below intake, 1½ miles east of Parker and 3½ miles northwest of Wapato, Yakima County.

RECORDS AVAILABLE.—Irrigation seasons 1904 to September 30, 1920.

GAGE.—Lietz water-stage recorder on right side; installed April 20, 1909, and referred to vertical staff installed April 6, 1908, at same site. For description of gages used previous to April 6, 1908, see Water-Supply Paper 482.

DISCHARGE MEASUREMENTS.—Made from gaging bridge 30 feet below gage.

CHANNEL AND CONTROL.—Bottom of canal gravel; fairly permanent. Operation of flashboard at drop No. 1 makes control changeable.

EXTREMES OF DISCHARGE.—Maximum mean daily discharge during years ending September 30, 1919 and 1920, 1,260 second-feet, July 4, 5, and August 22, 1919, and August 24, 1920; no flow reported during nonirrigating seasons.

1904–1920: Maximum mean daily discharge, 1,270 second-feet, July 21, 1917; no flow reported during nonirrigating seasons.

ACCURACY.—Stage-discharge relation not permanent; affected by operation of flashboards at drop No. 1. Current-meter measurements are made frequently and daily discharge ascertained by shifting-control method. Records excellent.

COOPERATION.—Complete record furnished by United States Reclamation Service.

Canal diverts water from left bank of Yakima River in sec. 28, T. 12, N., R. 19 E., about half a mile below intake of Old Reservation canal. Water is used for irrigation.

Discharge measurements of Sunnyside canal near Parker, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 9	B. G. James	3.97	676	Oct. 10	M. J. Dowd	3.80	589
21	do	3.37	493	22	do	3.19	452
24	C. E. Edwards	3.32	462	29	do	2.71	362
1919.				1920.			
Mar. 27	B. G. James	2.41	303	Apr. 16	B. G. James	4.39	827
Apr. 10	do	3.64	619	26	do	4.88	1,010
17	do	4.19	796	May 6	do	5.28	1,150
29	James and Dowd	5.16	1,120	17	do	5.52	1,220
May 8	do	5.48	1,230	27	do	5.36	1,180
19	James and Stone	5.37	1,180	June 7	do	5.37	1,160
29	M. J. Dowd	5.39	1,170	17	do	5.10	1,080
June 9	do	5.29	1,140	28	Dowd and James	5.14	1,100
18	do	5.33	1,190	July 19	B. G. James	5.67	1,210
30	do	5.47	1,220	22	do	5.68	1,240
July 9	do	5.56	1,240	28	do	5.73	1,250
21	do	5.32	1,150	Aug. 9	do	5.73	1,250
30	Dowd and James	5.53	1,210	17	do	5.75	1,240
Aug. 11	M. J. Dowd	5.58	1,200	26	do	5.69	1,240
20	do	5.60	1,230	Sept. 7	do	4.84	964
Sept. 2	do	5.43	1,160	15	do	4.86	937
11	do	4.78	940	27	do	4.18	724
20	Dowd and James	4.32	788				
30	M. J. Dowd	3.81	641				

Daily discharge, in second-feet, of Sunnyside canal near Parker, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918–19.									
1	772	.....	.....	358	1,130	1,110	1,240	1,150	1,160
2	755	.....	.....	384	1,130	1,130	1,240	1,220	1,160
3	733	.....	.....	417	1,160	1,100	1,250	1,200	1,120
4	736	.....	.....	461	1,170	1,100	1,260	1,190	1,080
5	717	.....	.....	461	1,200	1,100	1,260	1,200	927
6	710	.....	.....	525	1,200	1,110	1,250	1,200	944
7	704	.....	.....	606	1,210	1,120	1,240	1,220	927
8	701	.....	.....	642	1,210	1,120	1,230	1,210	901
9	676	.....	.....	645	1,190	1,130	1,240	1,230	881
10	666	.....	.....	642	1,180	1,130	1,250	1,220	931
11	657	.....	.....	679	1,180	1,140	1,240	1,230	911
12	654	.....	.....	700	1,170	1,140	1,230	1,220	875
13	633	.....	.....	703	1,170	1,140	1,240	1,210	865
14	618	.....	124	735	1,190	1,160	1,250	1,220	816
15	594	.....	123	753	1,200	1,150	1,240	1,240	813
16	568	.....	123	787	1,190	1,160	1,230	1,220	813
17	553	.....	123	810	1,170	1,160	1,230	1,240	800
18	545	.....	123	855	1,170	1,180	1,240	1,250	797
19	517	.....	126	895	1,170	1,200	1,230	1,220	781
20	481	.....	123	921	1,180	1,200	1,230	1,220	803
21	495	.....	123	944	1,170	1,200	1,210	1,250	747
22	503	.....	149	980	1,170	1,200	1,240	1,260	750
23	487	.....	178	1,020	1,170	1,210	1,240	1,240	747
24	492	.....	210	1,040	1,160	1,210	1,230	1,210	744
25	500	.....	210	1,070	1,180	1,220	1,230	1,220	738
26	.....	.....	239	1,070	1,160	1,220	1,230	1,220	633
27	.....	.....	283	1,080	1,150	1,220	1,240	1,210	588
28	.....	.....	302	1,100	1,150	1,220	1,220	1,210	618
29	.....	.....	315	1,120	1,130	1,210	1,210	1,210	642
30	.....	.....	328	1,110	1,140	1,230	1,210	1,210	662
31	.....	.....	344	.....	1,130	.....	1,210	1,160	.....
1919–20.									
1	688	126	.....	331	1,110	1,160	1,200	1,240	1,100
2	669	126	.....	402	1,100	1,130	1,220	1,240	1,110
3	700	61	.....	437	1,130	1,200	1,240	1,240	1,090
4	685	41	.....	453	1,160	1,190	1,240	1,240	1,080
5	648	41	.....	476	1,160	1,190	1,140	1,240	1,070
6	639	41	.....	492	1,140	1,190	984	1,240	1,030
7	633	41	.....	506	1,170	1,170	1,040	1,240	964
8	639	41	.....	542	1,190	1,190	1,240	1,240	944
9	642	41	.....	548	1,200	1,170	1,250	1,240	954
10	648	41	.....	583	1,200	1,150	1,250	1,240	1,000
11	642	41	.....	609	1,190	1,160	1,250	1,250	1,010
12	633	37	.....	688	1,200	1,130	1,250	1,250	967
13	630	37	.....	697	1,200	1,120	422	1,250	957
14	615	37	.....	775	1,200	1,100	525	1,240	937
15	591	37	.....	797	1,200	1,090	688	1,240	937
16	554	37	.....	878	1,210	1,080	862	1,230	918
17	539	37	.....	895	1,210	1,080	1,120	1,240	904
18	539	37	.....	937	1,220	1,070	1,200	1,240	901
19	525	.....	.....	990	1,220	1,080	1,210	1,240	865
20	500	.....	.....	1,020	1,200	1,090	1,210	1,240	858
21	476	.....	.....	1,040	1,210	1,120	1,230	1,240	842
22	455	.....	.....	1,030	1,220	1,130	1,240	1,240	832
23	440	.....	.....	1,010	1,210	1,130	1,240	1,250	810
24	422	.....	.....	1,070	1,200	1,140	1,250	1,260	791
25	410	.....	73	1,040	1,160	1,140	1,250	1,250	766
26	415	.....	98	1,010	1,160	1,160	1,250	1,240	766
27	422	.....	126	1,060	1,160	1,130	1,250	1,220	744
28	400	.....	157	1,090	1,180	1,100	1,250	1,210	725
29	372	.....	187	1,080	1,190	1,170	1,240	1,180	713
30	347	.....	218	1,110	1,190	1,200	1,240	1,140	682
31	315	.....	270	.....	1,190	.....	1,240	1,120	.....

