DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

WATER-SUPPLY PAPER 552

SURFACE WATER SUPPLY OF THE UNITED STATES

1922

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
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SURFACE WATER SUPPLY OF PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN, 1922.

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 year ending September 30, 1922.

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

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 relating to irrigation in the arid West. Since the fiscal year ending June 30, 1895, successive sundry civil bills passed by Congress have carried the following item and appropriations:

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

Annual appropriations for the fiscal years ending June 30, 1895–1923.

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
1921 to 1923, inclusive	180, 000. 00

In this work many private and State organizations have cooperated, either by furnishing data 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 page 9.

Measurements of stream flow have been made at about 5,480 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1922, 1,540 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.

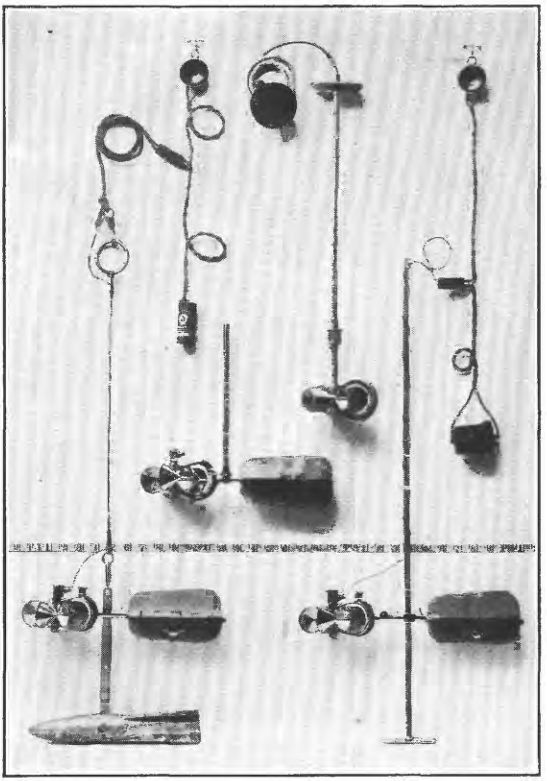
"Run-off in inches" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in inches.

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.

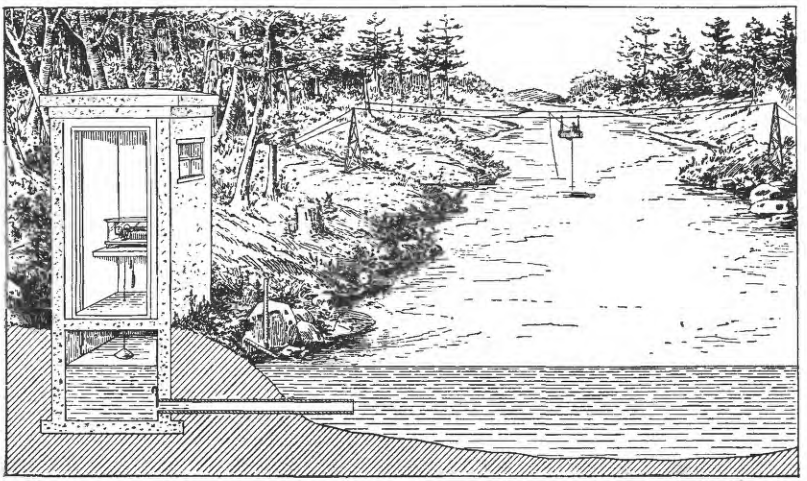
The following terms not in common use are here defined:

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

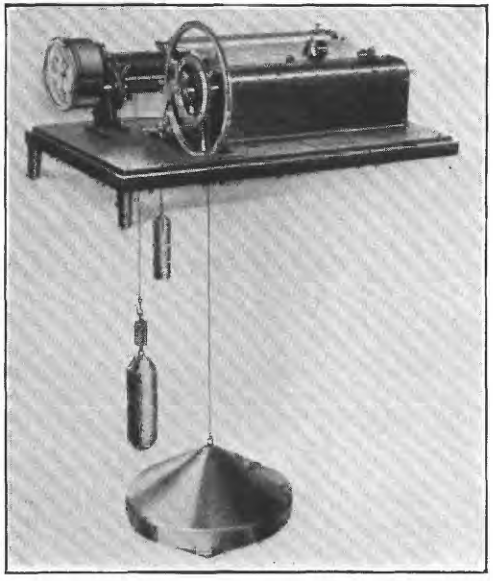
"Control," a term used to designate the section or sections of the stream below the gage which determine the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.



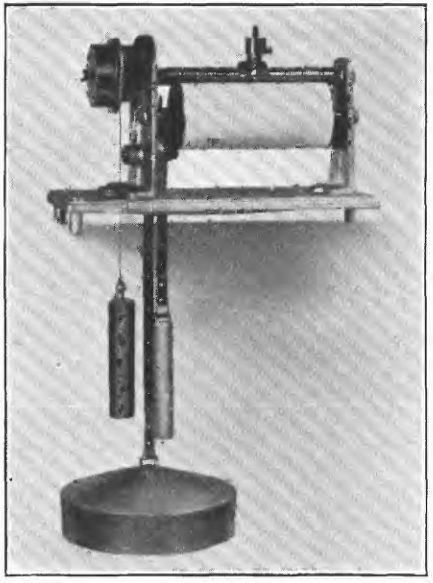
A. PRICE CURRENT METERS



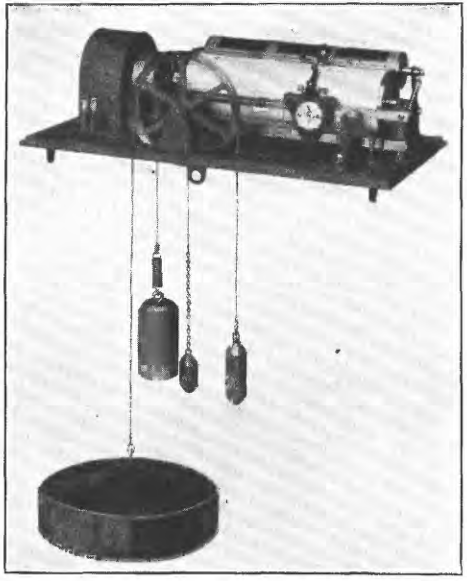
B. TYPICAL GAGING STATION



A



B



C

WATER-STAGE RECORDERS

A, Au; *B*, Gurley; *C*, Stevens

The "point of zero flow" for a given gaging station is that point on the gage—the gage height—at which water ceases to flow over the control.

EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1921, and ending September 30, 1922. At the beginning 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 a 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. (See Pls. I, II.) The general methods are outlined in standard textbooks on the measurement of river discharge.

From the discharge measurements, rating tables are prepared that give the discharge for any stage, and these rating tables, when applied to the gage heights, give the daily discharge from which the daily, monthly, and yearly means of discharge are determined.

The data presented for each gaging station in the area covered by this report comprise a description of the station, a table giving records of discharge measurements, a table showing the daily discharge of the stream, 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 height and records 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 control, 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, in general, 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 diurna fluctuation the discharge obtained from the rating table and the mean daily gage height may not be the true mean discharge for the day. If such stations are equipped with water-stage recorders the mean daily discharge is obtained by averaging discharge at regular intervals during the day or by using 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 given in the maximum 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" is 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 page 2 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 observation of stage, measurements of flow, and interpretation of records.

A paragraph in the description of the station gives information regarding (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 height to the rating table to obtain the daily discharge. For the rating tables "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 in inches may be subject to gross errors caused by the inclusion of 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. The computations 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.

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 table of daily discharge allows more detailed study 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 data previously published.

PUBLICATIONS.

Investigation of water resources by the United States Geological Survey has consisted in large part of measurements of the volume of flow of streams and studies of the conditions affecting that flow, but it has comprised also investigations of such closely allied subjects as irrigation, water storage, water powers, underground waters, and quality of waters. Most of the results of these investigations have been published in the series of water-supply papers, but some have appeared in the bulletins, professional papers, monographs, and annual reports.

The results of stream-flow measurements are now published annually in 12 parts, each part covering an area whose boundaries coincide with natural drainage features, as indicated below:

Part I. North Atlantic slope basins.
II. South Atlantic slope and eastern Gulf of Mexico basins.
III. Ohio River basin.
IV. St. Lawrence River basin.
V. Upper Mississippi River and Hudson Bay basins.
VI. Missouri River basin.
VII. Lower Mississippi River basin.
VIII. Western Gulf of Mexico basins.
IX. Colorado River basin.
X. Great Basin.
XI. Pacific slope basins in California.
XII. North Pacific slope basins; in three volumes:
A. Pacific slope basins in Washington and upper Columbia River basin.
B. Snake River basin.
C. Lower Columbia River basin and Pacific slope basins in Oregon.

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

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

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

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., 704 Journal Building.
Trenton, N. J., Statehouse
Asheville, N. C., 316 Jackson Building.
Chattanooga, Tenn., 37 Municipal Building.
Columbus, Ohio, Brown Hall, Ohio State University.
Chicago, Ill., 940 Transportation Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Ames, Iowa, 103 State Highway Commission Building
Rolla, Mo., Rolla Building, School of Mines and Metallurgy.
Topeka, Kans., 23 Federal Building.
Helena, Mont., 45–46 Federal Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Idaho Falls, Idaho, 228 Federal Building.
Boise, Idaho, Federal Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Calif., 328 Customhouse.
Los Angeles, Calif., 600 Federal Building.
Tucson, Ariz., 210 Agricultural Building, University of Arizona.
Austin, Tex., State Capitol.
Honolulu, Hawaii, 25 Capitol Building.

A list of the Geological Survey's publications may be obtained by applying to the Director of the United States Geological Survey, Washington, D. C.

Stream-flow records have been obtained at about 5,480 points in the United States, and the data obtained have been published in the reports tabulated on the following page.

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

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

Report	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	1895.
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	
W 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
W 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
W 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
W 28	Measurements, ratings, and gage heights, Arkansas River, and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
W 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
W 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
W 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
W 75	Monthly discharge	1901.
W 82 to 85	Complete data	1902.
W 97 to 100	do	1903.
W 124 to 135	do	1904.
W 165 to 178	do	1905.
W 201 to 214	do	1906.
W 241 to 252	do	1907–8.
W 261 to 272	do	1909.
W 281 to 292	do	1910.
W 301 to 312	do	1911.
W 321 to 332	do	1912.
W 351 to 362	do	1913.
W 381 to 394	do	1914.
W 401 to 414	do	1915.
W 431 to 444	do	1916.
W 451 to 464	do	1917.
W 471 to 484	do	1918.
W 501 to 514	do	1919–20.
W 521 to 534	do	1921.
W 541 to 554	do	1922.

The records at most of the stations discussed in these reports extend over a series of years, and miscellaneous measurements at many points other than regular gaging stations have been made each year. An index of the reports containing records obtained prior to 1904 has been published in Water-Supply Paper 119.

The following table gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1922. The data for any particular station will, as a rule, be found in the reports covering the years during which the station was maintained. For example, data for Machias River at Whitneyville, Maine, 1903 to 1921, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, 351, 381, 401, 431, 451, 471, 501, and 521, which contain records for the New England streams from 1903 to 1921. Results of miscellaneous measurements are published by drainage basins.

Numbers of water-supply papers containing results of stream measurements, 1899–1922.

Year.	I North Atlantic slope basins (St. John River to York River).	II South Atlantic and eastern Gulf of Mexico (James River to the Mississippi).	III Ohio River basin.	IV St. Lawrence River and Great Lakes basins.	V Hudson Bay and upper Mississippi River basin.	VI Missouri River basin.	VII Lower Mississippi River basins.	VIII Western Gulf of Mexico basins.	IX Colorado River basin.	X Great Basin.	XI Pacific slope basins in California.	XII North Pacific slope basins.		
												Pacific slope basins in Washington and upper Columbia River.	Snake River basin.	Lower Columbia River and Pacific slope basins in Oregon.
1899 [a]	35	[b] 35, 36	36	36	36	[c] 36, 37	37	37	[d] [a] 37, 38	38, [e] 39	38, [f] 39	38	38	38
1900 [g]	47, [h] 48	48	48, [i] 49	49	49, [j] 50	49, [j] 50	50	50	50	51	51	51	51	51
1901	65, 75	65, 75	65, 75	65, 75	[k] 65, 66, 75	66, 75	[k] 65, 66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75
1902	82	[b] 82, 83	83	[l] 82, 83	[k] 83, 85	84	[k] 83, 84	84	85	85	85	85	85	85
1903	97	[b] 97, 98	98	97	[k] 98, 99, [m] 100	99	[k] 98, 99	99	100	100	100	100	100	100
1904	[n] 124, [o] 125 [p] 126	[p] 126, 127	128	129	[k] 128, 130	130, [q] 131	[k] 128, 131	132	133	133, [r] 134	134	135	135	135
1905	[n] 165, [o] 166 [p] 167	[p] 167, 168	169	170	171	172	[k] 169, 173	174	175, [s] 177	176, [r] 177	177	178	178	[t] 177, 178
1906	[n] 201, [o] 202 [p] 203	[p] 203, 204	205	206	207	208	[k] 205, 209	210	211	212, [r] 213	213	214	214	214
1907–8	241	242	243	244	245	246	247	248	249	250, [r] 251	251	252	252	252
1909	261	262	263	264	265	266	267	268	269	270, [r] 271	271	272	272	272
1910	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911	301	302	303	304	305	306	307	308	309	310	311	312	312	312
1912	321	322	323	324	325	326	327	328	329	330	331	332–A	332–B	332–C
1913	351	352	353	354	355	356	357	358	359	360	361	362–A	362–B	362–C
1914	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919–20	501	502	503	504	505	506	507	508	509	510	511	512	513	514
1921	521	522	523	524	525	526	527	528	529	530	531	532	533	534
1922	541	542	543	544	545	546	547	548	549	550	551	552	553	554

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Tables of monthly discharge for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and Kern rivers and south Pacific slope basins.
[g] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables of monthly discharge for 1900 in Twenty-second Annual Report, Part IV.
[h] Wissahickon and Schuylkill rivers to James River.
[i] Scioto River.
[j] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[k] Tributaries of Mississippi from east.
[l] Lake Ontario and tributaries to St. Lawrence River proper.
[m] Hudson Bay only.
[n] New England rivers only.
[o] Hudson River to Delaware River, inclusive.
[p] Susquehanna River to Yadkin River, inclusive.
[q] Platte and Kansas rivers.
[r] Great Basin in California except Truckee and Carson river basins.
[s] Below junction with Gila.
[t] Rogue, Umpqua, and Siletz rivers only.

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 act appropriating money.

Work in Washington was carried on in cooperation with the Department of Conservation and Development, Dan A. Scott, director. Cooperative relations were administered by Marvin Chase, supervisor of hydraulics.

Acknowledgments are due to C. S. Heidel, State engineer of Montana, and to W. G. Swendsen, commissioner of reclamation of Idaho, for cooperation in their respective States.

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Acknowledgment is made in the description of gaging station to those who furnished gage-height records, discharge measurements, and equipment.

DIVISION OF WORK.

The data for stations in Washington were collected and prepared for publication under the direction of G. L. Parker, district engineer, assisted by J. E. Stewart, D. J. Calkins, R. B. Kilgore, John McCombs, A. C. Baldwin, C. C. Osborne, J. M. Rogers, and A. R. Haynes.

The 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, E. L. Grant, G. H. Ellis, and Lois H. Hershner.

The data for stations in the Yakima basin, exclusive of stations in Yakima Indian Reservation, were collected and results computed by Paul Taylor, engineer in charge of hydrometric work, United States Bureau of Reclamation, assisted by D. E. Ball and R. O. Crawford.

The manuscript was assembled and reviewed by I. J. Dirzulaitis.

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 December 21, 1922, when station was discontinued.

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. For description of previous gages see Water-Supply Paper 512.

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 above gage height about 20 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1, 1921, to December 21, 1922, from water-stage recorder, 16.3 feet at 5 p. m. December 12, 1921 (discharge, 37,000 second-feet); minimum stage from recorder, 1.30 feet from 1 a. m. to 1 p. m. September 21 (discharge, 560 second-feet).

1911–1922: Maximum stage recorded that of December 12, 1921; minimum stage recorded, 0.1 foot at 7 a. m. October 1, 1915 (discharge, 395 second-feet).

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

DIVERSIONS.—None.

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

ACCURACY.—Stage-discharge relation permanent; affected by drift November 24–26, 1921, and December 19–21, 1922. Rating curve well defined. Operation of water-stage recorder satisfactory. Discharge ascertained by applying to rating table 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.

Discharge measurements of Quinault River at Quinault Lake, Wash., during the period Oct. 1, 1921, to Dec. 21, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Aug. 4	1.71	792
Dec. 21	4.08	3,380

Daily discharge, in second-feet, of Quinault River at Quinault Lake, Wash., for the period Oct. 1, 1921, to Dec. 21, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1921-22.												
1	3,330	8,900	14,300	1,510	1,030	998	1,310	1,680	4,820	2,620	856	744
2	2,760	6,750	10,600	1,560	982	966	1,410	1,850	5,390	2,550	828	821
3	2,350	5,200	7,360	1,460	966	1,050	1,850	2,570	5,580	2,620	821	807
4	2,090	4,550	5,770	1,410	982	1,160	2,090	4,370	5,960	2,690	807	958
5	1,850	4,460	4,820	1,460	982	1,180	2,090	4,640	5,580	2,620	793	1,080
6	1,730	5,010	4,370	1,410	1,160	1,140	1,970	4,200	5,010	2,480	779	1,060
7	1,560	6,350	3,950	1,360	1,850	1,140	1,970	3,630	4,280	2,350	758	1,080
8	1,510	5,200	3,630	1,410	2,090	1,110	2,030	3,180	3,790	2,220	730	1,040
9	1,410	4,280	3,630	1,620	1,970	1,090	1,970	2,760	3,480	2,090	724	950
10	1,310	3,630	6,520	1,850	1,850	1,110	1,970	2,420	3,400	2,090	786	878
11	1,230	3,180	19,800	1,790	1,620	1,100	2,030	2,160	3,260	1,850	966	828
12	1,200	2,900	31,500	1,680	1,510	1,130	1,910	1,970	3,260	1,730	1,140	779
13	1,500	2,620	25,000	1,560	1,410	1,180	1,790	1,910	3,400	1,680	1,170	730
14	3,550	2,550	13,900	1,510	1,270	1,190	1,730	2,160	2,560	1,620	1,090	682
15	7,520	2,550	8,900	1,410	1,210	1,180	1,730	2,830	3,480	1,510	998	670
16	11,300	2,420	6,550	1,360	1,510	1,140	1,620	4,030	3,260	1,410	926	646
17	12,100	2,280	5,200	1,270	2,480	1,110	1,560	5,200	3,110	1,310	849	616
18	9,620	2,160	4,200	1,180	2,900	1,190	1,460	5,390	3,040	1,280	807	605
19	7,570	2,090	3,560	1,110	2,830	1,360	1,410	4,820	2,970	1,230	786	580
20	6,950	2,090	3,110	1,080	2,480	1,360	1,360	3,950	3,040	1,200	835	565
21	5,390	2,160	2,760	1,030	2,160	1,620	1,360	3,710	2,970	1,160	835	570
22	4,280	4,800	2,480	1,020	1,850	1,790	1,460	3,630	2,900	1,100	793	688
23	3,560	5,580	2,280	982	1,620	1,730	1,510	3,330	2,760	1,070	751	800
24	3,180	6,360	2,090	942	1,510	1,620	1,460	3,040	2,620	1,010	712	800
25	4,710	8,000	1,910	1,010	1,310	1,460	1,460	2,900	2,690	990	664	807
26	9,130	9,420	1,790	1,250	1,200	1,360	1,510	2,690	2,900	942	640	1,310
27	8,900	18,000	1,730	1,460	1,130	1,250	1,620	2,480	2,970	894	622	2,300
28	21,500	12,500	1,620	1,410	1,060	1,260	1,620	2,420	3,040	886	616	3,480
29	32,300	8,900	1,560	1,300	-------	1,310	1,620	2,900	2,970	878	610	3,180
30	20,300	11,000	1,560	1,200	-------	1,310	1,560	3,560	2,760	878	610	2,830
31	12,100	-------	1,460	1,120	-------	1,300	-------	4,200	-------	870	622	-------

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1922.				1922.				1922.			
1	2,550	2,900	1,180	11	1,310	1,460	878	21	718	2,090	3,330
2	2,220	2,550	1,130	12	1,230	1,360	842	22	688	1,910	-------
3	1,970	2,220	1,100	13	1,140	1,300	821	23	688	1,730	-------
4	1,790	2,030	1,040	14	1,080	1,220	800	24	793	1,620	-------
5	1,850	1,850	1,020	15	1,010	1,180	772	25	4,770	1,510	-------
6	2,090	1,730	1,010	16	966	1,680	751	26	9,130	1,460	-------
7	1,970	1,730	974	17	918	2,090	730	27	7,150	1,410	-------
8	1,730	1,790	942	18	856	2,350	1,070	28	5,010	1,410	-------
9	1,620	1,680	942	19	800	2,350	3,230	29	3,630	1,310	-------
10	1,460	1,620	910	20	751	2,220	3,710	30	3,040	1,250	-------
								31	3,110	-------	-------

Monthly discharge of Quinault River at Quinault Lake, Wash., for the period Oct. 1, 1921, to Dec. 21, 1922.

[Drainage area, 264 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1921–22.						
October	32,300	1,200	6,700	25.4	29.28	412,000
November	18,000	2,090	5,530	20.9	23.32	329,000
December	31,500	1,460	6,710	25.4	29.28	413,000
January	1,850	942	1,350	5.11	5.89	83,000
February	2,900	966	1,610	6.10	6.35	89,400
March	1,790	966	1,250	4.73	5.45	76,900
April	2,090	1,310	1,680	6.36	7.10	100,000
May	5,390	1,680	3,240	12.3	14.18	199,000
June	5,960	2,620	3,610	13.7	15.29	215,000
July	2,690	870	1,610	6.10	7.03	99,000
August	1,170	610	804	3.05	3.52	49,400
September	3,480	565	1,100	4.17	4.65	65,500
The year	32,300	565	2,940	11.1	151.34	2,130,000
1922.						
October	9,130	688	2,190	8.30	9.57	135,000
November	2,900	1,180	1,770	6.70	7.48	105,000
December 1–21	3,710	730	1,290	4.89	3.82	53,700

LYRE RIVER BASIN.

CRESCENT LAKE 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, 1922.

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

EXTREMES OF STAGE.—Maximum stage recorded during year, 5.46 feet December 13 and 14; minimum stage recorded, 0.54 foot September 25, 26, 29, and 30.

1919–1922: Maximum and minimum stages recorded in 1922.

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

COOPERATION.—Gage-height record furnished by Washington Pulp & Paper Co.

Daily gage height, in feet, of Crescent Lake at Piedmont, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.85	3.80	4.20	3.38	2.15	1.90	1.80	1.78	2.26	2.00	1.54	0.70
2	1.85	3.74	4.32	3.38	2.10	1.90	1.80	1.82	2.28	1.98	1.52	.70
3	1.82	3.66	4.32	3.28	2.06	1.95	1.80	1.86	2.30	1.96	1.52	.70
4	1.80	3.60	4.22	3.20	2.02	1.95	1.80	1.90	2.32	1.94	1.52	.72
5	1.78	3.55	4.18	3.25	2.00	1.98	1.80	1.96	2.30	1.92	1.50	.74
6	1.78	3.50	4.15	3.10	2.00	2.00	1.80	2.00	2.30	1.88	1.50	.74
7	1.76	3.50	4.08	3.05	2.02	2.00	1.82	2.02	2.30	1.86	1.50	.72
8	1.78	3.40	4.00	3.00	2.04	1.95	1.82	2.00	2.32	1.84	1.40	.72
9	1.78	3.34	3.95	2.98	2.06	1.92	1.82	1.98	2.32	1.82	1.30	.70
10	1.75	3.25	4.00	2.98	2.08	1.92	1.84	1.98	2.30	1.80	1.30	.68
11	1.72	3.18	4.05	2.92	2.08	1.92	1.86	1.98	2.28	1.78	1.30	.66
12	1.68	3.12	4.95	2.94	2.06	1.92	1.86	1.96	2.26	1.76	1.30	.65
13	1.70	3.08	5.46	2.82	2.08	1.92	1.88	1.96	2.24	1.76	1.24	.64
14	1.76	3.02	5.46	2.78	2.04	1.95	1.88	2.94	2.22	1.74	1.20	.62
15	1.86	2.94	5.40	2.72	2.00	1.95	1.86	2.94	2.20	1.72	1.16	.62
16	2.10	2.98	5.26	2.68	2.06	1.95	1.86	2.92	2.20	1.70	1.14	.62
17	2.15	3.00	5.14	2.64	2.14	1.95	1.84	2.92	2.18	1.68	1.12	.60
18	2.20	2.78	4.95	2.62	2.20	1.92	1.84	2.94	2.18	1.64	1.08	.58
19	2.30	2.72	4.85	2.60	2.22	1.92	1.82	2.96	2.18	1.60	1.00	.56
20	2.30	2.70	4.70	2.54	2.20	1.94	1.82	2.96	2.16	1.58	.98	.55
21	2.30	2.68	4.55	2.50	2.16	1.94	1.80	2.20	2.14	1.56	.95	.56
22	2.30	2.72	4.48	2.46	2.14	1.96	1.80	2.20	2.14	1.54	.90	.58
23	2.30	2.82	4.30	2.45	2.12	1.96	1.80	2.24	2.12	1.52	.88	.56
24	2.32	2.90	4.20	2.42	2.10	1.94	1.78	2.22	2.10	1.50	.84	.56
25	2.40	3.06	4.05	2.45	2.10	1.92	1.78	2.22	2.08	1.50	.82	.54
26	2.65	3.18	3.90	2.45	2.10	1.90	1.78	2.20	2.08	1.52	.80	.54
27	2.76	3.76	3.82	2.42	2.08	1.85	1.78	2.20	2.06	1.52	.80	.56
28	3.10	3.92	3.75	2.38	2.00	1.84	1.78	2.22	2.04	1.54	.78	.56
29	3.55	3.96	3.62	2.34	-------	1.84	1.78	2.22	2.02	1.54	.78	.54
30	3.70	4.10	3.55	2.28	-------	1.82	1.78	2.24	2.02	1.54	.74	.54
31	3.75	-------	3.48	2.22	-------	1.82	-------	2.26	-------	1.56	.70	-------

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 October 16, 1922, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by E. Brooks.

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

CHANNEL AND CONTROL.—Bed 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; stage of zero flow, determined September 4, 1919, gage height −0.4 foot ±0.25 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period October 1, 1921, to October 16, 1922, from water-stage recorder, 8.45 feet at noon December 13 (discharge, 985 second-feet); minimum stage, from recorder, 1.82 feet at 6. p m. July 31 (discharge, 25 second-feet).

1918–1922: Maximum stage, from recorder, 5.91 feet at noon January 4, 1918 (discharge, 1,080 second-feet); minimum stage, from recorder, 1.70 feet at 8.30 p. m. July 27, 1920 (discharge, 19 second-feet).

ICE.—None.

DIVERSION.—None.

REGULATION.—Flow is very uniform because of natural regulation in Lake Crescent. Channel at mouth of lake cleared of driftwood and deepened July 25 to August 7, 1922.

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

COOPERATION.—Station maintained in cooperation with the Straits Power Co.

Discharge measurements of Lyre River at Piedmont, Wash., during the period Oct. 1, 1921, to Oct. 16, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Nov. 14	G. L. Parker	4.90	369
Aug. 8	R. B. Kilgore	3.77	207
Sept. 13	D. J. F. Calkins	2.37	65.2

Daily discharge, in second-feet, of Lyre River at Piedmont, Wash., for the period Oct. 1, 1921, to Oct. 16, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	119	511	610	463	248	199	170	158	261	217	56	90	93
2	119	511	627	463	242	199	170	164	282	211	86	85	89
3	118	495	610	433	235	211	170	181	289	205	88	82	84
4	117	479	610	418	229	223	164	199	310	205	84	99	82
5	116	463	593	418	223	223	164	205	317	199	112	93	78
6	111	463	576	403	235	217	164	211	317	193	153	91	73
7	111	448	576	388	254	211	170	217	317	193	187	87	70
8	110	433	559	373	248	205	175	217	317	187	211	83	66
9	109	418	543	373	248	199	175	217	310	181	205	77	64
10	109	403	559	359	235	199	181	211	303	175	199	74	60
11	105	388	679	352	235	193	187	211	303	170	193	74	59
12	102	373	878	338	229	199	187	205	296	164	187	69	56
13	111	359	974	331	223	199	187	199	296	158	181	67	55
14	120	359	974	317	211	199	187	199	289	153	170	63	51
15	142	345	930	310	211	199	187	199	282	148	158	59	49
16	164	331	909	303	229	193	187	211	275	142	153	57	48
17	193	324	867	289	261	187	181	235	268	139	153	56	------
18	199	310	827	275	289	199	175	248	261	133	170	55	------
19	211	303	788	268	275	199	175	254	261	130	170	51	------
20	217	289	750	261	268	199	164	261	254	127	158	73	------
21	211	289	714	254	261	217	164	275	254	123	148	102	------
22	211	310	696	248	248	211	164	289	254	122	138	105	------
23	205	317	661	248	248	199	158	275	248	119	129	99	------
24	211	345	627	248	235	199	158	275	242	115	121	93	------
25	242	373	610	289	223	187	153	275	235	94	116	93	------
26	282	403	576	324	217	187	153	268	235	56	110	102	------
27	296	511	559	317	211	175	153	261	229	43	104	110	------
28	373	543	543	303	199	181	153	248	229	42	98	108	------
29	479	559	527	289	------	175	153	248	223	40	95	100	------
30	511	593	495	268	------	175	153	248	217	38	91	96	------
31	511	------	479	254	------	175	------	254	------	33	89	------	------

Monthly discharge of Lyre River at Piedmont, Wash., for the period Oct. 1, 1921, to Oct. 16, 1922.

[Drainage area, 49.5 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1921–22.						
October	511	102	201	4.06	4.68	12,400
November	593	289	408	8.24	9.19	24,300
December	974	479	675	13.6	15.68	41,500
January	463	248	328	6.63	7.64	20,200
February	289	199	238	4.81	5.01	13,200
March	223	175	198	4.00	4.61	12,200
April	187	153	169	3.41	3.80	10,100
May	289	158	230	4.65	5.36	14,100
June	317	217	272	5.49	6.12	16,200
July	217	33	137	2.77	3.19	8,420
August	211	56	139	2.81	3.24	8,550
September	110	51	83.1	1.68	1.87	4,940
The year	974	33	257	5.19	70.39	186,000
1922.						
October 1–16	93	48	67.3	1.36	0.81	2,140

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 Pl. I., U. S. Geol. Survey Professional Paper 7).

RECORDS AVAILABLE.—October 8, 1897, to December 31, 1901; October 1, 1918, to September 30, 1922.

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

DISCHARGE MEASUREMENTS.—Made from bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 9.4 feet at 11.30 a. m. December 12 (discharge, 16,200 second-feet); minimum stage from water-stage recorder, −0.17 foot at 6 a. m. March 31 (discharge, 454 second-feet).

1897–1901; 1918–1922: Maximum stage recorded, 10.6 feet November 27, 1901 (discharge, 23,800 second-feet); minimum discharge, 170 second-feet October 18, 1897.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed October 28 and gradually over the periods December 10–12, December 30 to April 27, and May 3 to July 13. Rating curve developed in 1922, well defined below 5,000 second-feet used as standard form of curve, to which changes in control, indicated by frequent discharge measurements, have been assumed to yield curves parallel. Shifting-control method used over periods of gradual change.

Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean gage height obtained by inspecting gage-height graph, or for days of considerable fluctuation, by averaging results obtained by applying gage heights for shorter intervals. Records good.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 15	G. L. Parker	1.38	1,380	June 3	A. C. Wingo	3.55	4,540
Dec. 30	A. C. Wingo	1.16	1,270	July 13	Wingo and Hooper	1.74	1,440
Jan. 26	do	.65	1,000	Aug. 7	R. B. Kilgore	.90	767
Mar. 29	do	−.15	462	29	A. J. Hooper	.69	598
Apr. 27	do	.48	857	Sept. 13	D. J. F. Calkins	.52	558

Daily discharge, in second-feet, of Elwha River at McDonald Bridge, near Port Angeles, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,040	4,090	5,480	1,260	744	708	499	1,120	3,920	2,100	984	714
2	968	3,360	3,920	1,160	744	708	504	1,160	4,430	2,100	945	625
3	938	2,920	3,140	1,120	744	708	600	1,390	4,600	2,280	892	585
4	885	2,920	2,690	1,080	744	696	610	2,100	4,770	2,220	857	769
5	871	2,840	2,480	1,040	744	560	580	1,760	4,430	1,980	822	620
6	829	3,380	2,280	1,000	756	560	615	1,450	3,840	1,880	782	560
7	815	3,140	2,100	952	871	550	796	1,300	3,360	1,760	756	657
8	815	2,480	2,040	952	744	550	815	1,120	2,990	1,710	} 760	555
9	802	2,100	2,160	1,340	738	550	732	1,020	2,920	1,600		530
10	802	1,930	5,580	1,080	738	555	702	984	2,920	1,550		565
11	802	1,820	10,600	1,020	732	580	696	968	2,920	1,500	822	570
12	802	1,660	13,300	968	732	580	657	952	2,990	1,450	808	565
13	1,550	1,550	8,100	968	732	585	635	1,120	3,140	1,400	738	550
14	2,430	1,500	6,200	960	732	590	620	1,710	3,290	1,400	679	530
15	3,980	1,400	4,600	915	732	600	605	2,340	2,920	1,300	674	526
16	4,260	1,300	4,260	892	930	605	585	3,670	2,920	1,260	674	508
17	4,430	1,210	3,670	850	1,080	600	580	4,180	2,620	1,210	674	490
18	2,990	1,160	3,360	782	945	570	575	3,670	2,410	1,260	690	486
19	3,330	1,120	2,920	782	815	530	585	3,060	2,410	1,260	702	486
20	2,760	1,040	2,550	782	738	504	640	2,550	2,550	1,160	708	486
21	2,220	1,140	2,340	789	720	555	744	2,480	2,410	1,120	640	486
22	1,930	2,340	2,180	763	720	540	776	2,160	2,280	1,040	605	646
23	1,710	1,710	2,020	750	714	517	756	1,930	2,160	1,030	600	530
24	1,600	3,060	1,870	750	714	499	732	1,880	2,160	992	630	494
25	2,760	3,220	1,710	776	714	494	744	1,760	2,340	968	640	609
26	3,440	4,260	1,550	902	702	490	815	1,660	2,550	952	646	843
27	2,920	6,680	1,500	822	708	478	857	1,550	2,620	957	662	864
28	10,500	4,090	1,450	796	702	474	850	1,820	2,550	962	662	708
29	9,810	3,520	1,350	756	-------	466	850	2,480	2,280	966	646	625
30	6,120	5,120	1,300	750	-------	462	968	3,140	2,100	971	640	652
31	4,940	-------	1,210	744	-------	458	-------	3,590	-------	976	635	-------

NOTE.—Recorder not operating Dec. 22–25, July 27–30, and Aug. 8–10. Discharge determined by comparison with records of near-by streams Aug. 8–10; otherwise by interpolation. Braced figure shows mean discharge for period indicated.