Monthly discharge of Sunnyside canal near Parker, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918-19.				
October 1-25	772	481	619	30,700
March 14-31	344	123	197	7,030
April	1,120	358	784	46,700
May	1,210	1,130	1,170	71,900
June	1,230	1,100	1,160	69,000
July	1,260	1,210	1,240	76,200
August	1,260	1,150	1,220	75,000
September	1,160	588	839	49,900
1919-20.				
October	700	315	543	33,400
November 1-18	126	37	50	1,790
March 25-31	270	73	161	2,240
April	1,110	331	787	46,800
May	1,220	1,100	1,180	72,600
June	1,200	1,070	1,140	67,800
July	1,250	422	1,140	70,100
August	1,260	1,120	1,230	75,600
September	1,110	682	909	54,100

TOPPENISH CREEK NEAR FORT SIMCOE, WASH.

LOCATION.—In sec. 26, T. 10 N., R. 16 E., at Olney ranch, 1½ miles below highway bridge, 3½ miles southeast of Fort Simcoe, and 5 miles southwest of White Swan, Yakima County.

DRAINAGE AREA.—124 square miles (measured on Pl. I, Water-Supply Paper 369.

RECORDS AVAILABLE.—February 27, 1909, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank half a mile east of ranch house; installed August 19, 1915; inspected by Ivan Hartzell, Howard Radford, and J. P. McCafferty. Previous gages as follows: February 27, 1909, to July 22, 1913, chain gage on left bank a quarter of a mile above site of present gage; July 23, 1913, to August 18, 1915, vertical staff attached to cottonwood tree on right bank 150 feet above site of present gage.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Concrete control constructed in September, 1916, was washed by high water January 23, 1919. Banks covered with brush; subject to overflow at extremely high water.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 6.2 feet at 1 p. m. January 23 (discharge, 1,630 second-feet); minmum stage from recorder, 1.39 feet August 19 (discharge, 11.9 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 3.32 feet at 2 a. m. March 14 (discharge, 396 second-feet); minimum stage, from recorder, 1.14 feet August 15 and September 18 (discharge, 3.0 second-feet).

1909-1920: Maximum discharge recorded, 1,650 second-feet at noon May 4, 1916; minimum stage recorded, August 15 and September 18, 1920.

ICE.—Stage-discharge relation affected by ice; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Nicol and Abe Lincoln ditches diverted from 3 to 6 second-feet above the station during the year ending September 30, 1919. During the year ending September 30, 1920, the diversion through Abe Lincoln ditch was determined from two discharge measurements and a fragmentary gage-height record. This diversion was added to the discharge at the gage on Toppenish Creek in order to determine natural monthly flow. Diversion of spring run-off into reservoir on Simcoe Creek for use in irrigating Indian lands is proposed.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed slightly October 1 to November 10, 1918, radically on January 23 and December 27, 1919, and gradually after August 16, 1920. Rating curves well defined. Operation of water-stage recorder excellent until November 26, 1919, after which it was faulty for periods noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection; or for a few days when range in stage was considerable, by averaging results obtained by applying mean gage heights for shorter intervals; shifting-control method used October 28 to November 10, 1918, and August 16 to September 30, 1920. Records excellent until November 26, 1919, after which they are good except over periods represented by flat estimates of discharge.

Discharge measurements of Toppenish Creek near Fort Simcoe, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 13	D. J. F. Calkins	2.43	20.8	Feb. 6	McCombs and Radford	2.17	55.0
1919.				7	McCombs and Adams	2.16	54.0
Apr. 3	R. B. Kilgore	2.82	354	Mar. 25	John McCombs	2.47	95.2
9	do	2.62	250	26	McCombs and McCafferty	2.42	87.9
May 21	John McCombs	2.19	90.1	June 24	Lasley Lee	1.50	9.77
28	do	2.10	64.2	25	do	1.51	10.2
July 23	G. L. Parker	1.50	14.2	Aug. 15	R. B. Kilgore	1.15	3.03
23	do	1.50	14.3	15	do	1.15	3.16

Daily discharge, in second-feet, of Toppenish Creek near Fort Simcoe, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	12.5	17.8	19.2	19.2	100	46	314	323	50	17.8	13.6	13.2
2	12.5	17.8	19.2	18.5	81	87	328	305	46	17.8	13.8	13.2
3	13.5	17.8	21	18.5	70	87	346	278	40	17.1	13.8	12.9
4	13.5	18.5	24	17.8	59	76	465	250	38	16.9	14.2	13.2
5	16.4	18.5	25	17.8	55	67	441	229	36	16.4	14.4	14.0
6	16.4	17.8	26	17.8	48	57	375	212	33	16.9	14.0	15.1
7	15.7	17.8	24	17.8	43	50	328	203	33	17.1	13.4	14.9
8	15.0	17.8	22	17.8	40	46	286	195	31	16.6	12.9	15.3
9	15.0	17.8	22	17.8	62	39	260	187	29	16.0	12.7	16.2
10	14.5	21	21	17.1	90	38	260	175	31	16.0	12.5	15.3
11	14.0	27	21	17.8	84	37	260	167	29	16.2	12.5	15.1
12	14.0	23	21	17.1	76	38	242	159	26	15.7	12.5	15.3
13	14.5	21	21	17.1	67	37	229	148	26	15.5	12.5	14.9
14	14.5	21	27	17.8	59	36	216	137	26	14.6	12.7	14.6
15	15.7	28	34	17.1	55	34	203	133	26	14.2	12.7	14.2
16	18.5	30	30	17.8	52	33	195	130	25	13.8	12.5	14.0
17	19.2	26	28	41	73	37	287	123	24	13.6	12.5	13.8
18	17.8	23	28	193	67	76	323	116	23	13.8	12.1	13.6
19	16.4	22	27	426	59	93	351	106	21	14.4	12.1	13.4
20	15.7	21	27	130	52	100	356	100	21	14.6	12.1	13.4
21	15.7	21	26	50	46	103	328	93	20	14.2	12.1	13.4
22	15.0	21	23	310	43	110	314	87	20	14.0	12.1	13.4
23	15.0	21	21	1,310	40	119	314	81	19.6	13.8	12.1	13.4
24	15.7	19.9	22	976	38	126	323	76	19.6	13.6	12.1	13.4
25	15.7	19.9	23	578	40	126	328	76	18.7	13.4	12.1	13.2
26	16.4	19.9	21	429	43	126	300	73	18.2	13.8	12.1	13.2
27	18.5	19.2	21	296	40	133	300	59	18.2	13.8	12.3	13.4
28	29	18.5	22	220	39	159	332	57	18.0	13.6	12.5	14.6
29	23	18.5	22	179	.....	203	337	57	18.0	13.6	12.5	14.6
30	19.9	19.2	22	148	.....	246	328	57	18.0	13.4	12.3	14.6
31	18.5	.....	19.2	123	.....	314	.....	55	.....	13.4	12.5	.....