Monthly discharge of Elwha River at McDonald Bridge near Port Angeles, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 262 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	10,500	802	2,710	10.3	11.87	167,000
November	6,680	1,040	2,600	9.92	11.07	155,000
December	13,300	1,210	3,550	13.5	15.56	218,000
January	1,340	744	919	3.51	4.05	56,500
February	1,080	702	765	2.92	3.04	42,500
March	708	458	559	2.13	2.46	34,400
April	968	499	691	2.64	2.94	41,100
May	4,180	952	2,000	7.63	8.80	123,000
June	4,770	2,100	2,990	11.4	12.72	178,000
July	2,280	952	1,400	5.34	6.16	86,100
August	984	600	726	2.77	3.19	44,600
September	864	486	594	2.27	2.53	35,300
The year	13,300	458	1,630	6.22	84.39	1,180,000

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 Pl. I, 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, 1922.

GAGE.—Stevens water-stage recorder on left bank just below trail bridge; inspected by Phillip Abbey and O. A. Abelson. 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 recorded during year, from slightly damaged record of water stage, 16.7 feet at 5 p. m. December 12 (discharge, 12,100 second-feet); minimum stage, from recorder, 0.87 foot at 1 p. m. September 21 (discharge, 125 second-feet).

1913–1922: Maximum stage estimated at 23.5 feet January 6, 1914, during part of day when recorder was not operating (discharge estimated at 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 changed May 16, August 9, and September 27. Rating curve used prior to May 16 well defined below 5,000 second-feet; curves used May 16 to September 27 fairly well defined and last curve poorly 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 mean daily gage height determined from recorder graph by inspection or for days when variation in stage was considerable by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent except for extreme high water until May 15; good thereafter.

COOPERATION.—Maintained in cooperation with the city of Tacoma.

Discharge measurements of North Fork of Skokomish River near Hoodsport, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 30	R. B. Kilgore	9.09	3,930	Apr. 20	John McCombs	2.01	337
30	do	8.56	3,490	20	do	2.02	337
31	do	7.09	2,450	Aug. 6	R. B. Kilgore	1.29	209
31	do	7.05	2,480	11	do	2.22	355
Nov. 1	do	6.05	1,890	Sept. 11	D. J. F. Calkins	1.10	158
2	do	5.44	1,570	16	do	.97	138
Feb. 24	McCombs and Abelson	1.99	336				

Daily discharge, in second-feet, of North Fork of Skokomish River near Hoodsport, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	524	1,940	3,360	510	262	260	456	660	1,620	696	232	178
2	469	1,540	2,300	496	260	265	496	708	1,720	679	223	176
3	416	1,320	1,690	469	256	306	524	760	1,820	696	217	168
4	390	1,240	1,360	456	254	328	553	1,150	1,870	696	207	176
5	365	1,280	1,240	456	249	304	524	1,030	1,620	646	203	199
6	340	1,630	1,190	429	285	287	496	866	1,370	583	201	189
7	316	1,890	1,110	403	482	278	538	760	1,200	553	197	179
8	306	1,410	1,030	403	510	267	598	676	1,080	524	188	191
9	290	1,150	1,070	469	442	274	568	598	1,040	481	191	175
10	278	996	2,230	510	403	283	524	553	1,080	453	232	161
11	265	902	6,530	469	365	276	482	510	1,040	439	343	158
12	260	830	9,450	429	328	278	442	482	1,040	426	353	155
13	419	760	5,640	403	311	287	429	538	1,120	399	313	148
14	1,690	742	2,780	390	299	299	416	787	1,160	399	266	143
15	3,410	708	2,000	378	299	302	390	1,140	1,040	373	239	139
16	4,240	660	1,590	365	498	292	365	1,720	964	355	219	140
17	3,760	613	1,360	352	848	274	352	1,920	946	335	203	135
18	2,430	583	1,190	328	830	328	340	1,720	890	330	195	135
19	1,790	568	1,070	328	660	352	328	1,420	872	328	192	133
20	1,590	538	958	316	538	352	340	1,120	908	316	199	128
21	1,280	568	884	306	456	482	403	1,120	872	304	189	129
22	1,070	1,700	812	299	416	538	496	1,120	782	287	184	149
23	902	1,640	760	294	365	469	524	946	730	278	176	157
24	830	2,240	692	283	340	416	510	908	730	264	170	152
25	1,450	2,940	660	302	316	378	524	854	800	257	170	148
26	3,840	2,630	613	352	299	340	613	765	872	253	170	304
27	2,540	5,970	583	365	280	352	644	696	872	249	170	492
28	7,170	3,130	553	340	265	403	628	782	854	249	170	858
29	8,150	2,060	538	314	-------	416	598	1,040	800	244	166	570
30	4,030	2,720	524	294	-------	403	613	1,280	730	240	162	420
31	2,540	-------	496	278	-------	429	-------	1,520	-------	238	175	-------

NOTE.—Gage-height record faulty Oct. 21–23, 26–29, and Dec. 11–13; discharge determined after completing gage-height graph from recorded range of stage, pencil marks on torn paper, evidence of peak in well, and comparison with records of near-by streams.

Monthly discharge of North Fork of Skokomish River near Hoodsport, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 91 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	8,150	260	1,850	20.3	23.40	114,000
November	5,970	538	1,560	17.1	19.08	92,800
December	9,450	496	1,810	19.9	22.94	111,000
January	510	278	380	4.18	4.82	23,400
February	848	249	397	4.36	4.54	22,000
March	538	260	339	3.73	4.30	20,800
April	644	328	490	5.38	6.00	29,200
May	1,920	482	973	10.7	12.34	59,800
June	1,870	730	1,080	11.9	13.28	64,300
July	696	238	405	4.45	5.13	24,900
August	353	162	210	2.31	2.66	12,900
September	858	128	220	2.42	2.70	13,100
The year	9,450	128	813	8.93	121.19	588,000

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 Mount Rainier National Park, map of Rainier National Forest, edition of 1918, and Pl. IV, U. S. Geol. Survey Water-Supply Paper 313).

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1922; 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 head-gate 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 from water-stage recorder, 15.6 feet from 3.30 to 6 a. m. on December 12 (discharge, 19,200 second-feet). Possibly no flow at gage for parts of several days in January, February, March, and September when entire flow was diverted into power conduit.

1920–1922: Maximum stage recorded, that of December 12, 1921. Possibly no flow at gage for parts of days when entire flow is diverted into power conduit.

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

DIVERSION.—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 permanent; affected by silt washed from settling basin and behind dam as noted in footnote to table of daily discharge. Rating curve for normal control conditions well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by use of discharge integrator except for extreme high water when discharge was determined by applying mean daily gage height to rating table or, for days of considerable variation in gage height, by averaging results obtained by applying mean gage height for shorter intervals. Records good except for extreme low water when amount of backwater effect is doubtful.

COOPERATION.—Maintained in cooperation with city of Tacoma.

Discharge measurements of Nisqually River near La Grande, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 5	John McCombs	4.35	796
Aug. 19	R. B. Kilgore	2.41	199

Daily discharge, in second-feet, of Nisqually River near La Grande, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1		634	10,400				482	749	2,820	683	512	339
2			5,690				568	1,020	2,920	810	454	374
3	60		3,260				1,260	1,370	2,870	882	354	425
4			2,440				1,460	2,660	2,860	1,040	292	276
5			1,980				1,020	2,640	2,420	852	270	113
		150		80	10	2						
6			1,860				756	2,130	2,020	726	365	60
7			1,590				822	1,860	1,720	644	259	156
8	55		1,400				1,160	1,420	1,480	513	230	74
9			1,310				927	1,160	1,420	554	288	34
10			2,080				736	934	1,180	429	294	168
11			8,420				610	804	1,240	281	414	252
12			16,200				481	818	1,080	379	252	292
13	65		10,200		2	3	398	995	1,190	376	249	252
14			4,580				368	1,480	1,240	350	115	246
15			2,780				355	2,040	1,100	310	96	236
		30		10								
16			1,960				436	2,760	1,060	417	86	172
17			1,540				270	3,390	1,070	345	103	192
18	85		1,280		260	416	236	3,280	1,120	322	229	105
19			876			1,620	236	2,540	961	292	320	
20			632			756	328	1,960	993	254	256	
21		2,050	480			724	496	1,790	954	268	120	15
22		4,040	430			720	758	1,600	830	276	81	
23	20	2,600	341			504	794	1,380	678	326	134	
24		2,150	352			346	554	1,340	706	218	297	
25		2,600	364		10	270	650	1,260	936	254	383	
				45								
26	686	3,820	268			251	732	1,140	919	243	404	
27	773	4,050	209			120	737	981	886	297	558	20
28	2,200	2,980	190			170	777	1,280	841	310	268	
29	1,890	2,490			-------	213	798	1,680	766	367	148	
30	1,360	6,580	90		-------	373	751	2,130	688	467	187	
31	860	-------			-------	516	-------	2,480	-------	422	262	-------

NOTE.—Braced figures show mean discharge for periods indicated. Stage-discharge relation affected by deposition of silt. Flow estimated from gage-height record and curves parallel to normal-control rating curve as determined from auxiliary gage readings at head of control and from notes of visiting engineers and of power-plant attendants.

Monthly discharge of Nisqually River and Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 287 square miles.]

Month.	Discharge in second-feet.						Run-off (combined).	
	River (mean).	Power conduit (mean).	Combined.				Inches.	Acre-feet.
			Maximum.	Minimum.	Mean.	Per square mile.		
October	297	432	2,650	----------	729	2.54	2.93	44,800
November	1,190	507	7,130	----------	1,700	5.92	6.60	101,000
December	2,690	562	16,700	----------	3,250	11.3	13.03	200,000
January	45.0	553	----------	----------	598	2.08	2.40	36,800
February	53.2	522	----------	----------	575	2.00	2.08	31,900
March	227	512	2,040	----------	739	2.57	2.96	45,400
April	665	502	1,980	745	1,170	4.08	4.55	69,600
May	1,710	443	3,750	1,220	2,150	7.49	8.64	132,000
June	1,370	373	3,280	1,060	1,740	6.06	6.76	104,000
July	449	331	1,280	559	780	2.72	3.14	48,000
August	267	369	848	446	636	2.22	2.56	39,100
September	133	414	732	----------	547	1.91	2.13	32,500
The year	762	460	16,700	----------	1,220	4.25	57.78	885,000

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., in Lewis County at Lutkens ranch, 1½ miles above mouth and 1½ miles southwest of Elbe, Pierce County.

DRAINAGE AREA.—Approximately 11½ square miles (measured on Forest Service map).

RECORDS AVAILABLE.—August 12, 1918, to September 30, 1922, when station was discontinued.

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; may overflow at extremely high stages. Artificial wooden control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.1 feet at 4.30 p. m. December 11 (discharge, 694 second-feet); minimum stage recorded, 0.60 foot August 25 to September 3 and September 17–26 (discharge, 3 second-feet).

1918–1922: Maximum stage recorded, 8.2 feet at 3 p. m. January 22, 1919 (discharge, 1,430 second-feet); minimum stage recorded, 0.35 foot and 0.36 foot September 15–29, 1918 (discharge, 1.6 second-feet).

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

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water May 4 and 5; rating curve used prior to change well defined below 550 second-feet; that used subsequent to change fairly well defined. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent except for extremely low water.

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

Discharge measurements of East Creek near Elbe, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 1	John McCombs	4.03	406	Apr. 4	John McCombs	2.11	131
2	do	3.11	287	Aug. 16	R. B. Kilgore	.64	3.4
Mar. 1	do	1.10	19.8	16	do	.64	3.6
Apr. 4	do	2.11	130				

Daily discharge, in second-feet, of East Creek near Elbe, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7.2	55	431	44	24	20	56	63	105	6.9	3.3	3.0
2	7.2	47	300	26	24	20	85	74	107	6.3	3.3	3.0
3	6.9	39	181	27	22	20	156	138	89	6.3	3.3	3.0
4	6.5	31	138	25	20	27	129	286	78	6.1	3.3	4.0
5	6.4	32	108	28	19	25	100	197	66	5.4	3.3	4.2
6	6.1	32	107	26	23	26	74	189	55	5.4	3.3	4.7
7	5.6	33	90	25	31	28	89	108	45	4.9	3.3	5.8
8	5.3	30	75	24	36	25	103	90	42	4.5	3.3	5.0
9	5.1	26	70	43	36	24	65	72	45	4.5	3.3	4.7
10	5.1	24	102	37	32	27	75	63	40	4.5	5.0	4.0
11	5.4	22	624	33	31	25	60	54	39	4.5	4.7	3.8
12	6.5	20	512	31	29	27	50	54	36	4.5	5.0	3.4
13	7.4	20	300	30	24	30	54	67	36	4.2	4.5	3.3
14	16.	26	258	29	22	29	54	114	35	4.2	4.5	3.3
15	24.	25	172	26	20	33	49	138	28	4.2	4.5	3.3
16	24	24	96	25	30	32	44	189	25	4.2	3.8	3.3
17	34	23	82	25	38	32	42	181	25	4.2	3.4	3.2
18	33	24	62	25	62	102	38	156	23	4.0	3.3	3.0
19	24	26	50	25	65	181	39	181	22	3.8	3.6	3.0
20	22	46	43	25	48	105	46	70	22	3.6	3.6	3.0
21	16	181	36	24	36	129	49	103	20	3.6	3.6	3.0
22	12	353	44	20	35	96	69	85	18	3.6	3.6	3.0
23	10	228	31	18	32	79	62	72	18	3.6	3.6	3.0
24	16	172	30	18	27	62	54	67	19	3.3	3.4	3.0
25	28	213	29	36	28	48	48	64	18	3.3	3.2	3.0
26	164	405	27	32	27	43	44	57	16	3.3	3.0	3.3
27	147	340	27	30	23	38	49	54	12	3.3	3.0	3.9
28	272	228	29	34	22	43	63	67	10	3.3	3.0	4.2
29	164	197	24	31	-------	45	64	80	8.3	3.3	3.0	4.5
30	80	457	22	30	-------	45	60	85	7.5	3.3	3.0	4.4
31	57	-------	22	28	-------	41	-------	96	-------	3.3	3.0	-------

NOTE.—Gage not read Nov. 2 and 3; discharge interpolated.

Monthly discharge of East Creek near Elbe, Wash., for the year ending Sept. 30, 1922

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	272	5.1	39.5	2,430
November	457	20	113	6,720
December	624	22	133	8,180
January	44	18	28.4	1,750
February	65	19	30.9	1,720
March	181	20	48.6	2,990
April	156	38	65.7	3,910
May	286	54	107	6,580
June	107	7.5	37.0	2,200
July	6.9	3.3	4.30	264
August	5.0	3.0	3.58	220
September	5.8	3.0	3.64	217
The year	624	3.0	51.3	37,200

LITTLE NISQUALLY RIVER NEAR ALDER, WASH.

LOCATION.—In NW. ¼ sec. 16, T. 15 N., R. 4 E., in Thurston County, 1,500 feet above mouth, 3,000 feet from diversion dam of city of Tacoma's power plant, and 1½ miles southwest of Alder, Pierce County.

DRAINAGE AREA.—28.5 square miles (measured on Forest Service map).

RECORDS AVAILABLE.—August 1, 1920, to September 30, 1922.

GAGE.—Stevens water-stage recorder on left bank; installed April 16, 1921; inspected by employees of city of Tacoma. Previous gages as follows: August 6 to September 20, 1920, gage heights obtained from reference point in rock at site of present gage and same datum; September 30 to December 30, 1920, staff gage at same site but at datum 17.0 feet lower than that of present gage; January 1–27, 1921, staff gage at practically same site and at datum 0.22 foot lower than that of present gage; January 28 to April 19, 1921, staff gage at present site but at datum 0.12 foot lower than present gage. All gage readings referred to present datum.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages. Banks high; not subject to overflow. Control is riffle in heavy boulders 100 feet below gage. At extremely high stage, gage is on riffle.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 6.4 feet at midnight December 11 (discharge, 2,020 second-feet); minimum stage recorded, 0.97 foot on August 9 and September 21 (discharge, 8.5 second-feet).

1920–1922: Maximum stage recorded that of December 11, 1921; minimum discharge, 8.2 second-feet on September 16 and 17, 1921.

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

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; affected by ice January 18–21. Rating curve well defined below 1,500 second-feet. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Discharge ascertained by applying to rating table mean daily gage height obtained graphically from automatic record. Records excellent except for periods of missing gage-height record.