Daily discharge, in second-feet, of Toppenish Creek near Fort Simcoe, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	16	18		54	82	40	69	115	30	7.4	8.3	8.3
2	16	18		53	73	46	68	109	29	6.4	6.8	8.0
3	15	19		52	66	46	64	104	28	6.1	5.9	7.1
4	15	20	20	50	62	48	63	99	27	5.7	6.1	6.6
5	15	22		49	58	50	70	104	26	5.4	5.9	6.3
6	14	19		48	56	52	74	111	24	5.5	6.4	6.3
7	14	19	21	47	54	52	74	108	23	5.4	6.6	6.3
8	14	18		46	52	55	78	104	22	5.5	6.3	6.3
9	15	18		43	50	69	76	101	20	5.2	6.8	6.3
10	15	18		42	46	68	76	97	19	4.7	4.4	7.4
11	15	18		37	46	63	82	94	18	4.7	3.7	7.7
12	15	18		37	44	63	90	90	17	5.4	3.4	8.0
13	15	18		39	44	167	104	86	17	7.7	3.2	9.5
14	15	18	20	41	43	302	102	81	16	13	3.2	17
15	15	18		43	41	186	99	77	16	20	3.2	13
16	15	18		45	39	138	95	73	15	17	3.5	11
17	15	19		47	38	117	88	69	14	16	4.4	8.3
18	15	19		46	39	102	87	65	14	12	5.5	4.4
19	15	19		45	39	92	95	61	13	9.8	6.1	5.6
20	15	19	23	44	38	88	99	56	13	9.5	5.5	4.9
21	15	18	26	44	38	97	92	52	12	9.2	5.0	5.0
22	16	18	30	42	33	109	87	48	11	9.5	5.0	5.5
23	16	18	33	41	33	106	82	46	11	9.5	4.6	
24	16	18	38	39	34	100	82	44	9.8	8.9	4.4	
25	16	18	43	60	37	97	90	42	10	8.9	5.5	
26	17	18	48	202	38	90	104	40	9.8	8.9	6.8	10
27	17		53	106	38	84	126	39	9.2	8.3	6.8	
28	17	20	58	85	36	78	141	37	9.2	7.7	8.3	
29	17		57	90	37	73	141	35	9.5	6.8	10	
30	18		56	87	.....	73	129	33	8.6	7.1	11	
31	17	.....	55	87	.....	70	.....	32	.....	8.0	9.5	.....

NOTE.—Water-stage recorder not operating Nov. 27, 1919, to Jan. 2, Jan. 5–7, 13–16, May 7 to June 23, and Sept. 23–30, 1920. Discharge Dec. 7, 20, 23, 28, 1919, May 11, 22, 30, June 11 and 21 determined from staff gage readings; Nov. 27 to Dec. 6, Dec. 8–19, 1919, ascertained from study of weather records and from general information; Dec. 21, 22, 24–27, 29–31, 1919, Jan. 1, 2, 5–7, 13–16, May 7–10, 12–21, 23–29, 31 to June 10, June 12–20, 22, and 23, 1920, by interpolation; Sept. 23–30, 1920, by comparison with records for near-by streams. Braced figures show mean discharge for periods included.

Monthly discharge of Toppenish Creek near Fort Simcoe, Wash., for the year ending Sept. 30, 1919.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	29	12.5	16.4	1,010
November	30	17.8	20.8	1,240
December	34	19.2	23.5	1,440
January	1,310	17.1	184	11,300
February	100	38	57.9	3,220
March	314	33	92.9	5,710
April	465	195	307	18,300
May	323	55	143	8,790
June	50	18.0	26.7	1,590
July	17.8	13.4	15.0	922
August	14.4	12.1	12.7	781
September	16.2	12.9	14.0	833
The year	1,310	12.1	76.2	55,100

Monthly discharge of Toppenish Creek and Abe Lincoln ditch near Fort Simcoe, Wash., for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Creek.			Ditch (mean).	Combined (mean).	
	Maximum.	Minimum.	Mean.			
October	18	14	15.5	0	15.5	953
November	22		18.7	0	18.7	1,110
December	58		29.1	0	29.1	1,790
January	202	37	57.8	0	57.8	3,550
February	82	33	46.0	0	46.0	2,640
March	302	40	91.0	0	91.0	5,600
April	141	63	90.9	2.60	93.5	5,560
May	115	32	72.6	18.3	90.9	5,590
June	30	8.6	16.7	16.8	33.5	1,990
July	20	4.7	8.55	6.39	14.9	916
August	11	3.2	5.87	4.39	10.3	633
September	17	4.4	8.39	2.80	11.2	666
The year	302	3.2	38.4	4.28	42.7	31,000

NOTE.—Flow of Abe Lincoln ditch estimated from two discharge measurements (p. 257) and fragmentary gage-height record.

SIMCOE CREEK BELOW SPRING CREEK, NEAR FORT SIMCOE, WASH.

LOCATION.—In sec. 34, T. 11 N., R. 16 E., at site of proposed reservoir 4 miles northeast of Fort Simcoe, Yakima County.

DRAINAGE AREA.—77 square miles (measured on Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—November 20, 1915, to September 30, 1920. For a station just above Spring Creek, February 28, 1909, to November 20, 1915.

GAGE.—Stevens continuous water-stage recorder on left bank just below Spring Creek; installed November 20, 1915; inspected by Ivan Hartzell, Howard Radford, and J. P. McCafferty. Previous gages as follows: Prior to March 24, 1910, a chain gage 100 yards above Spring Creek; March 24, 1910, to November 20, 1915, staff gage at same site and datum.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage or by wading.

CHANNEL AND CONTROL.—Bed composed of sand and gravel. Concrete control 16 feet below gage. Banks fairly high; not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, from water-stage recorder, 3.5 feet at noon January 23 (discharge, 379 second-feet); minimum discharge, 0.2 second-foot, October 1–15.)

Maximum stage during year ending September 30, 1920, from recorder 0.84 foot at 7 a. m. May 10 (discharge, 30 second-feet); minimum discharge, 0.1 second-foot August 7–13, 15–17, 19–25, September 3–13, 19–23, and 27–29.

1916–1920: Maximum stage recorded, 6.14 feet at 5 p. m. February 10, 1916 (discharge, 731 second-feet); minimum discharge August and September, 1920.

ICE.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Considerable water is diverted above the station for irrigation. Since about April, 1920, Simcoe Creek flume has diverted from 0.25 to 5 second-feet at a point just above Spring Creek. Monthly discharge April to September, 1920, has been corrected for estimated diversion through flume.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed January 23, 1919. Rating curves fairly well defined; revised October 1, 1919. Operation of water-stage recorder satisfactory except as indicated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table the mean gage height determined from recorder graph by inspection; for a few days in January, 1919, when the range in stage was considerable, mean gage heights for shorter intervals were used. Records good except for periods during which recorder was not operating for which they are fair.

Discharge measurements of Simcoe Creek below Spring Creek, near Fort Simcoe, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 13	D. J. F. Calkins	0.28	1.10	Feb. 7	McCombs and Radford	0.56	10.2
1919.				Mar. 26	McCombs and McCafferty	.72	19.1
Apr. 3	R. B. Kilgore	1.31	102	June 25	Lasley Lee	.36	2.31
May 22	John McCombs	.70	18.9	Aug. 14	R. B. Kilgore	.13	.22
29	do	.64	15.2	14	do	.13	.19
July 24	G. L. Parker	.38	3.05	15	do	.13	.20
24	do	.38	3.05				

Daily discharge, in second-feet, of Simcoe Creek below Spring Creek near Fort Simcoe, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	0.2	0.8		4.0	37	47	98	68	12.3	5.0	2.2	0.6
2	.2	.8			32	64	93	68	11.8	4.2	2.2	.6
3	.2	.8			29	63	99	64	10.8	4.2	2.2	.5
4	.2	.8			30	60	106	58	10.8	4.2	2.2	.5
5	.2	.6	2.6	4.2	29	60	106	55	9.7	4.2	2.0	.6
6	.2	.6			27	55	91	47	9.7	4.2	1.8	.7
7	.2	.6			25	50	77	44	9.7	4.2	1.6	.7
8	.2	.8			25	47	68	41	9.2	4.2	1.6	1.0
9	.2	8	2.8	4.4	29	44	61	38	8.7	3.9	1.6	1.0
10	.2	.8	2.8	4.4	40	41	56	34	9.2	3.9	1.6	.7
11	.2	.9	2.8	4.8	42	41	55	32	8.2	3.6	1.6	.7
12	.2	.9	2.8	4.4	40	38	52	31	8.2	3.6	1.4	.7
13	.2	1.1	2.5	4.0	34	38	49	29	7.7	3.6	1.4	.6
14	.2	1.1	2.5	4.0	34	37	47	27	8.2	3.6	1.4	.5
15	.2	1.3	2.5	4.0	33	36	46	25	8.2	3.3	1.3	.5
16	.3	1.3	2.5	4.4	35	35	45	25	8.2	3.3	1.3	.4
17		1.3	2.5	41	47	32	45	25	7.7	3.0	1.3	.4
18		1.5	2.8	31	45	40	50	23	7.7	3.0	1.0	.4
19		1.5	3.1	53	42	42	56	21	7.2	3.0	.8	.3
20		1.5	3.4	40	40	46	60	21	6.7	3.0	.8	.3
21		1.7	3.4	32	38	49	56	19.7	6.7	3.0	.8	.3
22		1.7	3.4	66	36	52	56	18.3	6.2	3.0	.7	.3
23		1.9	3.4	319	35	55	56	18.3	6.2	3.0	.7	.4
24	.5	2.2	3.4	251	33	56	56	18.3	5.8	3.0	.7	.4
25		2.2	3.4	163	35	55	56	17.7	5.4	3.0	.7	.3
26		2.2	3.4	117	41	55	55	17.7	5.0	2.8	.6	.3
27			3.7	85	38	53	56	16.5	5.0	3.0	.7	.3
28			3.7	68	41	56	63	15.2	5.0	2.8	.7	.4
29		2.3	4.0	56	.....	61	64	14.6	5.0	2.6	.6	.3
30			4.0	49	.....	72	66	14.0	5.0	2.6	.6	.3
31		.....	4.0	42	.....	88	.....	13.4	.....	2.4	.6	.....

Daily discharge, in second-feet, of Simcoe Creek below Spring Creek near Fort Simcoe, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	.3	.4	1.4	3.5	10.3	10.0	15.4	22	5.2	1.5	0.2	0.2
2	.3	.4	1.4	3.5	10.2	10.0	15.4	21	4.8	1.7	.2	.2
3	.3	.5	1.3	3.5	10.0	10.0	14.9	21	4.2	2.2	.2	.1
4	.3	.6	1.4	3.5	9.9	10.0	14.9	19.9	3.8	2.2	.2	.1
5	.3	.6	1.3	3.4	9.7	10.0	14.9	19.9	3.8	2.4	.2	.1
6	.3	.6	1.3	3.4	9.6	10.0	15.4	22	3.8	1.8	.2	.1
7	.3	.6	1.4	3.4	9.4	11.0	15.4	23	3.8	1.8	.1	.1
8	.3	.7	1.4	3.3	8.9	11.0	16.6	24	3.5	2.7	.1	.1
9	.3	.6	1.5	3.3	9.0	11.0	17.8	25	4.2	2.4	.1	.1
10	.3	.6	1.5	3.2	9.0	11.0	17.8	26	3.8	1.8	.1	.1
11	.3	.7		3.2	9.1	11.0	17.8	24	3.8	1.3	.1	.1
12	.3	.7		3.5	9.2	11.0	18.4	19.9	3.8	1.4	.1	.1
13	.3	.8		3.7	9.3	14.3	21	18.4	3.8	.8	.1	.1
14	.3	.8		4.0	9.3	24	23	17.2	3.2	.8	.2	.2
15	.3	.8	1.5	4.3	9.4	24	24	16.0	3.2	.4	.1	.2
16	.3	.8		4.5	9.4	23	24	14.9	3.0	.4	.1	.2
17	.3	.8		4.8	9.4	22	23	13.7	3.0	.4	.1	.2
18	.3	.8		4.8	8.9	19.9	21	13.1	3.0	.4	.2	.2
19	.3	1.0		4.7	9.4	18.4	21	12.0	3.0	.3	.1	.1
20	.4	1.1	2.2	4.7	9.4	17.2	19.9	11.0	2.7	.3	.1	.1
21	.3	1.1	2.4	4.6	9.4	17.2	19.2	10.5	2.7	.3	.1	.1
22	.3	1.1	2.6	4.6	9.4	18.4	18.4	10.0	2.4	.3	.1	.1
23	.4	1.3	2.8	4.5	3.9	18.4	17.2	9.4	2.4	.2	.1	.1
24	.5	1.4	2.9	4.5	9.4	17.8	16.6	9.4	2.4	.3	.1	.2
25	.6	1.3	3.1		9.4	17.8	16.6	8.9	2.2	.3	.1	.2
26	.6	1.3	3.3		10.0	17.8	16.6	8.9	2.2	.2	.2	.2
27	.5	1.4	3.5	15	9.4	16.6	17.2	8.4	2.0	.2	.2	.1
28	.5	1.4	3.5		9.4	16.0	21	7.9	1.8	.2	.2	.1
29	.4	1.4	3.5		9.4	15.4	24	7.4	1.8	.2	.2	.1
30	.4	1.5	3.5		.....	15.4	24	7.4	2.0	.2	.2	.2
31	.4	.....	3.5	10.5	.....	15.4	.....	6.5	.....	.2	.2	.....

NOTE.—Recorder not operating Oct. 17 to Nov. 2, Nov. 27 to Dec. 8, 1918, Jan. 2-8, and 14, Dec. 10, 1919, to Feb. 14, 1920; daily discharge in above table for these periods interpolated; braced figures showing mean discharge for periods included, obtained by comparison with records of Toppenish Creek and from general information.

Monthly discharge of Simcoe Creek below Spring Creek, near Fort Simcoe, Wash., for the year ending Sept. 30, 1919.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	.....	0.2	0.35	22
November	.....	.....	1.36	80.9
December	4.0	.....	3.02	186
January	319	.....	47.8	2,940
February	47	25	35.4	1,970
March	88	32	50.6	3,110
April	106	45	64.6	3,840
May	68	13.4	31.0	1,910
June	12.3	5.0	7.84	467
July	5.0	2.4	3.43	211
August	2.2	.6	1.25	76.9
September	1.0	.3	.50	30
The year	319	.2	20.5	14,800

Combined monthly discharge of Simcoe Creek below Spring Creek and Simcoe Creek flume near Fort Simcoe, Wash., for the year ending Sept. 30, 1920.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Creek.			Flume (mean [a]).	Combined. (mean).	
	Maximum.	Minimum.	Mean.			
October	0.6	0.3	0.35	.....	0.35	21.5
November	1.5	.4	.90	.....	.90	53.6
December	3.5	.....	2.07	.....	2.07	127
January	.....	3.2	6.29	.....	6.29	387
February	10.3	8.9	9.43	.....	9.43	542
March	24	10.0	15.3	.....	15.3	941
April	24	14.9	18.7	.....	18.7	1,110
May	26	6.5	15.4	2.0	17.4	1,070
June	5.2	1.8	3.18	3.5	6.7	399
July	2.7	.2	.95	1.5	2.4	148
August	.2	.1	.15	.5	.6	36.9
September	.2	.1	.14	.4	.5	29.8
The year	26	.1	6.07	.....	6.70	4,870

[a] Estimated roughly from two discharge measurements (p. 258) and readings of the flume gage on Aug. 27 and Sept. 4.

RESERVATION DRAIN AT ALFALFA, WASH.

LOCATION.—In sec. 29, T. 10 N., R. 21 E., at highway bridge a quarter of a mile southeast of Alfalfa, Yakima County, and 2 miles above mouth of drain.

RECORDS AVAILABLE.—December 5, 1912, to September 30, 1920; miscellaneous measurements 1911 and 1912.

GAGE.—Vertical staff on right bank under highway bridge; read by Miss Nellie Ide and Mrs. M. Gelhart.