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

Discharge measurements of Little Nisqually River near Alder, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 2	John McCombs	3.83	769	Apr. 5	John McCombs	2.42	260
Mar. 2	do	1.38	41.9	Aug. 19	R. B. Kilgore	1.04	12.2

Daily discharge, in second-feet, of Little Nisqually River near Alder, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	26		1,170	72	45	42	165	195	260	26	12	12
2	25	80	588	58	43	42	162	235	252	26	11	12
3	24		428	54	43	42	347	356	238	26	11	12
4	20	68	296	54	42	42	349	672	215	25	10	16
5	18	71	252	51	41	42	255	509	172	24	10	17
6	17	69	252	50	42	41	205	368	137	23	10	16
7	15	71	218	47	53	41	229	293	116	21	10	22
8	15	69	180	47	87	41	272	240	111	20	10	18
9	15	59	158	75	87	45	215	195	103	20	9	17
10	15	55	249	83	71		174	162	89	20	12	17
11	15	49	1,220	75	59		144	142	82	19	18	15
12	15	45	1,520	69	54		120	140	77	19	20	12
13	19	43	919	68	48	43	111	170	77	17	17	12
14	35	49	464	62	44		103	249	75	16	14	11
15	48	54	299	53	50		92	320	66	16	13	11
16	51	53	210	47	156		89	408	58	16	12	10
17	58	47	165	42	170	41	83	428	55	16	12	10
18	65	44	133		170		79	365	55	15	12	10
19	51	50	109		124		80	255	54	15	12	10
20	42	55	98	30	101		90	192	55	15	14	10
21	39	506	85		85	250	131	218	51	14	12	10
22	34	827	75	40	74		180	218	47	14	11	10
23	34	457	69	38	68		158	174	45	14	11	10
24	35	401	63	36	56	103	137	167	44	13	10	10
25	53	612	56	68	53		135	162	43	14	10	10
26	320	919	54	105	50		160	144	43	14	10	11
27	342	804	53	107	44	100	170	129	42	14	10	18
28	548	528	48	80	42		184	140	37	14	10	34
29		446	44	63	-------		187	187	36	14	10	22
30	230	1,120	43	49	-------		177	221	32	13	11	20
31		-------	42	44	-------	162	-------	252	-------	12	11	-------

NOTE.—Water-stage recorder not operating Oct. 29 to Nov. 3; gage-height record Mar. 3–30 lost in transit. Flow Oct. 29 to Nov. 3, Mar. 10–16, 18–23, and 25–30 estimated by comparison with records of near-by streams; flow Mar. 3–7 determined by interpolation; flow Mar. 8, 9, 17, and 24, obtained from observer's staff-gage reading.

Monthly discharge of Little Nisqually River near Alder, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 28.5 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	548	15	86.6	3.04	3.50	5,320
November	1,120	43	260	9.12	10.18	15,500
December	1,520	42	308	10.8	12.45	18,900
January	107	----------	56.7	1.99	2.29	3,490
February	170	41	71.5	2.51	2.61	3,970
March	----------	----------	99.5	3.49	4.02	6,120
April	349	79	166	5.82	6.49	9,880
May	672	129	255	8.95	10.32	15,700
June	260	32	92.2	3.24	3.62	5,490
July	26	12	17.6	.618	.71	1,080
August	20	9	11.8	.414	.48	726
September	34	10	14.2	.498	.56	845
The year	1,520	9	120	4.21	57.23	87,000

TACOMA POWER CONDUIT NEAR LA GRANDE, WASH.

LOCATION.—In sec. 9, T. 15 N., R. 4 E., in Thurston County, 750 feet below headgate at diversion dam of city of Tacoma's municipal power plant and 2½ miles southeast of La Grande, Pierce County.

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1922.

GAGE.—Stevens long-distance recorder on right side of conduit, 750 feet below head gate; inspected by head gate 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 recorded during year, from water-stage recorder, 9.55 feet at 1.30 p. m. December 15, and 5 p. m. December 20 (discharge, 820 second-feet). No flow when operating gates are closed or when waste gates are opened wide for cleaning settling basin.

1920–1922: Maximum stage recorded from water-stage recorder 10.0 feet February 16, 1920, and January 3, 1921 (discharge, 878 second-feet). No flow when operating gates are closed and when waste gates are opened wide.

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

REGULATION.—Flow regulated at head gate 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.

COOPERATION.—Maintained in cooperation with city of Tacoma.

Canal diverts water from left bank of Nisqually River in SW. ¼ sec. 9, T. 15 N., R. 4 E. Willamette meridian. Water used for municipal power.

Discharge measurements of Tacoma power conduit near La Grande, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 2	John McCombs	6.90	500
Aug. 19	R. B. Kilgore	7.10	511

Daily discharge, in second-feet, of Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	430	502	530	502	475	442	530	571	370	334	336	376
2	330	498	536	548	509	442	446	506	356	240	334	358
3	411	528	562	602	496	525	509	496	352	286	356	265
4	430	513	493	598	510	543	516	497	260	237	352	281
5	430	453	576	600	470	484	501	498	387	344	340	400
6	418	358	530	598	490	458	480	450	384	352	244	416
7	414	468	544	598	558	470	560	376	388	380	358	392
8	444	496	546	487	579	498	536	527	378	354	362	412
9	421	518	534	582	600	503	480	489	402	258	352	380
10	394	516	524	581	594	503	552	500	457	352	382	268
11	454	514	444	588	568	494	560	472	354	365	362	376
12	427	512	512	595	502	491	534	398	434	352	380	385
13	442	406	495	604	471	491	556	387	432	355	258	424
14	448	525	570	600	461	522	560	350	464	368	353	430
15	434	545	594	535	488	555	529	376	371	358	364	428
16	254	552	614	587	578	554	400	350	358	251	360	444
17	428	554	604	580	571	530	536	358	359	342	350	312
18	441	526	556	478	578	549	509	402	256	356	368	505
19	464	576	611	440	490	415	510	404	364	364	384	558
20	459	484	645	578	558	552	464	412	374	370	256	564
21	492	513	624	515	586	546	464	434	455	373	370	510
22	502	542	612	497	550	552	486	506	390	368	367	415
23	389	571	604	484	565	548	418	495	379	248	360	370
24	426	420	606	459	478	549	550	507	360	341	352	337
25	434	543	515	564	528	518	442	507	243	362	355	482
26	477	522	516	582	456	446	489	488	348	345	352	500
27	502	410	582	596	489	546	510	476	370	338	252	549
28	446	543	571	598	420	539	514	319	368	364	491	490
29	466	562	582	526	-------	548	490	425	391	341	547	433
30	392	546	591	546	-------	541	418	339	378	248	582	364
31	483	-------	588	490	-------	524	-------	414	-------	325	556	-------

NOTE.—Water-stage recorder not operating satisfactorily Nov. 10, 11, 21, 22, Jan. 19, 20, Aug. 1–11, and 26–27; discharge Nov. 10, 11, 21, and 22 determined by interpolation. For other periods of missing gage height record graph was used as constructed from record of gate openings.

Monthly discharge of Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	502	254	432	26,600
November	576	358	507	30,200
December	645	444	562	34,600
January	604	440	553	34,000
February	600	420	522	29,000
March	555	415	512	31,500
April	560	400	502	29,900
May	571	319	443	27,200
June	464	243	373	22,200
July	380	237	331	20,400
August	582	244	369	22,700
September	564	265	414	24,600
The year	645	237	460	333,000

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 Pl. IV, Water-Supply Paper 313).

RECORDS AVAILABLE.—January 1, 1909, to September 30, 1922.

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 from water-stage recorder, 6.65 feet at 3 p. m. December 12 (discharge, 4,560 second-feet); minimum stage, from recorder, 0.38 foot at 7 p. m. on March 17 (discharge, 118 second-feet).

1909–1922: Maximum discharge estimated from partial gage height record 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 frequently during year; affected by ice January 19, 20, 30, 31, and February 1–4. Rating curve developed in 1922 and well defined below 2,000 second-feet has been used as standard form of curve for the year and changes in control indicated by frequent discharge measurements have been assumed to yield curves parallel to this. See footnote to table of daily discharge. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records good.

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

Discharge measurements of Puyallup River near Electron, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 3	William Chambers	1.73	307	May 14	William Chambers	1.61	471
24	do	1.44	195	17	do	2.92	1,330
Nov. 6	do	1.77	302	June 1	do	2.84	1,210
16	do	1.49	210	15	do	2.22	793
Dec. 8	do	1.99	536	July 2	do	2.29	778
Jan. 24	do	.64	172	24	do	1.62	389
Feb. 14	do	.50	132	Aug. 8	do	1.68	420
20	Chambers and Murbach	.57	149	15	R. B. Kilgore	1.56	410
Mar. 2	William Chambers	.44	133	16	do	1.34	319
25	do	.57	158	25	William Chambers	1.92	598
Apr. 4	do	1.17	302	Sept. 2	do	1.80	481
24	do	1.02	267	15	do	1.54	407

Daily discharge, in second-feet, of Puyallup River near Electron, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	300	312	2,560	330		128	183	345	1,310	855	754	630
2	291	270	1,410	256	150	130	195	394	1,470	890	664	560
3	327	250	890	236		133	370	504	1,550	1,030	585	526
4	342	242	718	231		130	318	790	1,470	1,030	550	518
5	356	312	664	225	151	128	270	748	1,270	855	550	352
6	330	306	600	220	153	126	253	575	1,070	790	513	352
7	315	279	555	210	157	130	362	483	960	724	508	451
8	327	239	536	220	161	130	384	415	855	658	550	324
9	333	220	555	285	157	131	312	362	855	658	620	404
10	348	210	1,260	248	151	131	282	327	855	682	664	545
11	345	248	2,980	228	148	123	250	303	855	664	615	590
12	321	234	4,020	220	146	124	228	303	820	688	495	590
13	384	234	2,460	212	142	124	215	362	925	676	380	555
14	465	239	1,350	205	138	123	205	491	960	652	342	522
15	356	236	890	200	149	124	200	688	855	585	404	495
16	276	212	694	197	253	123	192	1,030	790	600	373	435
17	321	195	590	195	202	120	190	1,350	790	652	500	394
18	291	192	522	174	188	148	190	1,230	820	682	630	431
19	370	210	439	175	172	205	190	925	890	625	570	447
20	423	245	404	175	155	165	220	712	995	560	412	408
21	309	850	384	176	148	205	282	652	890	536	404	321
22	259	1,160	356	168	138	195	327	575	760	459	401	324
23	207	610	327	161	135	172	294	526	664	415	518	330
24	202	504	309	163	138	159	276	555	718	439	670	359
25	212	536	297	200	144	151	282	536	820	447	736	394
26	321	635	294	192	133	151	297	479	890	443	790	615
27	294	960	282	178	130	148	291	459	925	500	855	398
28	637	664	265	159	126	151	306	522	960	531	706	312
29	518	676	253	161	-------	157	294	706	820	565	670	245
30	439	2,870	239	150	-------	172	300	925	790	620	664	300
31	362	-------	231	140	-------	178	-------	1,110	-------	724	694	-------

NOTE.—Rating curves parallel to and varying from nothing to 0.65 foot higher in datum than standard curve were used for the period Oct. 1 to July 2. Shifting-control method used July 3 to Sept. 30. Braced figures show mean discharge for period indicated. See accuracy paragraph for days on which stage-discharge relation was affected by ice.

Monthly discharge of Puyallup River near Electron, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 91 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	637	202	341	3.75	4.32	21,000
November	2,870	192	478	5.25	5.86	28,400
December	4,020	231	882	9.69	11.17	54,200
January	330	140	203	2.23	2.57	12,500
February	253	126	154	1.69	1.76	8,550
March	205	120	146	1.60	1.84	8,980
April	384	183	265	2.91	3.25	15,800
May	1,350	303	625	6.87	7.92	38,400
June	1,550	664	953	10.5	11.71	56,700
July	1,030	415	653	7.18	8.28	40,200
August	855	342	574	6.31	7.28	35,300
September	630	245	438	4.81	5.37	26,100
The year	4,020	120	478	5.25	71.33	346,000

PUYALLUP RIVER AT ALDERTON, WASH.

LOCATION.—On 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 Pl. IV, Water-Supply Paper 313).

RECORDS AVAILABLE.—November 20, 1914, to September 30, 1922.

GAGE.—Chain gage on highway bridge; installed December 15, 1920; read by Mrs. H. D. Foster. Vertical staff in two sections on downstream side of bridge pier on right bank used to January 15, 1920. Several temporary staff gages just below bridge used January 16 to December 14, 1920. Datum of gage lowered 1 foot August 5, 1918.

DISCHARGE MEASUREMENTS.—Made from bridge at gage.

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, 11.5 feet at 11 a. m. December 12 (discharge, 21,200 second-feet); minimum stage recorded, 0.73 foot September 30 (discharge, 495 second-feet).

1915–1922: Maximum stage recorded that of December 12, 1921; minimum discharge, 342 second-feet, October 10, 1919.

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

DIVERSION.—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 December 1 and gradually April 1 to May 18, and June 2 to July 6. Rating curves fairly well defined. Gage read to hundredths once daily. Slight diurnal fluctuation. Daily discharge ascertained by applying daily gage height to rating table. Shifting-control method used April 1 to May 18 and June 2 to July 6. Records good.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 1	John McCombs	0.98	658	Feb. 1	John McCombs	0.66	638
Nov. 18	do	.86	571	Mar. 31	do	1.23	1,130
Dec. 1	D. J. F. Calkins	6.34	9,930	June 1	D. J. F. Calkins	3.08	3,090
2	Calkins and Baldwin	5.29	7,370	Aug 11	do	1.79	1,310

Daily discharge, in second-feet, of Puyallup River at Alderton, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	680	930	11,900	1,040	675	638	1,080	1,120	3,110	1,580	1,270	1,080
2	640	760	8,110	1,120	675	600	1,040	1,370	3,410	1,580	1,120	1,270
3	680	640	4,580	948	675	600	1,370	1,470	3,570	1,800	1,120	1,040
4	600	640	3,410	905	750	675	1,800	2,690	3,410	1,920	1,220	865
5	680	600	2,970	825	712	675	1,470	3,260	3,260	1,690	990	865
6	680	680	2,690	905	675	638	1,120	2,420	2,830	1,800	1,120	788
7	680	840	2,290	788	788	638	1,270	2,160	2,420	1,470	905	905
8	600	680	2,040	825	1,170	675	2,160	2,160	2,290	1,270	1,040	788
9	640	600	1,920	905	1,220	675	1,580	1,920	2,160	1,220	1,080	638
10	640	565	2,420	1,080	1,040	675	1,470	1,800	2,290	1,270	1,120	788
11	640	565	5,310	905	905	638	1,370	1,580	2,160	1,270	1,270	990
12	640	720	18,400	825	825	638	1,220	1,470	2,160	1,270	905	948
13	640	600	11,900	788	825	712	1,170	1,470	2,290	1,370	990	1,080
14	760	640	5,880	750	750	675	1,120	1,690	2,160	1,370	788	1,080
15	885	680	6,670	750	712	712	1,120	2,160	2,040	1,170	825	948
16	680	720	4,230	750	948	788	1,120	2,690	1,920	1,220	865	1,040
17	565	600	2,690	750	1,080	712	1,080	3,570	1,800	1,170	788	948
18	680	600	2,290	712	1,170	712	948	4,580	1,800	1,270	825	865
19	640	600	1,370	638	1,040	990	905	2,690	1,690	1,270	905	788
20	885	680	1,690	712	905	990	905	2,160	1,800	1,170	905	750
21	840	680	1,580	638	865	990	990	1,800	1,920	1,080	825	675
22	680	4,280	1,470	675	788	1,370	1,220	1,690	1,580	990	675	600
23	600	3,050	1,270	675	750	1,170	1,120	1,580	1,470	788	788	600
24	530	2,160	1,220	638	712	1,080	1,080	1,170	1,470	825	905	638
25	530	2,280	1,120	712	712	948	990	1,580	1,580	865	1,170	600
26	565	3,330	1,040	1,040	638	865	990	1,580	1,920	865	1,220	750
27	720	4,280	990	1,080	638	825	1,040	1,370	1,800	865	1,080	1,040
28	840	3,480	990	905	638	788	1,120	1,470	1,800	948	1,120	825
29	1,600	3,630	948	788	-------	865	1,270	2,040	1,690	1,170	1,120	712
30	1,400	8,320	948	750	-------	1,120	1,120	2,040	1,580	1,120	1,120	495
31	1,920	-------	825	712	-------	1,120	-------	2,690	-------	1,270	1,080	-------

Monthly discharge of Puyallup River at Alderton, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1,600	530	737	1.80	2.08	45,300
November	8,320	565	1,630	3.98	4.44	97,000
December	18,400	825	3,710	9.05	10.43	228,000
January	1,120	638	824	2.01	2.32	50,700
February	1,220	638	831	2.03	2.11	46,200
March	1,370	600	813	1.98	2.28	50,000
April	2,160	905	1,210	2.95	3.29	72,000
May	4,580	1,120	2,050	5.00	5.76	126,000
June	3,570	1,470	2,180	5.32	5.94	130,000
July	1,920	788	1,260	3.07	3.54	77,500
August	1,270	675	1,000	2.44	2.81	61,500
September	1,270	495	847	2.07	2.31	50,400
The year	18,400	495	1,430	3.49	47.31	1,030,000

PUYALLUP RIVER AT PUYALLUP, WASH.

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

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

RECORDS AVAILABLE.—May 1, 1914, to September 30, 1922.

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 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 recorded during year from water-stage recorder, 17.05 feet at 2 a. m. December 13 (discharge, 35,600 second-feet); minimum stage recorded, 1.21 feet at 8 a. m. September 24 (discharge, 1,160 second-feet); may have been lower on same and other days while intake was above water.

1914–1922: Maximum stage recorded, 34.15 feet at 4.45 p. m. December 18, 1917 (discharge, 40,500 second-feet); minimum discharge, 726 second-feet at 8 p. m. November 18, 1917.