DISCHARGE MEASUREMENTS.—Made from footbridge 1,000 feet below gage.

CHANNEL AND CONTROL.—Bed composed of gravel. Shifting. Banks high. Current swift at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1919, 4.2 feet on September 5–12 (discharge, 457 second-feet); minimum stage recorded, 2.95 feet January 10 (discharge, 175 second-feet).

Maximum stage recorded during year ending September 30, 1920, 4.5 feet, June 16–18 (discharge, 546 second-feet); minimum stage recorded 2.9 feet March 1–31, April 1–7, 23–30; May 1, 2, and 5–8 (discharge, 190 second-feet).

1913–1920: Maximum stage recorded, 8.2 feet on January 2, 1918, from high-water mark (discharge estimated at 1,500 second-feet); minimum stage recorded, 1.8 feet July 3, August 12, 15–31, September 1–14, 19, 1915 (discharge, 145 second-feet).

ICE.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed frequently before October 15, 1919; fairly permanent after that date. Several rating curves used for short periods in 1919; well-defined curve used October 15, 1919, to September 30, 1920. Gage read once daily to quarter-tenths. Daily discharge ascertained by applying daily gage height to rating table, or by shifting-control method. Records excellent.

COOPERATION.—Some discharge measurements made by United States Office of Indian Affairs.

Reservation drain carries the return water from irrigation by the reservation canals and the underflow of Toppenish Valley. During the low-water period practically the whole flow of Toppenish Creek is carried into this channel by seepage.

Discharge measurements of Reservation drain at Alfalfa, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Oct. 26	Skillin and Henninger..	3.51	295	Aug. 20	Raleigh Skillin.....	3.73	367
Nov. 12	D. J. F. Calkins.....	3.22	232	Sept. 28	.....do.....	3.70	342
Dec. 28	Skillin and Richardson.	3.08	205	Oct. 15	.....do.....	3.66	349
1919.				1920.			
Jan. 28	.....do.....	3.02	207	Feb. 8	John McCombs.....	3.11	229
Mar. 18	Skillin and Clemans....	3.10	218	Mar. 23	Raleigh Skillin.....	2.90	191
Apr. 2	R. B. Kilgore.....	3.25	245	27	John McCombs.....	2.90	188
May 20	John McCombs.....	3.41	295	June 25	Raleigh Skillin.....	4.15	468
29	Raleigh Skillin.....	3.79	362	27	Lee, Skillin, and Paquette.	4.09	457
July 28	G. L. Parker.....	3.56	322				
29	Raleigh Skillin.....	3.48	311	Aug. 16	R. B. Kilgore.....	3.61	337

Daily discharge, in second-feet, of Reservation drain at Alfalfa, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	322	322	204	194	344	244	224	277	389	389	299	412
2	299	322	204	194	322	234	244	277	389	367	299	434
3	299	322	204	194	299	234	244	277	389	389	299	434
4	299	322	204	194	299	234	266	299	389	389	299	434
5	277	322	204	194	277	244	277	299	389	389	322	457
6	277	266	204	194	277	244	299	299	389	389	322	457
7	277	255	204	194	277	244	299	277	412	389	322	457
8	277	244	204	194	277	234	299	255	412	367	322	457
9	277	244	204	184	277	234	299	244	434	367	299	457
10	266	234	204	175	299	234	299	244	434	367	299	457
11	277	234	204	184	299	224	277	266	434	367	322	457
12	266	234	204	184	299	224	277	266	434	367	322	457
13	266	234	204	184	299	224	255	266	412	367	322	434
14	255	234	204	194	277	224	255	266	412	367	322	434
15	266	244	204	194	277	224	244	266	412	367	344	434
16	266	244	204	184	277	224	255	255	412	367	344	412
17	277	224	204	184	277	214	266	266	412	367	344	412
18	299	224	204	194	299	214	266	277	389	367	344	412
19	299	214	204	194	299	214	266	277	389	367	344	412
20	299	214	204	204	277	194	255	299	389	367	367	389
21	277	214	204	214	266	194	255	299	389	367	367	389
22	277	214	204	224	255	194	266	299	412	367	367	367
23	277	214	194	234	255	194	266	299	412	367	367	367
24	277	214	204	266	255	184	277	322	412	344	367	367
25	277	214	194	322	255	194	277	344	389	344	389	344
26	299	214	194	434	255	194	266	344	412	322	389	344
27	322	214	204	434	244	194	266	344	412	344	389	344
28	322	214	204	204	244	204	266	344	389	322	389	322
29	322	214	204	299	.....	194	266	367	434	322	412	322
30	322	204	204	367	.....	214	277	367	434	299	412	322
31	322	.....	194	344	.....	224	.....	389	.....	299	412	.....

Daily discharge, in second-feet, of Reservation drain at Alfalfa, Wash., for the years ending Sept. 30, 1919 and 1920—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.												
1	344	251	240	230	230	190	190	190	339	407	385	430
2	344	262	240	230	230	190	190	190	339	407	385	430
3	344	251	230	230	230	190	190	210	317	385	385	430
4	344	262	230	220	230	190	190	210	339	385	385	430
5	367	262	230	220	230	190	190	190	385	385	385	430
6	367	273	220	220	230	190	190	190	385	385	385	430
7	367	273	210	210	230	190	190	190	385	362	339	430
8	367	273	210	210	230	190	210	190	407	362	339	430
9	367	273	210	210	230	190	210	200	430	385	339	430
10	367	262	210	210	230	190	210	210	430	385	362	430
11	367	262	210	210	230	190	210	230	430	385	339	452
12	367	262	210	210	230	190	210	230	452	407	339	452
13	367	262	210	210	220	190	210	210	452	407	339	475
14	344	273	210	210	220	190	210	210	475	430	339	499
15	344	273	210	210	220	190	210	220	499	430	339	499
16	339	273	200	210	220	190	210	220	546	452	339	475
17	339	251	210	230	210	190	210	220	546	430	339	475
18	339	262	210	240	210	190	210	230	546	430	339	475
19	339	262	210	240	210	190	210	251	522	430	339	475
20	339	251	210	230	210	190	210	251	522	430	339	452
21	339	251	210	230	210	190	210	273	522	430	339	452
22	317	251	210	230	210	190	200	273	475	430	339	430
23	317	251	210	230	210	190	190	284	475	430	362	475
24	295	251	220	230	210	190	190	284	475	430	362	475
25	295	251	230	230	210	190	190	295	475	430	362	452
26	284	251	230	230	210	190	190	273	452	452	385	430
27	273	251	230	230	210	190	190	273	452	430	385	430
28	295	251	230	230	200	190	190	284	430	430	385	407
29	262	251	230	230	200	190	190	295	430	407	407	430
30	262	251	230	230	.....	190	190	295	430	385	430	430
31	262	.....	230	230	.....	190	.....	317	.....	385	430	.....

Monthly discharge of Reservation drain at Alfalfa, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918-19.				
October	322	255	288	17,700
November	322	204	243	14,500
December	204	194	203	12,500
January	434	175	231	14,200
February	344	244	281	15,600
March	244	184	218	13,400
April	299	224	268	15,900
May	389	244	296	18,200
June	434	389	407	24,200
July	389	299	360	22,100
August	412	299	346	21,300
September	457	322	407	24,200
The year	457	175	295	214,000
1919-20.				
October	367	262	331	20,400
November	273	251	259	15,400
December	240	200	219	13,500
January	240	210	223	13,700
February	230	200	219	12,600
March	190	190	190	11,700
April	210	190	200	11,900
May	317	190	238	14,600
June	546	317	445	26,500
July	452	362	410	25,200
August	430	339	363	22,300
September	499	407	448	26,700
The year	546	190	295	214,000

SATUS CREEK BELOW DRY CREEK, NEAR TOPPENISH, WASH.

LOCATION.—In sec. 24, T. 9 N., R. 19 E., at dam site 1 mile below mouth of Dry Creek and 9 miles southwest of Toppenish, Yakima County.

DRAINAGE AREA.—427 square miles (measured on topographic maps and map of Yakima Indian Reservation).

RECORDS AVAILABLE.—June 22, 1913, to September 30, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank; inspected by H. E. Larimore, E. L. May, and C. L. Walker.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel; shifting. Stage of zero flow, according to measurements made July 27, 1919, gage height 0.9 ± 0.1 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1919, 7 feet January 23, from high-water mark (discharge, 2,160 second-feet); minimum stage, from water-stage recorder, 1.50 feet at 11 p. m. August 26 (discharge, 10 second-feet).

Maximum stage during year ending September 30, 1920, from recorder, 3.67 feet at 3 a. m. March 14 (discharge, 548 second-feet); minimum stage, from recorder, 1.38 feet at midnight August 22, 23, 24 (discharge, 8 second-feet).

1913–1920: Maximum stage recorded, 9.15 feet December 22, 1915, from high-water mark in well (discharge 3,870 second-feet); minimum stage recorded, 0.28 foot at 10 p. m. August 28 and 4 a. m. August 30, 1915 (discharge, 6.6 second-feet).

ICE.—Stage-discharge relation affected by ice; flow estimated from gage-height record, discharge measurements, observer's notes, and weather records.

DIVERSIONS.—Entire flow of Satus Creek above Lazy Creek is diverted for irrigation during July and August; records for low-water summer months show run-off of Lazy and Dry creeks and seepage return from upper Satus.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water January 23, 1919, and a slight change occurred probably April 8–30, 1920. Rating curve used prior to January 24, 1919, and curve used January 24, 1919, to April 8, 1920, well defined; rating curve used after April 30, 1920, fairly well defined. Operation of water-stage recorder unsatisfactory through several long periods as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table the daily mean gage height determined from recorder graph by inspection. Records good except during breaks in gage-height record, for which they are fair.

Discharge measurements of Satus Creek below Dry Creek, near Toppenish, Wash., during the years ending Sept. 30, 1919 and 1920.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1919.		*Feet.*	*Sec.-ft.*
Nov. 11	D. J. F. Calkins	1.58	32.1	July 27	G. L. Parker	1.60	16.1
1919.				1920.			
Apr. 1	R. B. Kilgore	3.44	475	Feb. 5	McCombs and Walker	2.37	141
May 19	John McCombs	2.30	155	Mar. 27	do	2.21	108
26	do	2.63	210	June 26	Lee and Walker	1.65	24.6
July 25	G. L. Parker	1.59	15.5				

Daily discharge, in second-feet, of Satus Creek below Dry Creek, near Toppenish, Wash., for the years ending Sept. 30, 1919 and 1920.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1918-19.												
1	16	23	32		256	157	476		136	36	16	13
2	16	24	30		229	347	459		129	35	16	14
3	16	25	34		206	435	442		129	33	17	14
4	17	26	39		203	354	530		122	30	18	14
5	16	27	42		192	289	494		118	28	17	15
				30				270				
6	17	27	43		176	250	459		115	28	15	16
7	16	26			168	229	408		106	27	14	17
8	16	26			162	206	363		102	26	14	17
9		25			184	195	335		96	25	14	18
10		25			238	181	341		96	24	14	17
			50									
11	15	32		37		173	348	187	89	24	13	21
12		32		37		168	314	184	85	22	13	23
13		32		37		168	295	170	81	22	13	22
14		32		36	220	165	274	165	74	21	13	21
15		34		35		170	256	162	72	19	14	20
16		48		37		154	247	159	68	19	13	20
17		45		670		152	304	154	66	18	13	19
18		43		1,140		418	408	146	61	18	13	19
19		41		849		494	373	146	59	18	12	18
20	20	39		522	190	442	363		58	17	12	18
21		39	60	370		418	344		54	15	12	18
22		38		600		402	323	180	52	15	11	18
23	18	37		1,800		389	307		52	15	12	19
24	18	35		1,300	139	389	298		51	15	12	18
25	19	35		800	136	351			46	15	11	18
26	19	33		600	152	344		212	42	18	11	18
27	19	32	43		152	357	350	229	42	17	12	18
28	27	33	45		146	386		227	42	17	12	21
29	27	32	48	400	.....	425		201	41	16	12	22
30	23	32	42		.....	476		168	38	16	12	22
31	23	.....	28		.....	494	.....	146	.....	16	13	.....
1919-20.												
1	23	46				59	89	115	48	18	8.5	11
2	26	52				58	89	108	46	17	8.5	11
3	25	56			150	56	87	104	43	16	8.2	10
4	25	59				54	81	102	40	16	8.2	9.9
5	24	61			146	54	83	102	42	15	8.5	9.9
6	23	54			108	54	85	102	40	14	8.8	10
7	23	51			104	56	83	113	43	13	8.8	10
8	22	48			101	54	96	127	54	12	8.8	10
9	24	46			98	61	107	150	50	11	9.6	10
10	25	45			95	66	124	134	42	11	9.6	11
11	26	45			92	68	148	122	40	10	9.6	11
12	25	45			89	70	160	117	36	11	9.6	11
13	25	45			86	158	177	117	38	11	9.2	13
14	25	45			83	421	182	117	39	11	8.5	15
15	25	45			79	253	183	113	39	9.9	8.5	16
			50	120								
16	25	45			76	203	183	97	35	9.2	8.8	13
17	24	52			74	170	165	89	34	9.6	8.5	12
18	25	51			73	154	148	85	34	9.9	8.8	10
19	27	46			71	139	149	81	32	9.9	9.6	10
20	28	46			69	132	146	79	28	9.6	9.2	9.9
21	30	45			68	146	135	71	28	9.9	8.8	11
22	32	43			66	170	128	66	26	9.9	8.5	11
23	34	45			64	144	121	64	26	9.6	8.2	13
24	34	45			63	127	117	62	25	8.8	8.2	13
25	35	45			61	122	111	58	24	9.6	9.6	13
26	36	42			58	118	111	54	23	9.2	11	12
27	39	39			51	108	125	54	22	9.2	10	11
28	41				49	104	144	54	21	8.8	11	11
29	42	40			52	98	131	48	21	8.8	12	11
30	42				.....	96	124	51	20	8.5	12	11
31	42	.....			.....	89	.....	50	.....	8.5	12	.....

NOTE.—Recorder not operating Oct. 9–22, Nov. 4, Dec. 7–26, 1918; Jan. 1–10, 22–31, Feb. 11–23, Apr. 25 to May 10, May 20–25, Nov. 28 to Dec. 31, 1919; Jan. 1 to Feb. 4, Feb. 8–13, and 17–24, 1920. Discharge Jan. 23, 1919, based on observer's record of flood crest and ratio of daily mean discharge to crest discharge of Toppenish Creek on same day; Feb. 8–13 and 17–24, 1920, obtained by interpolation; discharge for other periods of no gage-height record ascertained by comparison with records of flow of Toppenish Creek. Braced figures show mean discharge for periods included.

Monthly discharge of Satus Creek below Dry Creek, near Toppenish, Wash., for the years ending Sept. 30, 1919 and 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1918–19.				
October	27	.....	18.3	1,130
November	48	23	32.6	1,940
December	.....	28	49.5	3,040
January	1,800	.....	360	22,100
February	256	.....	192	10,700
March	494	152	309	19,000
April	530	247	362	21,500
May	.....	.....	208	12,800
June	136	38	77.4	4,610
July	36	15	21.5	1,320
August	18	11	13.4	824
September	23	13	18.3	1,090
The year	1,800	11	138	100,000
1919–20.				
October	42	22	29.1	1,790
November	61	.....	46.9	2,790
December	.....	.....	50.0	3,070
January	.....	.....	120	7,380
February	.....	49	88.8	5,110
March	421	54	118	7,260
April	133	81	127	7,560
May	150	48	90.5	5,560
June	54	20	34.6	2,060
July	18	8.5	11.1	682
August	12	8.2	9.33	574
September	16	9.9	11.4	678
The year	421	8.2	61.3	44,500

MISCELLANEOUS DISCHARGE MEASUREMENTS.