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

DIVERSIONS.—Two hydroelectric plants, owned by the Puget Sound Power & Light 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 into 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 frequently. Well defined rating curve developed during 1921 used as standard form of curve for this station and changes in control indicated by frequent discharge measurements have been assumed to yield curves parallel to this. Water below intake for several long periods. In general and except as noted in footnote to daily-discharge table, discharge below about 2,500 second-feet has been determined by increasing by 10 per cent results obtained by applying one early morning staff-gage reading to rating table after correcting for shift in accordance with results of discharge measurements; 10 per cent increase based upon diurnal fluctuation due to regulation of White River for power, as indicated on recorder graph for stages yielding slightly more than 2,500 second-feet. Operation of water-stage recorder satisfactory when stage was above intake except as noted in footnote to table of daily discharge. Daily discharge, November 22 to December 22, and May 3 to July 17, ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph and corrected as to time and amount of shift in accordance with results of discharge measurements. Records good December and May to July; otherwise fair.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 23	John McCombs	4.78	4,830	May 6	R. B. Kilgore	5.22	6,180
Dec. 1	R. B. Kilgore	13.00	23,400	June 1	D. J. F. Calkins	6.30	7,790
12	Calkins and Baldwin	16.09	33,200	Aug. 11	do	3.24	2,400
Jan. 31	John McCombs	3.08	2,270	Sept. 30	do	2.25	1,590
Mar. 30	do	2.94	2,120				

Daily discharge, in second-feet, of Puyallup River at Puyallup, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,660	1,960	23,800	1,920	2,780	2,000	2,080	2,230	7,580	4,030	2,320	1,730
2	1,610	1,920	15,000	2,080	2,780	2,000	1,920	2,500	8,530	4,220	2,230	1,790
3	1,550	1,860	7,810	2,320	2,780	2,000	2,190	4,030	9,010	4,870	2,230	1,660
4	1,660	1,730	5,090	2,320	2,780	2,000	2,440	7,350	9,500	5,090	2,160	1,610
5	1,730	1,730	4,870	2,410	2,580	1,860	2,270	7,580	9,010	4,870	2,080	1,500
6	1,660	1,660	4,030	2,500	2,580	1,790	2,320	6,200		4,030	1,920	1,450
7	1,660	1,660	3,410	2,320	2,680	1,860	2,350	5,530		4,650	2,080	1,450
8	1,660	1,610	2,930	2,230	2,580	1,860	3,040	5,310		4,030	1,920	1,410
9	1,610	1,610	2,820	2,320	2,580	1,790	2,580	4,430		3,550	1,790	1,410
10	1,610	1,550	4,220	2,230	2,580	1,790	2,000	3,860		2,930	1,860	1,380
11	1,610	1,550	13,500	2,320	2,410	1,790	2,000	3,410		2,720	2,270	1,450
12	1,660	1,790	32,400	2,230	2,230	1,550	2,080	3,550	6,230	2,720	1,790	1,450
13	1,730	1,660	27,800	2,410	2,230	1,550	2,080	4,030		2,720	1,660	1,450
14	1,790	1,660	14,200	2,410	2,230	1,610	2,080	4,430		2,720	1,730	1,410
15	1,790	1,730	9,750	2,410	2,160	1,610	2,000	5,970		3,280	1,660	1,450
16	1,730	1,860	7,580	2,500	2,160	1,610	1,920	7,580		2,930	1,610	1,410
17	1,610	1,890	6,430	2,500	2,160	1,610	1,920	10,000		3,040	1,550	1,310
18	1,610	1,920	5,090	2,410	2,160	1,610	2,000	10,000		2,720	1,550	1,410
19	1,610	2,150	4,650	2,320	2,080	1,500	2,000	7,350	5,530	2,530	1,550	1,410
20	1,790	2,390	4,430	2,080	2,080	1,500	2,000	4,870	5,530	2,530	1,500	1,410
21	1,790	2,620	3,700	2,000	2,080	1,550	2,080	4,030	5,530	2,720	1,610	1,410
22	1,660	6,200	3,280	1,860	2,080	1,660	2,000	5,090	4,870	2,440	1,660	1,380
23	1,550	4,870	2,720	1,730	2,160	1,730	1,920	3,700	4,430		1,610	1,380
24	1,550	3,160	2,670	2,230	2,160	1,660	1,920	3,700	3,410		1,610	1,380
25	1,550	4,030	2,620	2,080	2,160	1,660	2,000	3,860	4,430		1,660	1,380
26	1,550	6,200	2,580	2,000	2,080	1,550	2,080	4,030	5,310	2,250	1,610	1,380
27	1,660	8,290	2,530	2,160	2,080	1,660	2,080	3,550	5,310		1,550	1,380
28	2,190	6,890	2,350	2,000	2,000	2,080	2,160	3,410	5,310		1,660	1,340
29	2,530	5,970	2,270	2,080	-------	2,160	2,160	4,650	4,870		1,660	1,380
30	2,230	15,800	2,160	1,730	-------	1,890	2,160	3,860	4,430		1,730	1,360
31	2,080	-------	2,040	2,000	-------	1,920	-------	6,890	-------		1,660	-------

NOTE.—No gage-height record Nov. 17, 19, 20, Dec. 24–26, 30, 31, May 2, June 6–18, and July 23–31. Discharge determined as follows: Nov. 17, 19, 20, Dec. 24–26, 30, and 31 by interpolation; June 6–18 from recorded range of stage; and July 23–31 from results at Alderton increased by estimated inflow between the two stations. Discharge Oct. 28, 29, Nov. 21, Dec. 23, 27–29, Apr. 3–5, 7, 8, July 18–22 determined from partial gage-height graph.

Monthly discharge of Puyallup River at Puyallup, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	2,530	1,550	1,730	106,000
November	15,800	1,550	3,330	198,000
December	32,400	2,040	7,380	454,000
January	2,500	1,730	2,200	135,000
February	2,780	2,000	2,340	130,000
March	2,160	1,500	1,760	108,000
April	3,040	1,920	2,130	127,000
May	10,000	2,230	5,060	311,000
June	9,500	3,410	6,120	364,000
July	5,090		3,080	189,000
August	2,320	1,500	1,790	110,000
September	1,790	1,280	1,440	85,700
The year	32,400	1,280	3,200	2,320,000

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, 1922.

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; inspected by O. E. Osgood. 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. For description of previous gages see Water-Supply Paper 462. Staff gage in South Channel, caused by flood on January 23, 1919; installed at railway bridge April 2, 1919, moved 700 feet upstream June 11, 1919. Gage read by O. E. Osgood.

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 thereafter. Right bank of main channel low and flat; left bank protected by concrete wing wall. Various types of protection to under crossing of city of Tacoma's municipal water supply have also been factors in control for this station.

EXTREMES OF DISCHARGE.—Maximum combined daily discharge of river and flume, 11,500 second-feet December 12; minimum combined daily discharge, 410 second-feet January 18.

1899–1901; 1911; 1913–1922: 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 for main channel changed several times during year; radically with destruction by flood of city of Tacoma's pipe line protection November 30. Rating curve developed in 1921 and poorly defined has been used as standard form of curve October 1 to November 30, and curve developed in 1921–22, fairly well defined below 5,000 second-feet, has been used as standard form for the period December 1 to September 13. Changes in control indicated by frequent discharge measurements have been assumed to yield curves parallel to one or the other of these curves, depending upon whether shift occurred prior or subsequent to radical change on November 30. See footnote to table of daily discharge. A fairly well-defined curve has been used direct September 14–30. Stage-discharge relation for secondary channel changed October 1 to November 4 and on December 12. Rating curves poorly defined. Flow from river through this channel so slight as to be negligible except for the periods November 30 to December 2 and December 11–13.

Daily discharge is combined flow of two channels. That for main channel ascertained by applying to rating table mean daily gage height determined graphically from automatic gage-height record or for days of considerable variation in stage by applying mean gage heights for shorter intervals. Daily discharge for secondary channel ascertained by applying daily gage reading to rating table or for days for which gage-height record was doubtful by comparison with flow of main channel. Records of combined flow fair.

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

Discharge measurements of White River at Buckley, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
	Main channel.	*Feet.*	*Sec.-ft.*
Oct. 8	Osgood and Hill	21.74	12.6
21	Hill and Wolslegel	21.75	14.7
Nov. 4	D. J. F. Calkins	21.78	10.3
26	Hill and Osgood	25.82	1,480
Dec. 3	Wolslegel, Hill, and Osgood	24.49	3,030
7	do	22.58	705
30	Hill and Osgood	20.35	70.9
Jan. 10	do	20.52	87.2
21	Wolslegel and Osgood	19.98	35.0
Feb. 10	Hill and Wolslegel	19.89	22.8
Apr. 10	Wolslegel and Osgood	20.36	53.7
25	Rhodes and Osgood	20.27	76.8
May 11	Wolslegel, Rhodes, and Osgood	21.85	653
23	Wolslegel, Hill, and Osgood	22.44	1,090
June 10	Wolslegel, Rhodes, and Osgood	23.84	2,450
28	Ross, Rhodes, and Osgood	22.76	1,540
July 13	Rhodes and Osgood	20.64	111
21	do	21.19	315
Aug. 14	Osgood and Quenon	20.14	42.5
31	Wolslegel and Rhodes	20.50	20.4
Sept. 9	Wolslegel and Quenon	20.80	11.6
25	Osgood and Quenon	20.97	14.9
	South channel.		
Nov. 4	D. J. F. Calkins	1.92	24.2
Jan. 26	Hill and Osgood	1.28	.81

Daily discharge, in second-feet, of White River, main and south channels, at Buckley, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	15	12	8,220	216	50	16	10	134	4,210	1,190	212	22
2	14	11	4,830	176	20	16	10	790	4,550	1,630	163	24
3	13	11	3,150	64	22	16	61	2,430	5,260	1,630	97	18
4	14	11	2,470	63	23	16	77	3,740	5,640	1,690	111	22
5	14	11	2,020	63	21	16	55	3,460	4,740	1,130	137	15
6	14	11	1,400	63	20	16	53	2,760	3,700	897	206	11
7	12	12	741	111	30	16	115	2,760	3,220	1,160	51	14
8	13	11	516	236	38	16	220	2,010	2,680	1,010	49	14
9	18	10	446	151	28	16	73	1,410	2,470	772	47	12
10	13	11	1,760	90	23	16	53	916	2,460	108	47	11
11	13	11	6,370	71	23	16	52	700	2,460	112	45	12
12	23	11	11,500	58	21	16	49	1,680	2,160	116	42	13
13	14	11	8,640	57	18	16	44	2,090	2,160	117	158	12
14	14	13	4,320	56	15	16	44	2,310	2,310	189	105	10
15	14	13	2,550	55	15	16	48	3,360	2,160	798	44	15
16	14	12	1,580	55	17	16	47	4,560	1,950	783	43	15
17	14	12	1,020	55	17	16	45	5,680	1,950	445	43	15
18	15	12	920	217	21	16	44	5,890	2,240	145	43	15
19	15	12	810	220	16	16	45	4,160	1,820	145	43	15
20	16	12	782	71	16	16	50	2,460	1,820	257	43	15
21	15	115	441	34	16	20	64	2,040	1,820	356	43	15
22	14	473	265	33	16	14	96	2,420	1,510	326	43	15
23	12	228	204		16	12	79	1,140	1,170	257	43	14
24	13	226	152		16	11	76	1,120	674	137	41	14
25	13	696	61	40	16	10	76	1,480	1,880	156	29	14
26	13	1,640	269		16	10	80	1,510	1,830	141	14	17
27	13	2,720	484	48	16	10	80	1,370	1,690	102	13	18
28	151	1,920	235	41	16	10	92	1,510	1,630	102	11	15
29	205	1,910	220	29	-------	10	92	2,300	1,400	117	9	14
30	18	6,950	139	27	-------	11	84	3,300	1,190	224	20	14
31	14	-------	68	25	-------	10	-------	3,760	-------	123	24	-------

NOTE.—Daily discharge obtained by rating main and south channels separately and combining results. Rating curves for main channel parallel to first standard form used Nov. 4–30. Shifting-control method used Oct. 1 to Nov. 3. Curves parallel to second standard form used Dec. 1 to Apr. 10, Apr. 26–30, May 5–11, 24–29, July 10–13, July 18 to Aug. 25, Sept. 1–13. Shifting-control method used Apr. 11–25, May 1–4, 12–23, May 30 to July 9, July 14–17, and Aug. 26–31.

Monthly discharge of White River and flume at Buckley, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 424 square miles.]

Month.	Discharge in second-feet.						Run-off.	
	Combined.		River mean.	Flume mean.	Combined.		Combined.	
	Maximum.	Minimum.			Mean.	Per square mile.	Inches.	Acre-feet.
October	1,340	485	24.8	627	652	1.54	1.78	40,100
November	7,260	558	570	622	1,190	2.81	3.14	70,800
December	11,500	830	2,150	651	2,800	6.60	7.61	172,000
January	835	410	82.1	588	670	1.58	1.82	41,200
February	648	443	20.8	532	553	1.30	1.35	30,700
March	764	414	14.5	493	508	1.20	1.38	31,200
April	1,860	686	67.1	1,150	1,220	2.88	3.21	72,600
May	6,330	1,530	2,430	664	3,090	7.29	8.40	190,000
June	5,760	1,930	2,490	652	3,140	7.41	8.27	187,000
July	1,900	993	528	741	1,270	3.00	3.46	78,100
August	1,170	652	65.1	842	907	2.14	2.47	55,800
September	946	471	15.0	672	687	1.62	1.81	40,900
The year	11,500	410	709	686	1,400	3.30	44.70	1,010,000

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, 1922.

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; inspected by O. E. Osgood. Prior to January 12, 1918, Fuller water-stage recorder 800 feet below headgate.

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 recorded during year, from water-stage recorder, 6.05 feet from 7 to 9.30 a. m. May 1 (discharge, 1,780 second-feet). No flow in flume when headgates are closed for cleaning flume or on account of high water.

1913–1922: Maximum stage recorded, from water-stage recorder, 6.20 feet at 4.30 p. m. October 28, 1918 (discharge, 2,140 second-feet); no flow in flume when head gates 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 continuously throughout the year. Slightly affected by ice January 29 to February 1. Rating curve developed in 1918 used as standard form of curve for this station and changes in control indicated by frequent discharge measurements have been assumed to yield curves parallel to this. Operation of water-stage recorder satisfactory. Daily discharge ascertained by shifting-control method. Records good.

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

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

Discharge measurements of White River flume at Buckley, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 8	Hill and Osgood	2.72	515	Apr. 25	Rhodes and Osgood	4.92	1,230
21	Hill and Wolslegel	3.22	638	May 10	Wolslegel and Osgood	4.20	963
Nov. 4	Parker and Osgood	2.84	580	25	do	3.04	674
Dec. 7	Hill and Osgood	4.81	1,160	June 9	do	2.78	592
28	Osgood and Hill	3.02	631	26	Rhodes and Osgood	3.31	754
Jan. 10	Hill and Osgood	3.25	692	July 12	do	4.59	1,180
26	do	2.98	632	25	do	3.58	832
Feb. 10	Hill and Wolslegel	2.75	548	Aug. 14	Quenon and Osgood	3.12	688
25	Wolslegel and Hill	2.56	506	31	Wolslegel and Rhodes	3.53	827
Mar. 10	Hill and Wolslegel	2.50	428	Sept. 9	Wolslegel and Quenon	2.80	606
27	Wolslegel and Osgood	2.64	478	25	Quenon and Osgood	2.62	578
Apr. 10	do	5.08	1,170				

Daily discharge, in second-feet, of White River flume at Buckley, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	578	788	0	575	442	427	805	1,740	771	673	958	924
2	532	690	366	658	562	427	822	1,330	706	212	994	890
3	547	626	370	771	594	442	1,360	281	402	248	994	788
4	547	594	281	754	594	457	1,540	187	117	207	958	856
5	547	610	310	722	562	427	1,180	690	447	557	839	722
6	532	658	640	706	532	398	1,070	613	658	529	578	924
7	517	738	1,060	575	578	427	1,340	273	610	158	839	754
8	517	642	1,220	370	610	427	1,640	323	594	156	856	610
9	502	578	1,220	644	594	412	1,400	690	644	327	924	578
10	502	547	1,300	706	562	412	1,180	856	594	1,260	1,030	642
11	502	547	582	658	547	398	994	828	594	1,220	1,070	754
12	517	578	30	658	532	412	890	46	642	1,260	924	805
13	562	578	447	642	517	412	805	25	722	1,220	562	771
14	706	722	722	626	487	398	754	305	722	1,010	547	754
15	722	788	658	610	502	398	722	351	706	195	805	722
16	578	706	532	610	562	427	722	449	706	212	690	706
17	610	626	412	594	578	412	674	436	578	739	771	610
18	722	578	370	193	594	457	642	436	325	1,140	856	594
19	594	594	424	208	578	610	642	795	573	1,140	890	594
20	738	562	228	578	532	547	754	1,490	674	924	706	626
21	658	594	805	626	532	658	1,100	1,150	690	754	722	547
22	547	1,110	1,040	578	517	658	1,690	544	674	754	626	517
23	502	1,180	1,070	562	502	594	1,490	1,300	891	769	690	472
24	472	977	1,070	578	457	562	1,260	1,300	1,410	924	805	517
25	487	655	1,070	626	502	532	1,260	911	399	856	890	547
26	578	240	772	658	472	502	1,490	658	642	856	958	706
27	578	170	377	626	442	487	1,490	642	782	924	994	754
28	980	384	626	578	427	502	1,640	658	791	994	924	547
29	1,140	276	610	517	-------	562	1,590	497	754	924	890	487
30	1,030	309	738	517	-------	738	1,490	216	738	839	924	457
31	890	-------	822	502	-------	754	-------	575	-------	994	890	-------

Monthly discharge of White River flume at Buckley, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	1,140	472	627	38,600
November	1,180	170	622	37,000
December	1,300	0	651	40,000
January	771	193	588	36,200
February	610	427	532	29,500
March	754	398	493	30,300
April	1,690	642	1,150	68,400
May	1,740	25	664	40,800
June	1,410	117	652	38,800
July	1,260	156	741	45,600
August	1,070	547	842	51,800
September	924	457	672	40,000
The year	1,740	0	686	497,000

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, 1922.