In addition to the records of stream flow obtained at gaging stations and reported in the preceding pages, measurements of flow were made at a number of other points, as shown by the following table:

Miscellaneous discharge measurements in drainage basins in Washington during the years ending Sept. 30, 1919 and 1920.

Chehalis River basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
1920.				*Feet.*	*Sec.-ft.*
July 7	Black River	Chehalis River	Below Beaver Creek at Little Rock, Wash.	.....	50.4
7	.....do	.....do	.....do	.....	50.0
Aug. 14	.....do	.....do	.....do	.....	26.9
Sept. 12	.....do	.....do	.....do	.....	152
July 7	Dempsey Creek	Black River	Highway bridge ¾ mile above mouth, Wash.	.....	[a] 3.0
Aug. 15	.....do	.....do	.....do	.....	[a] .2
Sept. 13	.....do	.....do	.....do	.....	[a] 7.5
July 8	Salmon Creek	.....do	Highway bridge on main road between Olympia and Little Rock, Wash.	.....	.9
Aug. 15	.....do	.....do	.....do	.....	.9
Sept. 13	.....do	.....do	.....do	.....	3.9
July 8	Waddles Creek	.....do	Highway bridge ¼ mile above mouth, at Little Rock, Wash.	.....	5.3
Aug. 14	.....do	.....do	.....do	.....	Dry.
Sept. 12	.....do	.....do	.....do	.....	88.4
July 7	Beaver Creek	.....do	½ mile above mouth, at Little Rock, Wash.	.....	8.6
7	.....do	.....do	.....do	.....	8.9
Aug. 14	.....do	.....do	.....do	.....	5.5
Sept. 12	.....do	.....do	.....do	.....	10.2
July 7	Mima Creek	.....do	Highway bridge 1 mile above mouth, Wash.	.....	4.9
7	.....do	.....do	.....do	.....	4.8
Aug. 14	.....do	.....do	.....do	.....	1.4
Sept. 20	.....do	.....do	.....do	.....	15.1

[a] Velocity estimated by means of floats.

Miscellaneous discharge measurements in drainage basins in Washington during the years ending Sept. 30, 1919 and 1920—Continued.

Skokomish River basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
1920.				*Feet.*	*Sec.-ft.*
June 1	Skokomish River	Hood canal	Olympic Highway bridge near Union, Wash.		824
15	do	do	do		2,420
Sept. 24	do	do	do		2,300
30	do	do	do		1,400
1919.					
July 5	South Fork of Skokomish River.	Skokomish River	200 feet below Brown Creek, Wash.		261

Nisqually River basin.

1920.					
Jan. 15	Nisqually River	Puget Sound	Trail suspension bridge at Longmire, Wash.		72.0
15	do	do	Former gaging station near Ashford, Wash.		242
14	Paradise River	Nisqually River	Just below Tatoosh Creek, near Longmire, Wash.		19.8
Aug. 9	Little Nisqually River.	do	Gaging station at mouth, Wash.	1.08	11.5
Sept. 16	do	do	do	2.07	150
21	do	do	do	1.85	112

Snohomish River basin.

Sept. 19[b]	Miller Creek	South Fork of Skykomish River.	Former gaging station at Miller River, Wash.	2.01	187
				2.01	187
17	Tate Creek	North Fork of Snoqualmie River.	At mouth, Wash.		8.8

Skagit River basin.

1918.					
Nov. 2[c]	Thunder Creek	Skagit River	Gaging station ¼ mile above mouth, Wash.	4.31	383
6[c]	do	do	do	3.97	240
11[c]	do	do	do	4.18	297
1919.					
Feb. 13[c]	do	do	do	3.50	168
18[c]	do	do	do	3.50	129
Mar. 6[c]	do	do	do	3.29	118
Apr. 21[c]	do	do	do	4.92	468
28[c]	do	do	do	5.75	845
June 15	do	do	do	5.62	757
15	do	do	do	5.57	763
July 23[c]	do	do	do	6.68	1,600
Oct. 3[c]	do	do	do	3.63	204
1920.					
Mar. 26[c]	do	do	do	3.56	170
July 10	do	do	do	7.40	2,040
1918.					
Nov. 7[c]	Stetattle Creek	do	Gaging station 500 feet above mouth, Wash.	1.40	69
1919.					
Feb. 24[c]	do	do	do	.69	34
Mar. 10[c]	do	do	do	.57	26
June 24[c]	do	do	do	2.80	392
July 28[c]	do	do	do	1.82	221
28[c]	do	do	do	2.18	317
Sept. 27[c]	do	do	do	.83	51

[b] Furnished by Stone & Webster Engineering Corporation.
[c] Furnished by city of Seattle.

Miscellaneous discharge measurements in drainage basins in Washington during the years ending Sept. 30, 1919 and 1920—Continued.

Skagit River basin—Continued.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
1920.					
Mar. 29[c]	Stetattle Creek	Skagit River	Gaging station 500 feet above mouth, Wash.	.73	45
July 11	do	do	do	1.97	281
1918.					
Oct. 22[c]	Newhalem Creek	do	Gaging station ¼ mile above mouth, Wash.	8.70	77
1919.					
Feb. 25[c]	do	do	do	8.58	64
Mar. 13[c]	do	do	do	8.30	40
July 22[c]	do	do	do	9.91	302
Aug. 6[c]	do	do	do	9.46	173
Sept. 26[c]	do	do	do	8.53	49
1920.					
Mar. 29[c]	do	do	do	8.59	55
1919.					
Oct. 19	Whitechuck River	Sauk River	Gaging station about 4½ miles above mouth, Wash.	1.15	157
22	do	do	do	1.57	239
1920.					
July 18	do	do	do	3.58	867
18	do	do	do	3.71	988
22	do	do	do	2.88	594
22	do	do	do	2.97	589
Sept. 29	do	do	do	2.39	458
1919.					
Sept. 25[d]	Clear Creek	do	300 feet above mouth, Wash.	0.65	229

[c] Furnished by city of Seattle.

[d] Furnished by Nicolai Aall.

Nooksack River basin.

1920.					
Aug. 26	Nooksack River	Bellingham Bay	Gaging station at highway bridge at Excelsior, Wash.	1.93	7.2
Sept. 1	do	do	do	1.50	4.4
Aug. 31	do	do	Railway bridge at Warnick, Wash.		686
Sept. 1	Glacier Creek	Nooksack River	Railway bridge ½ mile above mouth, Wash.		148
Aug. 29	Middle Fork of Nooksack River.	do	Gaging station at highway bridge 4 miles above mouth, Wash.	3.15	1,360
31	do	do	do	1.58	244
Sept. 1	do	do	do	1.70	283
Aug. 30	South Fork of Nooksack River.	do	Gaging station at Saxon Bridge, Wash.	3.47	432
31	do	do	do	3.24	293
Sept. 2	do	do	do	2.97	180
2	Skookum Creek	South Fork of Nooksack River.	Highway bridge at mouth, Wash.	.....	35.0

Kootenai River basin.

1919.					
Mar. 20	Lake Creek	Kootenai River	Bridge 1,000 feet below gage near Troy, Mont.	2.15	277

Clark Fork basin.