GAGE.—Stevens continuous water-stage recorder on right bank, 0.7 mile below power plant; installed April 8, 1914; inspected by E. C. and F. H. Hoffstrom.

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 25–26, 1922, at gage height 3.7 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 10.52 feet at 10 p. m. December 12 (discharge, 4,500 second-feet); minimum stage from recorder, 4.02 feet from 2 to 8 p. m. September 20 (discharge, 1.4 second-feet).

1914–1922: 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.

DIVERSION.—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 flow at low water 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 October 7, 14, and December 11–16. Rating curves used prior to December 10, fairly well defined; curve used since December 17, well defined. Operation of water-stage recorder excellent except as noted in footnote to table of daily discharge. Daily discharge ascertained by use of discharge integrator. Shifting-control method used December 11–16. Records excellent.

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

Discharge measurements of Cedar River at Cedar Falls, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 2	R. B. Kilgore	5.60	497	Mar. 29	E. C. and F. H. Hoffstrom	5.83	288
3	do	5.58	499				
14	do	9.95	3,240	May 29	do	6.11	430
15	do	9.75	2,580	Sept. 8	Stewart and Hoffstrom	5.69	241
15	do	9.68	2,460	9	J. E. Stewart	5.46	165
16	do	7.96	1,230	19	F. H. and E. C. Hoffstrom	4.29	8.41
Feb. 22	F. H. and E. C. Hoffstrom	5.10	77.2	20	do	4.02	1.35
Mar. 21	do	5.64	218	25	J. E. Stewart	5.23	109
22	E. C. Hoffstrom	5.75	254	26	do	4.86	48.6

Daily discharge, in second-feet, of Cedar River at Cedar Falls, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	213		392	424	310	60	250	260	298	365	246	48
2	184		450	416	301	78	229	282	498	326	244	54
3	122		513	444	290	80	274	304	618	350	228	50
4	106		468	464	293	108	278	316	634	320	243	50
5	104	260	456	442	281	82	272	314	725	354	237	80
6	80		420	424	290	96	271	326	748	363	200	122
7	160		394	442	260	120	298	256	562	361	234	194
8	112		390	364	208	100	281	282	410	360	249	198
9	156	250	413	422	194	98	248	286	414	297	253	182
10	196	257	428	404	184	97	286	293	410	336	229	83
11	200	250	742	376	171	103	277	291	362	331	233	89
12	195	244	2,840	354	114	104	272	291	391	322	232	106
13	85	234	3,910	368	172	113	276	287	402	321	187	102
14	198	282	3,210	364	174	112	268	224	406	301	228	88
15	203	288	2,690	324	176	113	270	284	402	280	237	94
16	192	308	1,120	352	203	104	236	306	378	227	236	89
17	208	319	761	343	294	112	270	323	392	266	229	62
18	196	292	573	338	309	132	260	358	340	266	240	83
19	200	283	529	312	288	171	260	342	380	271	226	5
20	203	264	502	328	297	185	247	344	388	267	186	2
21	208	302	497	326	253	214	250	307	394	260	203	85
22	203	328	492	300	110	218	255	348	388	258	130	120
23	202	330	487	327	161	240	214	364	380	209	78	106
24	222	292	469	318	132	224	250	368	379	254	59	68
25	222	332	421	324	80	222	249	370	335	260	58	85
26	219	339	418	326	51	206	256	367	373	248	56	115
27	234	321	468	326	64	228	263	374	380	252	48	115
28	268	354	463	324	67	249	270	328	377	249	40	107
29	258	366	472	291	-------	256	252	374	376	238	28	102
30	220	436	458	308	-------	249	222	366	366	195	42	76
31	229	-------	477	322	-------	255	-------	283	-------	232	48	-------

NOTE.—Gage-height record faulty Oct. 6, 7, 13, and Sept. 19; recorder not operating Nov. 1–8. Discharge Oct. 6, 7, and 13 estimated from flow near Landsberg less inflow. Discharge Nov. 1–8 determined by city of Seattle officials from power load; discharge Sept. 19 estimated from discharge measurement and partial graph.

Monthly discharge of Cedar River at Cedar Falls, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 83 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	268	80	187	----------	----------	11,500
November	436	234	292	----------	----------	17,400
December	3,910	390	849	----------	----------	52,200
January	464	291	361	----------	----------	22,200
February	310	51	205	----------	----------	11,400
March	256	60	153	----------	----------	9,410
April	298	214	260	----------	----------	15,500
May	374	224	317	----------	----------	19,500
June	748	298	430	----------	----------	25,600
July	365	195	288	----------	----------	17,700
August	253	28	174	----------	----------	10,700
September	198	2	92	----------	----------	5,470
The year	3,910	2	302	3.64	49.41	219,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not computed owing to regulation. The yearly figures represent the natural yield quite closely.

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, King County, 3 miles northeast of Ravensdale and 5 miles below Taylor Creek.

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

RECORDS AVAILABLE.—April 30, 1914, to September 30, 1922; 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 on right bank installed April 29, 1914; inspected by 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, 1917, about gage height 2.5 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 12.03 feet at 9 p. m. December 12 (discharge, 5,990 second-feet); water below intake on September 20; stage and discharge not determined.

1914–1922: 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.

DIVERSION.—None above the station.

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 December 12. Rating curve used prior to change well defined up to 1,500 second-feet; that used after change fairly well defined. Operation of water-stage recorder excellent except as noted in footnote to table of daily discharge. Daily discharge ascertained by use of discharge integrator. Records excellent except for extremely high water, prior to December 12; good thereafter.

COOPERATION.—Gage-height record furnished by city of Seattle.

Discharge measurements of Cedar River near Landsberg, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 3	R. B. Kilgore	6.75	1,130	Dec. 16	R. B. Kilgore	7.53	1,700
3	do	6.71	1,070	Sept. 9	J. E. Stewart	4.93	367
13	do	11.41	5,300	26	do	4.57	279

Daily discharge, in second-feet, of Cedar River near Landsberg, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	422	506	1,430	830	605	354	579	584	575	678	509	309
2	398	484	1,270	819	603	352	566	647	832	630	503	324
3	352	474	1,120	810	606	380	778	717	978	647	490	289
4	308	495	1,010	787	620	383	757	978	1,010	618	501	293
5	302	492	940	773	590	361	664	896	1,110	642	492	308
6	278	477	892	760	603	350	618	801	1,170	657	462	338
7	356	494	831	780	605	384	730	694	1,020	643	488	406
8	307	472	808	752	575	359	753	677	700	646	495	408
9	336	482	829	807	555	344	645	642	701	586	501	388
10	392	491	940	753	534	356	682	630	701	612	482	317
11	394	494	1,770	701	497	360	643	606	641	616	487	277
12	394	490	4,030	689	467	366	614	598	675	611	499	293
13	291	493	5,410	701	486	365	609	590	696	602	466	286
14	412	592	4,260	696	490	370	591	558	701	586	476	274
15	416	622	3,370	650	490	386	584	611	696	564	494	279
16	401	624	1,750	692	515	380	564	659	694	521	478	269
17	419	608	1,470	668	605	376	573	698	686	543	470	256
18	410	577	1,180	652	653	445	556	735	649	549	472	266
19	405	564	1,070	658	611	558	562	686	686	550	468	200
20	426	538	997	624	611	513	553	660	698	540	433	
21	465	568	926	660	579	588	563	637	707	534	444	
22	434	745	881	615	448	572	573	666	716	530	380	290
23	422	725	884	637	468	564	542	660	705	499	336	282
24	436	684	856	632	440	528	547	673	701	521	330	250
25	448	813	820	666	400	513	543	663	654	530	322	246
26	478	940	823	699	364	496	558	652	690	514	319	276
27	499	1,060	846	676	356	502	568	648	704	522	300	292
28	674	947	846	646	363	531	629	614	698	519	292	278
29	616	944	843	608	------	551	592	651	694	509	273	268
30	551	1,430	841	618	------	584	558	662	685	478	271	244
31	530	------	844	615	------	593	------	622	------	498	289	------

NOTE.—Water below intake for part of Sept. 19–21; discharge estimated from flow at Cedar Falls plu inflow.

Monthly discharge of Cedar River near Landsberg, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 135 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	674	278	418	------	------	25,700
November	1,430	472	644	------	------	38,300
December	5,410	808	1,440	------	------	88,500
January	830	608	699	------	------	43,000
February	653	356	526	------	------	29,200
March	593	344	444	------	------	27,300
April	778	542	610	------	------	36,300
May	978	558	671	------	------	41,300
June	1,170	575	752	------	------	44,700
July	678	478	571	------	------	35,100
August	509	271	427	------	------	26,300
September	408	------	287	------	------	17,100
The year	5,410	------	626	4.64	62.98	453,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not computed owing to regulation. The yearly figures represent natural flow quite closely.

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 and 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, 1922.

GAGE.—Inclined and vertical staff gage on right bank; installed April 19, 1914; read by Gene Brown and W. E. Duke; used in conjunction with Stevens continuous recorder, September 14, 1920, to October 1, 1921. Location of gage unchanged since establishment; datum raised 0.61 foot April 26, 1911, and lowered 1 foot to present datum April 19, 1914.

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 from high-water mark, 22.8 feet on December 12 after recording installation had been destroyed (discharge, 45,000 second-feet); minimum stage recorded, 1.22 feet September 25 (discharge, 417 second-feet).

1902–1905; 1911–1922: Maximum discharge, 47,000 second-feet at 9 a. m. December 18, 1917; minimum stage recorded, 0.54 foot September 30, 1915 (discharge, 262 second-feet).

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

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 16,000 second-feet. Staff gage read once daily to hundredths. Daily discharge ascertained by applying daily gage heights to rating table. Records good.

COOPERATION.—Gage-height record furnished by Stone-Webster Engineering Corporation.

The following discharge measurement was made by R. B. Kilgore:

August 30, 1922: Gage height, 1.40 feet; discharge, 505 second-feet.

Daily discharge, in second-feet, of South Fork of Skykomish River near Index, Wash., for the year ending Sept. 30, 1922.

Day	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1		575	433	1,120	2,660	8,530	2,480	673	1,140
2		556	483	1,200	3,370	8,910	2,480	673	1,090
3		575	501	2,480	3,480	9,490	2,390	633	776
4		594	519	2,210	7,480	9,100	2,390	614	733
5		614	483	1,760	5,760	7,820	2,390	614	798
6		673	466	1,680	2,860	6,670	2,160	575	693
7		693	483	2,570	2,760	5,910	1,840	556	2,960
8		693	483	2,760	3,060	5,060	1,760	556	1,410
9		653	483	2,000	2,480	5,200	1,540	556	1,020
10		614	538	1,760	2,120	5,060	1,440	614	843
11		575	519	1,510	1,920	4,670	1,380	753	776
12		556	519	1,350	1,960	4,800	1,380	673	713
13		538	519	1,260	2,000	5,060	1,320	614	653
14		519	519	1,170	4,050	5,060	1,200	538	594
15		519	519	1,120	5,620	4,410	1,170	519	575
16		519	519	1,120	7,820	4,290	1,140	733	556
17		519	501	1,060	10,100	4,170	1,060	653	501
18		538	653	1,040	8,910	3,810	1,020	614	483
19		556	915	1,020	6,060	3,810	990	614	466
20		594	890	1,410	4,800	4,290	965	673	466
21		556	1,170	2,000	4,670	3,930	940	614	433
22		538	1,090	2,960	3,810	3,590	843	556	449
23	575	519	940	1,920	3,370	3,160	820	538	466
24	594	501	866	1,960	3,700	3,160	776	538	449
25	633	483	733	2,000	3,590	3,590	753	538	417
26	733	483	843	2,390	3,370	3,590	733	519	433
27	693	466	940	2,390	2,960	3,480	713	519	693
28	673	466	890	2,210	3,700	3,160	693	519	915
29	653		843	2,040	5,340	2,960	693	483	843
30	653		843	2,160	6,360	2,760	693	483	843
31	594		1,060		7,820		673	713	

NOTE.—Discharge Oct. 1, 1921, 1,840 second-feet. Record lost Oct. 2 to Jan. 22.

Monthly discharge of South Fork of Skykomish River near Index, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 351 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October			1,900	5.41	6.24	117,000
November			2,600	7.41	8.27	155,000
December	45,000		5,000	14.2	16.37	307,000
January			730	2.08	2.40	44,900
February	693	466	560	1.60	1.67	31,100
March	1,170	433	683	1.95	2.25	42,000
April	2,960	1,020	1,790	5.10	5.69	107,000
May	10,100	1,920	4,450	12.7	14.64	274,000
June	9,490	2,760	4,980	14.2	15.84	296,000
July	2,480	673	1,320	3.76	4.34	81,200
August	753	483	596	1.70	1.96	36,600
September	2,960	417	773	2.20	2.46	46,000
The year	45,000	417	2,120	6.04	82.13	1,540,000

NOTE.—Monthly discharge, October to January, estimated by comparison with monthly discharge of Snoqualmie River at Snoqualmie Falls.

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, 1922, when station was discontinued.

GAGE.—Chain gage on upstream rail of Scenic Highway bridge at Index, installed December 21, 1921; read by Mary E. Axtell. 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 gages used January 13, 1918, to December 11, 1921. November 27, 1911, to December 29, 1917, vertical staff on wing dam on right bank about 300 feet upstream from previous gage; destroyed by flood. January 13–31, 1918, readings from a reference point one-third mile above present site. February 1 to September 27, 1918, vertical staff at same site and datum. October 31 to November 3, 1918, temporary gage at same location. November 4, 1918, to December 11, 1921, vertical and inclined staff at same location; destroyed by flood.

DISCHARGE MEASUREMENTS.—Made from highway bridge at 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.

EXTREMES OF DISCHARGE.—Maximum discharge occurred December 12, after gage was destroyed; stage and discharge not determined. Minimum stage recorded, 3.80 feet February 23–24 (discharge, 80 second-feet).

1911–1922: Maximum stage recorded, 13 feet at 5 a. m. December 29, 1917 (discharge, 17,000 second-feet); probably greater on December 12, 1921. Minimum discharge that of February 23–24, 1922.

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

DIVERSION.—A measured diversion of 2 second-feet was being made 400 feet above the station on May 2, 1918.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed with change in gages December 12–20 and at high water May 17; not affected by ice. Rating curve used prior to first change well defined below 5,000 second-feet; latest curves poorly defined. Gage read to hundredths once daily; oftener during floods. Some diurnal fluctuation during summer. Daily discharge ascertained by applying daily gage height to rating table. Records good below 5,000 second-feet prior to December 11; fair thereafter.

Discharge measurements of North Fork of Skykomish River at Index, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 21	John McCombs	5.08	830	May 27	R. B. Kilgore	5.80	1,340
Mar. 14	do	4.09	181	Aug. 29	do	4.35	229
15	do	4.07	178				

Daily discharge, in second-feet, of North Fork of Skykomish River at Index, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	940	1,780	7,460	358	172	150	430	1,240	2,840	1,290	246	950
2	680	1,450	3,210	340	172	195	621	1,400	3,970	1,320	237	620
3	600	1,240	2,270	329	177	204	812	1,820	3,970	1,340	246	602
4	530	1,040	1,670	285	182	195	900	3,120	3,680	1,340	224	585
5	497	1,670	1,290	312	150	162	685	2,320	3,400	1,190	242	515
6	466	3,030	1,190	312	218	130	600	1,820	2,920	995	216	475
7	434	1,780	1,090	285	204	140	1,400	1,560	2,450	820	189	1,450
8	403	1,450	990	285	204	150	1,190	1,300	2,320	820	160	1,340
9	352	1,040	1,190	568	195	150	959	1,120	2,320	720	141	415
10	352	850	7,020	302	195	150	728	945	2,320	620	232	358
11	330	1,040	15,500	312	195	164	605	812	2,320	550	385	300
12	309	895		285	150	184	530	992	2,320	515	291	273
13	403	1,040		262	130	204	495	1,570	2,840	550	246	246
14	1,040	1,140		262	150	195	430	1,820	2,320	515	202	219
15	1,140	990		204	150	177	400	2,840	2,060	448	700	202
16	940	850	4,000	240	172	186	400	3,820	2,320	432	660	168
17	1,140	805		240	226	164	391	3,820	2,060	415	246	158
18	850	640		130	226	267	382	3,120	2,000	385	224	149
19	990	497		174	130	370	382	2,450	1,930	355	232	149
20	1,450	330		217	150	300	568	2,060	2,190	344	255	138
21	1,140	505	855	204	172	605	992	1,810	1,930	328	278	130
22	895	680	685	204	172	460	1,570	1,560	1,560	306	232	355
23	680	680	530	172	80	400	1,210	1,450	1,560	306	232	219
24	680	640	495	204	80	340	855	1,560	2,320	306	229	178
25	760	990	495	233	130	285	998	1,560	2,060	287	227	138
26	1,780	1,560	495	262	150	254	1,140	1,340	1,800	268	224	160
27	1,670	3,950	460	226	150	254	1,040	1,340	2,060	273	217	415
28	12,100	1,450	430	204	130	254	992	2,580	1,810	278	210	620
29	5,550	1,560	400	95	-------	276	945	2,710	1,560	268	232	415
30	3,210	6,600	370	130	-------	305	900	3,680	1,340	257	232	550
31	2,550	-------	340	130	-------	334	-------	3,680	-------	246	355	-------

NOTE.—Gage not read Oct. 6, Nov. 21, Jan. 19, 25, Feb. 3, Mar. 5, 7, 12, 18, 20, 23, 27, 30, Apr. 2, 6, 9, 17, 23, 25, May 7, 9, 21, June 4, 6, 11, 18, 25, 28, July 2, 9, 16, 23, 25, 30, Aug. 6, 13, 20, 24, 25, 27, Sept. 3, 6, 10, 12, 13, 17, and 24; no gage Dec. 12–20. Discharge for Dec. 12–20, Mar. 20, Apr. 6, 30, and Sept. 6 determined by comparison with records of Sultan River near Sultan; discharge interpolated for other days.