1918.					
Nov. 20	Swan River	Flathead Lake	Big Fork, Mont.	394.30	504
1919.					
Mar. 22	do	do	do	394.20	490

Miscellaneous discharge measurements in drainage basins in Washington during the years ending Sept. 30, 1919 and 1920—Continued.

Stranger Creek basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
1920. May 17	Stranger Creek	Columbia River	Former gaging station at Inchelium, Wash.	0.55	11.2

Kettle River drainage basin.

1919. May 9	Lambert Creek	Curlew Creek	At mouth, Wash.		5.2
1920. Apr. 8	do	do	do		.7
May 14	do	do	do		5.1

Spokane River basin.

1920. July 30 *e*	Coeur d' Alene River	Coeur d'Alene Lake	Gaging station near Cataldo, Idaho.	2,138.00	606
Aug. 4	do	do	do	2,137.84	508
28	do	do	do	2,137.91	402
Sept. 23	do	do	do	2,137.87	540
June 7	Little Spokane River	Spokane River	Mouth, Wash.		402
Aug. 2 *e*	do	do	do		379

e Furnished by Washington Water Power Co.

Sanpoil River basin.

1920. Sept. 9	Lost Creek	West Fork of Sanpoil River.	Gaging station 1,200 feet below Sheep Creek, near Aeneas, Wash.	0.44	2.0

Nespelem River basin.

1920. Sept. 29	Nespelem River	Columbia River	Dam site at headworks of Nespelem canal, Wash.		5.3
30	do	do	do		5.9

Okanogan River basin.

1919. May 13	Okanogan River	Columbia River	Highway bridge at Oroville, Wash.		630
1920. Sept. 4	do	do	do		307
9	Bonaparte Creek	Okanogan River	Gaging station ¼ mile below headgate of Anglin ditch, near Anglin, Wash.	2.13	.1
June 4	Sinlahekin Creek	Similkameen River	Just below proposed Blue Lake diversion, Wash.		3.6
4	do	do	Former gaging station at Garrett ranch, near Loomis, Wash.		3.8
8	do	do	do		6.7
9	do	do	do		6.0
1919. May 12	West Okanogan Valley irrigation district canal.	do	500 feet below headgate 2¼ miles below Nighthawk, Wash.		106
Aug. 19	do	do	Opposite gage on Similkameen River, near Oroville, Wash.		114
1920. Sept. 5	do	do	do		108
June 4	Barnes and Wilder ditches.	Sinlahekin Creek	Head at Blue Lake near Loomis, Wash.		4.0
8	do	do	do		3.6
9	do	do	do		3.6
July 31	Whitestone irrigation district canal.	Right side of Toats Coulee Creek ¼ mile below gage.	Intake, Wash.	21	3.4

Miscellaneous discharge measurements in drainage basins in Washington during the years ending Sept. 30, 1919 and 1920—Continued.

Methow River basin.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
1919.					
Aug. 13	Methow River	Columbia River	¼ mile above Chewack Creek, Wash.		403
Oct. 2	do	do	do	0.70	169
Aug. 13	Chewack Creek	Methow River	Highway bridge at Winthrop, Wash.	1.34	127
Oct. 2	do	do	do	1.06	72.5
1918.					
Oct. 2	Twisp River	do	½ mile above mouth of North Creek, Wash.	.43	5.6
1919.					
Aug. 11	do	do	6 miles above mouth, above all diversions, Wash.		187
Aug. 11	do	do	Mouth, Wash		113
1920.					
Sept. 22	Falls Creek	Chewack Creek	400 feet above mouth, above Falls Creek ditch, Wash.		7.5
22	Eight-mile Creek	do	300 feet above mouth, Wash.		13.8
June 17	Boulder Creek	do	1,000 feet above mouth, Wash		35.3
30	do	do	do		26.2
Sept. 24	do	do	400 feet above mouth, Wash.		6.7
1919.					
Aug. 13	Foghorn ditch	Methow River about 3 miles above Chewack Creek.	Above all laterals, ½ mile below intake, Wash.		30.5
13	Banker-Wetzell ditch	Right side Methow River.	Intake at Wolf Creek, Wash.		6.0
13	Jones ditch	Left side of Chewack Creek about 7 miles above mouth.	½ mile below intake, Wash.		1.2
13	Chewack ditch	Left side of Chewack Creek about 6½ miles above mouth.	Above all laterals, 5.9 miles above Winthrop, Wash.		43.0
11	Burke-Lehman ditch	Left side of Twisp River about 6 miles above mouth.	Above all laterals, 1 mile below intake, Wash		14.1
11	Methow Valley irrigation district canal.	Right side of Twisp River about 4½ miles above mouth.	½ mile below intake, Wash		51.2
1920.					
June 13	do	do	Gaging station 3 miles below headworks, at Twisp, Wash.	2.56	46.4
15	do	do	do	2.62	48.3
29	do	do	do	2.59	50.0
Aug. 24	do	do	do	2.24	41.2
28	do	do	do	1.82	31.5
28	do	do	do	.84	13.5
Sept. 21	do	do	do	1.83	33.2
24	do	do	do	1.85	34.1
1919.					
Aug. 11	Klinkert-Staples ditch	Right side of Twisp River 3½ miles above mouth.	Intake, Wash		4.4
12	Byrne's or North Side ditch.	Left side of Twisp River 2 miles above mouth.	400 feet below intake, Wash.		4.1
11	Risley ditch	Right side of Twisp River ½ mile above mouth.	⅛ mile below intake, Wash		9.0
1920.					
June 15	do	do	Gaging station ½ mile below intake, at Twisp, Wash.	4.55	6.2
18	do	do	do	4.43	5.0
29	do	do	do	4.52	6.4
Aug. 24	do	do	do	4.39	8.2
29	do	do	do	4.48	9.7
Sept. 21	do	do	do	4.73	12.0
25	do	do	do	4.46	9.2

Miscellaneous discharge measurements in drainage basins in Washington during the years ending Sept. 30, 1919 and 1920—Continued.

Methow River basin—Continued.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
1919.				*Feet.*	*Sec.-ft.*
Aug. 14	Barclay ditch	Left side of Methow River about 2 miles Chewack Creek.	½ mile below intake, Wash.		27.1
14	Bolinger ditch	Right side of Methow River about 2 miles above Methow, Wash.	do		4.9
15	Steiner's canal	Left side of Methow River ¾ mile above Okanogan Valley Power Co.'s plant.	¾ mile below intake, opposite power plant, Wash.		11.0
15	Larraby ditch	Left side of Methow River above 5½ miles above mouth.	Lower end of siphon crossing of Methow River, Wash.		1.7
15	Starr canal	Right side of Methow River 3½ miles above mouth.	½ mile below intake, Wash.		13.2
15	Parker ditch	Conduit to Okanogan Valley Power Co.'s plant, 2½ miles above mouth of Methow River.	Above laterals, 800 feet below power house, Wash.		3.0

Chelan River basin.

1919. Aug. 4	Domke Creek	Lake Chelan	Proposed dam site at outlet of Domke Lake near Lucerne, Wash.		22.2

Yakima River basin.

1920. May 7f	Selah Valley canal	Naches River	Stump waste near Naches, Wash.	3.17	116
June 4f	do	do	do	3.21	119
July 8f	do	do	do	1.25	23.1
21f	do	do	do	3.17	113
Sept. 16f	do	do	do	3.12	110
29f	do	do	do	2.91	99.6
June 25	Abe Lincoln ditch	Toppenish Creek	Gaging station at head, Wash	2.51	13.9
Aug. 15	do	do	do	1.80	5.0
June 25	Simcoe Creek flume	Simcoe Creek	Gaging station near headworks, Wash.	.82	3.4
Aug. 15	do	do	do	.30	.4
14	Spring Creek	do	Mouth, Wash		.2

f Furnished by U. S. Reclamation Service.

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