Monthly discharge of North Fork of Skykomish River at Index, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 143 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	12,100	309	1,450	10.1	11.64	89,200
November	6,600	330	1,410	9.86	11.00	83,900
December	----------	340	2,720	19.0	21.90	167,000
January	568	95	251	1.76	2.03	15,400
February	226	80	165	1.15	1.20	9,160
March	605	130	245	1.71	1.97	15,100
April	1,570	382	785	5.49	6.12	46,700
May	3,820	812	2,040	14.3	16.49	125,000
June	3,970	1,340	2,350	16.4	18.30	140,000
July	1,340	246	583	4.08	4.70	35,800
August	700	141	266	1.86	2.14	16,400
September	1,450	130	416	2.91	3.25	24,800
The year	----------	80	1,060	7.41	100.74	768,000

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, in Snohomish County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 18, 1911, to September 30, 1922.

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 recorded during year, from high-water mark in well, 18.5 feet on December 12 (discharge, 24,600 second-feet); minimum stage recorded, 0.73 foot at 5 p. m. August 9 (discharge, 90 second-feet).

1911–1922: Maximum stage recorded that of December 12, 1921; minimum stage, from recorder, 0.28 foot on August 24, 1920 (discharge, 54 second-feet).

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

DIVERSION.—City of Everett diverts about 7½ second-feet above station for municipal water supply.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; affected by ice January 18–20, 30, 31, Feb. 1 and 2. Rating curve 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 mean daily gage height determined graphically from automatically made record or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records good October to January; excellent thereafter.

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

Discharge measurements of Sultan River near Sultan, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 10	McCombs and Carson	1.36	109
Aug. 28	R. B. Kilgore	.95	118

Daily discharge, in second-feet, of Sultan River near Sultan, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	532	1,100	7,140	243	110	128	497	1,000	2,480	567	129	995
2	447	809	2,330	222	120	131	656	1,250	2,380	604	125	682
3	336	585	1,370	180	142	220	1,420	2,350	2,380	680	119	342
4	287	549	980	170	150	209	1,200	3,830	2,100	641	112	492
5	248	1,130	955	162	148	179	786	2,140	1,660	549	108	680
6	218	1,430	1,100	161	208	160	680	1,400	1,400	497	103	497
7	200	1,630	980	154	255	168	1,540	1,220	1,220	464	98	1,380
8	184	980	880	211	333	170	1,270	980	1,060	392	94	730
9	170	721	1,000	662	312	180	809	786	1,060	342	92	447
10	161	567	4,640	532	235	226	742	641	955	306	128	330
11	150	604	10,000	382	197	185	641	585	856	281	231	268
12	142	641	14,800	304	182	182	532	660	1,030	268	211	220
13	199	1,060	4,340	276	167	178	480	1,080	1,160	270	170	190
14	674	1,100	1,860	260	148	173	430	1,660	1,080	260	135	172
15	1,120	1,000	1,220	239	147	178	430	2,330	786	226	415	155
16	882	880	905	170	155	202	447	3,180	809	207	345	142
17	900	641	721	148	357	182	414	2,140	832	207	290	134
18	716	532	604	}	370	298	382	2,480	786	211	161	124
19	869	430	514	130	278	641	378	1,560	786	202	196	115
20	1,280	366	414	}	235	430	532	1,250	880	185	493	110
21	836	430	354	155	204	1,290	858	1,310	786	172	289	107
22	567	1,850	304	155	182	880	1,100	1,160	622	155	200	160
23	430	1,250	276	155	161	549	809	1,060	567	143	161	174
24	404	1,000	246	155	141	430	641	1,190	721	134	138	140
25	722	1,310	222	230	145	336	700	1,160	856	130	128	120
26	1,660	1,970	209	395	136	278	930	980	856	129	119	130
27	2,080	4,090	199	292	129	241	960	930	809	124	115	316
28	8,680	1,770	199	213	124	233	955	1,490	764	123	112	741
29	3,960	1,660	199	182	-------	241	856	2,010	660	128	110	567
30	1,970	7,460	197	140	-------	360	809	2,140	604	130	109	604
31	1,400	-------	172	110	-------	447	-------	2,430	-------	130	276	-------

NOTE.—Recorder not operating Oct. 28–31, Nov. 1, 11–23, 26–30, Dec. 1–5, 10–13, and Jan. 16–25. Discharge Nov. 1, 15, 23, 29, and Dec. 13 determined from staff gage readings. For other days of missing gage-height record, discharge determined from curves of relation between gage heights at this gaging station and at a gaging station maintained by Sound Power Co., 1⅛ miles upstream. Discharge for ice-affected periods determined from weather records. Braced figures show mean discharge for period included.

Monthly discharge of Sultan River near Sultan, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	8,680	142	1,050	64,600
November	7,460	366	1,320	78,600
December	14,800	172	1,910	117,000
January	662	110	227	14,000
February	370	110	195	10,800
March	1,290	128	313	19,200
April	1,640	378	763	45,400
May	3,830	585	1,560	95,900
June	2,480	567	1,100	65,500
July	680	123	286	17,600
August	493	92	177	10,900
September	1,380	107	375	22,300
The year	14,800	92	776	562,000

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, 1922.

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 recorded during year, from water-stage recorder, 11.9 feet at 2 p. m. December 12 (discharge, 17,300 second-feet); minimum stage, from recorder, 1.66 feet on August 29 or 30, when clock was stopped and only range of stage recorded (discharge, 215 second-feet).

1907–1922: 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 of 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.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 12 and April 8. Rating curves used prior to first change well defined below 5,000 second-feet. Curve used December 12 to April 7 poorly defined. Latest curve well defined below 7,000 second-feet. Operation of water-stage recorder satisfactory except as stated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined graphically from automatically made record 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 good October, November, and April to September; otherwise fair.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 14	McCombs and Neth	5.25	3,050	May 2	Neth and Bertrand	4.10	2,010
Jan. 4	Neth and Van Wagoner	2.12	386	31	R. B. Kilgore	5.90	4,780
Apr. 23	Neth and Bertrand	3.43	1,300	July 14	Neth and Bertrand	2.53	601
				Aug. 25	Kilgore and Neth	1.77	252

Daily discharge, in second-feet, of Middle Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	880	1,680	8,580	439	285	247	748	1,400	4,780	1,400	298	1,530
2	750	1,200	4,360	439	325	256	786	1,890	4,780	1,400	290	1,270
3	649	985	2,500	387	349	310	1,750	2,410	4,960	1,500	280	670
4	577	848	1,860	370	515	314	1,520	4,610	4,610	1,450	273	590
5	536	880		361	453	296	1,090	3,380	3,780	1,300	263	682
6	480	1,100		357	439	285	965	2,340	3,220	1,130	256	578
7	439	1,620	2,100	349	484	333	1,750	1,950	2,840	1,050	247	1,970
8	410	1,160		365	463	333	2,160	1,600	2,410	938	241	1,340
9	387	950		546	439	317	1,400	1,300	2,620	848	241	878
10	365	815		581	383	341	1,170	1,130	2,410	771	253	663
11	353	815	12,800	463	361	314	1,050	1,010	2,340	702	330	560
12	345	915	14,600	415	345	333	885	1,090	2,480	689	339	492
13	353	1,090	6,320	396	321	349	813	1,600	2,690	656	322	452
14	478	1,240	3,200	379	299	325	771	2,310	2,690	602	263	413
15	744	1,320	2,560	357	292	321	729	3,480	2,140	530	328	373
16	704	1,200	1,920	345	317	333	764	4,530	2,080	492	410	334
17	799	1,020	1,280	345	357	314	722	5,320	2,080	486	318	294
18	856	880	1,180	270	448	446	650	4,490	1,950	475	287	280
19	633	848	1,080	298	424	800	626	2,990	2,010	460	276	266
20	1,180	763	983	341	379	633	806	2,340	2,200	445	330	256
21	1,410	750	883	314	349	808	1,220	2,010	2,080	410	302	244
22	950		784	299	321	806	1,660	1,950	1,830	385	273	244
23	750	1,100	685	282	296	627	1,260	1,720	1,660	362	250	250
24	685		586	282	266	531	1,050	1,890	1,890	334	244	235
25	805		560	356	282	463	1,090	1,770	2,140	322	244	226
26	1,640	2,180	534	509	272	429	1,300	1,600	2,080	310	238	247
27	1,800	3,350	508	504	263	392	1,300	1,500	1,950	294	235	410
28	6,600	2,220	481	410	253	405	1,260	2,140	1,830	298		626
29	4,090	1,980	455	361	-------	458	1,130	3,260	1,660	298	290	663
30	2,670	9,350	429	321	-------	663	1,090	3,880	1,500	298		608
31	1,920	-------	401	282	-------	711	-------	4,610	-------	298		-------

NOTE.—Water-stage recorder not operating Nov. 20–25. Dec. 5–10, 15–29, Mar. 17, 18, Aug. 28–31, Sept. 1, 2, 8, 9, 13–16; discharge Nov. 20–25, Dec. 5–10, Mar. 17, 18, Aug. 28–31, Sept. 1, 2, 8, 9, determined from recorded range of stage and comparison with records of near-by stations. Other gaps in record filled by interpolation and by use of occasional staff-gage reading. Braced figures show mean discharge for periods indicated.

Monthly discharge of Middle Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 184 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	6,600	345	1,140	6.20	7.15	70,100
November	9,350	750	1,520	8.26	9.22	90,400
December	14,600	401	2,650	14.4	16.60	163,000
January	581	270	378	2.05	2.36	23,200
February	515	253	356	1.93	2.01	19,800
March	808	247	435	2.36	2.72	26,700
April	2,160	626	1,120	6.09	6.80	66,600
May	5,320	1,010	2,500	13.6	15.68	154,000
June	4,960	1,500	2,590	14.1	15.73	154,000
July	1,500	294	675	3.67	4.23	41,500
August	----------	----------	284	1.54	1.78	17,500
September	1,970	226	588	3.20	3.57	35,000
The year	14,600	----------	1,190	6.47	87.85	862,000

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.—Approximately 102 square miles (measured on topographic and county maps).

RECORDS AVAILABLE.—July 4, 1907, to September 30, 1922.

GAGE.—Friez water-stage recorder on right bank 200 yards southeast of ranch house; installed September 26, 1916; inspected by employees of Puget Sound Power & Light Co. For description of previous gages see Water-Supply Paper 512.

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. Left bank not subject to overflow; right bank fairly high, not subject to overflow except at extremely high stages. Stage of zero flow, according to measurements made August 25, 1922, gage height 0.0 ±0.3 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 9.9 feet at 11 a. m. December 12 (discharge, 8,630 second-feet); may have been as high or higher on December 11. Minimum stage recorded, 1.80 feet at 4 p. m. August 30 (discharge, 87 second-feet).

1907–1922: 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 revised slightly January 1; well defined below 3,000 second-feet. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined graphically from automatically made record, or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent except for extremely high water and for periods when intake was clogged.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 9	John McCombs	2.23	179	July 14	Neth and Bertrand	2.50	244
12	Neth and Van Wagoner	2.12	153	Aug. 25	Kilgore and Neth	1.93	108
Dec. 15	McCombs and Neth	4.13	1,320	26	do	1.91	103
Jan. 6	Neth and Van Wagoner	2.52	262	Sept. 22	A. R. Neth	2.08	141
Apr. 6	Neth and Bertrand	3.38	668				

Daily discharge, in second-feet, of North Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	373	1,010	4,000	315	179	157	436	897	2,460	634	116	1,020
2	320	708	2,050	294	182	161	465	1,170	2,520	628	112	809
3	284	552	1,430	274	187	179	1,210	1,470	2,520	648	109	426
4	253	461	1,130	262	203	184	1,100	3,360	2,400	596	105	422
5	230	558	1,010	253	206	176	780	2,230	1,940	508	101	436
6	212	652	1,160	250	209	169	674	1,530	1,630	450	98	387
7	195	1,000	998	238	232	179	1,170	1,260	1,440	404	95	1,450
8	183	650	878	244	241	176	1,290	1,080	1,260	355	93	814
9	177	499	1,050	335	238	171	889	897	1,300	323	92	520
10	168	421	2,730	367	226	179	765	772	1,170	298	100	404
11	160	430	6,000	315	214	174	667	715	1,120	280	137	335
12	156	499	7,530	287	203	174	576	765	1,220	268	169	287
13	162	688	3,400	277	198	174	520	1,090	1,300	256	159	256
14	280	786	1,860	268	187	171	475	1,480	1,260	241	132	229
15	477	762	1,340	256	187	171	450	2,080	990	223	184	209
16	395	679	1,020	250	250	174	450	2,640	1,030	212	231	192
17	366	558	836	241	271	166	426	2,880	1,010	200	161	174
18	402	482	708	206	277	226	400	2,460	930	195	139	164
19	322	441	583	206	256	404	395	1,730	973	184	128	154
20	770	399	510	212	238	351	470	1,440	1,060	171	159	148
21	751	523	488	206	226	594	741	1,260	930	161	161	139
22	441	1,000	451	200	209	593	982	1,220	810	157	139	137
23	320	1,000	417	192	198	450	765	1,060	750	150	126	139
24	281	921	386	198	184	387	634	1,140	857	145	116	137
25	348	1,110	358	226	179	343	648	1,100	930	139	109	128
26		1,300	338	277	176	312	788	1,030	922	137	105	139
27	1,600	2,230	324	274	169	301	765	956	881	132	101	235
28		1,440	317	244	161	287	736	1,360	818	130	97	327
29		1,250	303	226	-------	277	701	1,830	729	128	93	339
30	1,540	4,200	290	206	-------	331	680	2,050	667	122	89	339
31	1,120	-------	277	187	-------	387	-------	2,340	-------	118	303	-------

NOTE.—Intake clogged Oct. 26–29; kink in float tape interfered with operation of recorder for discharge above 960 second-feet on Nov. 7, 21–23, 25, and 26; pencil caught in and tore paper from drum Nov. 30; no record Dec. 1; record faulty for few hours Dec. 11; discharge determined from comparison with records of other two forks. Braced figures show mean discharge for period indicated.

Monthly discharge of North Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 102 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	-------	156	551	5.40	6.23	33,900
November	4,200	399	907	8.89	9.92	54,000
December	7,530	277	1,420	13.9	16.03	87,300
January	367	187	251	2.46	2.84	15,400
February	277	161	210	2.06	2.14	11,700
March	594	159	264	2.59	2.99	16,200
April	1,290	395	702	6.88	7.68	41,800
May	3,360	715	1,530	15.0	17.29	94,100
June	2,520	667	1,260	12.4	13.83	75,000
July	648	118	277	2.72	3.14	17,000
August	303	89	131	1.28	1.48	8,060
September	1,450	128	363	3.56	3.97	21,600
The year	7,530	89	658	6.45	87.54	476,000

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 maps).

RECORDS AVAILABLE.—July 21, 1907, to February 29, 1908, and June 26, 1908, to September 30, 1922.

GAGE.—Friez water-stage recorder on left bank at Cooper ranch; installed October 2, 1916; inspected by employees of Puget Sound Power & Light Co. For description of previous gages see Water-Supply Paper 512.

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 recorded during year, from water-stage recorder, 10.8 feet at 2 p. m. December 12 (discharge, 6,780 second-feet); minimum stage from recorder, 1.19 feet September 25 and 26 (discharge, 109 second-feet).

1907–1922: 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 and 11, 1908 (discharge, 68 second-feet).

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

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water December 12 and May 5, and owing to removal by blasting of drift from control February 28 to March 28. Rating curve used prior to December 12 well defined below 3,000 second-feet; curves used December 12 to May 4 poorly defined; curve used May 5 to September 30 fairly well defined between 100 and 1,800 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table the mean daily gage height determined graphically from automatically made record 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 water stage in well to lag 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 results. Records good October, November, and May to September; otherwise fair.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 16	John McCombs	4.20	1,040	July 15	Neth and Bertrand	2.28	345
Jan. 4	Neth and VanWagoner	2.46	358	Aug. 24	R. B. Kilgore	1.24	112
Apr. 4	do	3.04	477	Sept. 22	A. R. Neth	1.24	118
May 31	R. B. Kilgore	5.21	1,650				

Daily discharge, in second-feet, of South Fork of Snoqualmie River at North Bend, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	389	681	3,930	402	168	141	338	630	1,760	638	158	203
2	336	555	2,040	386	176	144	338	864	1,760	598	158	281
3	298	469	1,170	370	186	170	676	1,060	1,820	598	149	188
4	270	417	863	340	195	160	768	1,890	1,760	598	140	168
5	249	407	703	340	195	156	523	1,760	1,540	560	140	168
6	232	417	681	326	195	160	443	1,230	1,330	522	140	168
7	218	469	617	326	206	160	691	1,030	1,180	522	132	309
8	202	414	555	355	216	160	960	850	1,080	486	132	308
9	192	369	535	386	206	150	676	720	1,080	450	132	220
10	183	339	1,130	386	195	160	523	598	1,080	450	140	188
11	200	333	4,370	340	186	150	482	560	986	416	149	168
12	170	349	6,460	326	186	170	406	560	986	400	168	149
13	177	369	3,900	299	176	170	354	720	1,030	384	158	149
14	198	488	1,880	286	168	160	338	894	1,030	368	149	140
15	232	535	1,300	274	168	160	322	1,230	894	352	149	132
16	232	507	1,040	261	176	160	338	1,650	850	352	149	124
17	232	446	898	250	186	160	307	2,040	850	337	140	124
18	307	414	808	227	195	214	278	1,870	806	308	132	124
19	243	389	724	227	186	307	278	1,330	806	281	132	117
20	312	356	684	227	176	238	322	1,080	850	268	140	117
21	465	352	646	216	168	264	482	940	806	256	132	117
22	379	410	608	206	168	264	676	850	806	232	132	117
23	320	400	572	195	159	238	586	762	762	232	124	117
24	292	400	536	186	151	214	502	850	806	220	117	110
25	317	507	536	216	159	192	523	806	806	209	117	110
26	515	703	502	261	151	181	630	762	806	198	110	117
27	576	936	468	250	151	170	630	720	762	188	117	132
28	1,960	816	468	216	142	186	630	894	762	178	117	140
29	1,630	748	434	206	-------	203	544	1,230	720	178	117	158
30	960	2,640	434	195	-------	251	523	1,430	678	168	117	149
31	725	-------	402	176	-------	292	-------	1,700	-------	168	140	-------

Monthly discharge of South Fork of Snoqualmie River at North Bend, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 84 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1,960	170	420	5.00	5.76	25,800
November	2,640	333	554	6.60	7.36	33,000
December	6,460	402	1,290	15.4	17.75	79,300
January	402	176	279	3.32	3.83	17,200
February	216	142	178	2.12	2.21	9,890
March	307	141	190	2.26	2.61	11,700
April	960	278	503	5.99	6.68	29,900
May	2,040	560	1,080	12.9	14.87	66,400
June	1,820	678	1,040	12.4	13.83	61,900
July	638	168	359	4.27	4.92	22,100
August	168	110	136	1.62	1.87	8,360
September	309	110	160	1.90	2.12	9,520
The year	6,460	110	518	6.17	83.81	375,000

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, 1922.

GAGE.—Stevens continuous water-stage recorder on left bank about 250 feet below mouth of 3-mile canyon; inspected by C. G. Bloxham. Datum lowered 0.50 foot July 24, 1920.

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 13, 1921, gage height −0.50 foot ±0.25 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year from high-water marks in well, 11.7 feet on December 12 (discharge, 10,400 second-feet); minimum stage, from recorder, 0.70 foot August 8–10 (discharge, 45 second-feet).

1918–1922: Maximum stage recorded that of December 12, 1921; minimum discharge, 27 second-feet September 29 and 30, 1919.

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

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 13; not affected by ice. Rating curve used prior to change well defined below 3,000 second-feet; that used subsequent to December 13 well defined below 2,000 second-feet. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Clogged intake pipe interfered with correct registering of low-water gage heights for long periods as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined graphically from automatically made record or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent October, November, and May to August; good for September; otherwise fair.

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

Discharge measurements of Deer Creek at Oso, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 18	John McCombs	1.43	130	May 23	R. B. Kilgore	3.59	855
18	do	1.47	136	25	do	3.46	773
Apr. 16	do	1.97	229	Aug. 31	do	1.54	146
May 22	R. B. Kilgore	4.13	1,140	Sept. 8	do	2.51	385

Daily discharge, in second-feet, of Deer Creek at Oso, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	222	698	2,860	286			356	648	1,670	248	51	1,050
2	181	432	1,380	297			458	988	1,630	256	50	352
3	153	335	700	240			2,230	1,880	1,630	256	49	177
4	134	332	506	222	140		1,100	2,240	1,400	220	48	413
5	118	677	478	193			648	1,650	1,070	188	47	456
6	106	1,520	590	163		160	519	1,020	905	171	46	258
7	101	1,320	470	134	378		1,240	795	795	157	46	1,440
8	91	550	438	430	417		988	626	695	137	46	410
9	88	382	710	1,480	384		603	500	770	124	45	243
10	85	309	3,340	672	303		582	417	720	113	137	184
11	79	319	5,760		221		507	362	626	108	236	154
12	78	404		300	140	148	424	384	744	100	188	130
13	296	684					295	618	795	93	118	111
14	392	700				130	273	1,040	672	89	75	104
15	859	577	2,200	162			256	1,420	540	81	311	92
16	1,120	438				145	238	1,840	560	80	241	85
17	930	332				150	217	1,800	540	75	108	81
18	509	286	258			194		1,360	500	73	79	79
19	1,540	235	224		190	410		822	540	71	318	76
20	1,080	210	220	100		263		603	603	70	540	73
21	615	385	220			1,040		962	492	69	202	72
22	404	2,420	209			570		1,310	430	66	126	547
23	299	862				320	600	850	400	63	94	243
24	509	1,590				248		878	451	62	81	154
25	1,700	1,430		226		211		744	451	61	72	122
26	2,220	2,750	150		100	183		626	455	60	69	121
27	1,800	4,290		400	90	162		560	420	58	64	
28	4,060	1,460			80	190		988	359	57	62	550
29	2,640	1,520		129	-------	250		1,280	314	56	61	
30	1,240	3,920		100	-------	286	560	1,440	263	54	59	
31	900	-------		80	-------	369	-------	1,510	-------	54	134	-------

NOTE.—Recorder not operating satisfactorily Dec. 12–17, and Apr. 18–29. Silt in well seriously affected operation of recorder Dec. 23–31, Jan. 5, 6, 11–31, Feb. 1–6, Feb. 8 to Mar. 17, and Sept. 27–30. Discharge determined by comparison with records of Sultan River near Sultan and from occasional staff readings by observer.

Monthly discharge of Deer Creek at Oso, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 84 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,060	78	792	9.43	10.87	48,700
November	4,290	210	1,050	12.5	13.95	62,500
December	-------	-------	1,060	12.6	14.53	65,200
January	1,480	-------	262	3.12	3.60	16,100
February	-------	-------	194	2.31	2.40	10,800
March	1,040	-------	235	2.80	3.23	14,400
April	2,230	-------	623	7.42	8.28	37,100
May	2,240	362	1,040	12.4	14.30	64,000
June	1,670	263	715	8.51	9.50	42,500
July	256	54	109	1.30	1.50	6,700
August	540	45	123	1.46	1.68	7,560
September	1,440	72	314	3.74	4.17	18,700
The year	-------	45	544	6.48	88.01	394,000

SKAGIT RIVER BASIN.

SKAGIT RIVER BELOW RUBY CREEK, NEAR MARBLEMOUNT, WASH.

LOCATION.—In Whatcom County, three-fourths of a mile below Ruby Creek, 5 miles above Reflector Bar, and 23 miles northeast of Marblemount, Skagit County.

DRAINAGE AREA.—978 square miles. Area in United States measured on Washington National Forest map, edition of 1922; area in British Columbia, 390 square miles.[1]

RECORDS AVAILABLE.—June 1, 1919, to September 30, 1922.

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

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

CHANNEL AND CONTROL.—Control at head of rapids about 125 feet below gage; composed of large, angular boulders and perhaps some bedrock; permanent. Banks high and wooded; not subject to overflow. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 16.1 feet at 7 p. m. December 12 (discharge, 45,700 second-feet): minimum stage, from recorder, 3.44 feet on March 6 (discharge, 627 second-feet).

1919–1922: Maximum stage recorded that of December 12, 1921; minimum stage recorded, 3.30 feet at 10 p. m. November 11, 1919 (discharge, 555 second-feet).

ICE.—Stage-discharge relation slightly affected by ice during severe winters. Flow estimated from observer's notes and weather records.

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent and well defined below 20,000 second-feet; affected by ice December 21 to January 1, January 15–21, and February 1–5. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage heights 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.—Maintained in cooperation with city of Seattle.

Discharge measurements of Skagit River below Ruby Creek, near Marblemount Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 3	F. E. Davis	4.63	1,660	Apr. 28	John McCombs	5.62	2,840
Feb. 15	do	3.60	716	June 11	Parker and Davis	8.95	10,900
Mar. 1	do	3.48	653	Sept. 14	J. E. Stewart	4.58	1,600

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

Daily discharge, in second-feet, of Skagit River below Ruby Creek, near Marblemount, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,150	5,820	2,810	1,850		660	750	3,890	17,200	6,970	2,600	2,150
2	1,910	4,830	2,740	1,740		649	794	4,070	20,200	6,970	2,540	1,910
3	1,690	4,160	2,480	1,640	780	649	920	3,890	23,200	7,490	2,410	1,740
4	1,580	3,720	2,280	1,580		644	1,000	4,070	24,700	7,490	2,340	1,800
5	1,480	3,720	2,150	1,530		632	1,020	4,160	22,200	6,710	2,220	1,640
6	1,430	4,340	2,030	1,480	794	627	1,090	4,070	18,200	6,060	2,090	1,480
7	1,330	4,250	1,910	1,430	822	632	1,380	3,890	14,800	5,580	2,030	1,800
8	1,280	3,800	1,860	1,380	822	638	1,530	3,640	12,200	4,930	1,970	1,580
9	1,270	3,400	1,910	1,430	787	644	1,480	3,400	11,400	4,440	2,030	1,480
10	1,280	3,100	3,770	1,380	774	649	1,430	3,180	11,000	4,160	2,150	1,690
11	1,280	3,020	12,400	1,280	774	654	1,380	2,950	11,000	4,070	2,410	1,860
12	1,280	2,880	29,200	1,280	768	654	1,330	2,880	11,400	4,070	2,150	1,860
13	1,430	2,670	24,200	1,240	768	660	1,280	3,250	12,200	4,070	1,910	1,740
14	2,030	2,540	13,000	1,190	762	660	1,250	4,340	13,000	3,890	1,800	1,640
15	2,410	2,410	8,600	1,170	738	660	1,200	6,450	12,200	3,560	2,600	1,580
16	2,480	2,280	6,580	1,140	738	660	1,180	10,200	10,600	3,320	2,280	1,530
17	2,600	2,090	5,470	1,120	750	654	1,170	14,800	9,900	3,250	2,030	1,380
18	2,540	1,970	4,630	1,090	744	654	1,150	15,300	8,900	3,400	2,030	1,330
19	3,980	1,740	3,800	1,070	732	654	1,160	12,600	8,310	3,320	2,150	1,330
20	4,930	1,690	3,180	1,040	726	654	1,380	10,200	9,550	3,180	2,410	1,330
21	3,560	1,690	3,070	1,020	720	690	1,800	8,310	10,200	2,950	2,030	1,190
22	2,950	1,690	2,960	992	714	690	2,540	7,230	8,900	2,810	1,800	1,640
23	2,480	1,690	2,850	960	702	684	2,540	6,580	7,760	2,600	1,800	1,380
24	2,280	1,690	2,740	944	696	660	2,480	6,580	7,760	2,540	1,800	1,260
25	2,150	1,690	2,630	936	708	654	2,480	6,710	8,600	2,600	1,860	1,200
26	2,410	1,800	2,520	952	696	649	2,670	6,190	8,900	2,670	1,970	1,640
27	2,340	2,950	2,400	928	690	649	2,810	5,940	9,200	2,600	2,030	2,030
28	6,210	2,670	2,290	906	678	649	2,810	7,230	8,600	2,600	2,030	1,690
29	13,000	2,410	2,180	864	-------	654	2,880	9,550	8,030	2,600	2,030	1,480
30	9,900	2,540	2,070	801	-------	672	3,180	12,200	7,230	2,600	2,030	1,580
31	7,230	-------	1,960	787	-------	714	-------	15,300	-------	2,600	2,150	-------

NOTE.—Braced figures show mean discharge for period indicated.

Monthly discharge of Skagit River below Ruby Creek, near Marblemount, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 978 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	13,000	1,270	3,060	3.13	3.61	188,000
November	5,820	1,690	2,840	2.90	3.24	169,000
December	29,200	1,860	5,250	5.37	6.19	323,000
January	1,850	787	1,200	1.23	1.42	73,800
February	822	678	750	.767	.80	41,700
March	714	627	657	.672	.77	40,400
April	3,180	750	1,670	1.71	1.91	99,400
May	15,300	2,880	6,870	7.02	8.09	422,000
June	24,700	7,230	12,200	12.5	14.00	726,000
July	7,490	2,540	4,070	4.16	4.80	250,000
August	2,600	1,800	2,120	2.17	2.50	130,000
September	2,150	1,190	1,600	1.64	1.83	95,200
The year	29,200	627	3,540	3.62	49.16	2,560,000

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 of a mile above Stetattle Creek, 1½ miles below Thunder Creek, and 19 miles northeast of Marblemount, Skagit County.

DRAINAGE AREA.—1,100 square miles. Area in United States measured on Washington National Forest map, 1922 edition. Area in British Columbia 390 square miles.[2]

RECORDS AVAILABLE.—December 6, 1913, to September 30, 1922, when records were discontinued.

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. Prior to April 13, 1914, inclined staff at same site but at datum 2.00 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, from water-stage recorder, 14.1 feet at 7 p. m. December 12 (discharge, 58,000 second-feet); minimum stage recorded, 1.72 feet at noon February 24 (discharge, 704 second-feet).

1913–1922: Maximum stage recorded that of December 12, 1921; minimum stage, from recorder, 1.64 feet from 4 p. m. November 11 to 9 p. m. November 12, 1919 (discharge, 665 second-feet).

A field investigation and office study of flood data in the Skagit River basin indicates that a great flood occurred sometime 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 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 slightly affected by ice during severe winters; discharge determined from observer's notes and weather records.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water on December 12; affected by ice December 19–26 and January 26 to February 4. Rating curves well defined. Operation of water-stage recorder satisfactory except that intake pipe to stilling well was clogged for long periods resulting in a lag between river and stilling well heights. Except as noted 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. Records good.

COOPERATION.—Maintained in cooperation with city of Seattle.

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

Discharge measurements of Skagit River at Reflector Bar, near Marblemount, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 1	D. J. F. Calkins	3.22	2,580	Apr. 29	John McCombs	3.78	3,400
Dec. 27	F. E. Davis	3.38	2,580	June 8	G. L. Parker	7.01	13,300
Feb. 9	do	2.05	969	14	do	7.31	14,600
26	do	1.83	761	Sept. 16	J. E. Stewart	3.20	2,240
Apr. 26	John McCombs	3.72	3,190	16	do	3.30	2,440

Daily discharge, in second-feet, of Skagit River at Reflector Bar, near Marblemount, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,630	6,960	3,720	2,100		784	947	4,750	20,700	8,850	4,500	3,760
2	2,380	5,690	3,500	2,030		784	983	4,880	23,600		4,370	3,120
3	2,140	4,970	3,190	1,890	900	816		4,880		9,700	4,240	2,830
4	2,070	4,440	2,900	1,890		800		5,150				3,020
5	2,000	4,370	2,720	1,820	920	776		5,290	25,000	8,850		2,480
6	1,850	5,350	2,540	1,760	912	776		5,150		8,000	3,400	
7	1,740	5,400	2,460	1,700	929	768		5,020	16,700	7,830		2,300
8	1,750	4,700	2,460	1,700	1,000	768		4,620	13,800	6,600		
9	1,720	4,320	2,460	1,700	974	768	1,500	4,240	12,700	6,010		
10	1,780	3,840	5,420	1,640	947	768		4,000	13,000	5,580		2,650
11	1,850	3,720	16,200	1,580	938	760		3,650	13,000	5,430	3,880	
12	1,780	3,500	38,000	1,520	938	760		3,540	13,400		3,320	
13	2,070	3,190	30,200	1,460	904	760		4,000	14,300		2,830	2,950
14	2,860	3,090	16,700	1,460	880	760		5,430	15,200	5,500	2,700	
15	3,170	2,900	11,300	1,360	880	753			14,200		4,200	
16	3,090	2,720	8,680	1,360	888	739	1,360	12,500	12,700	4,750	3,540	2,560
17	3,290	2,540	7,200	1,320	912	725	1,400			4,620	3,320	2,240
18	3,090	2,460	6,300	1,340	888	768	1,380	17,500	11,000	4,900	3,430	2,170
19	6,000	2,140		1,280	864	800	1,400	14,200		4,800	3,650	2,240
20	7,240	2,140		1,270	856	792	1,580	12,000	12,000	4,620	3,760	2,150
21	4,840	2,070		1,250	848	832	2,100	9,900	12,700	4,500	3,120	1,820
22	3,840	2,140	3,700	1,220	800	792	2,920	8,500		4,000	2,830	2,600
23	3,290	2,140		1,160	784	856	3,120	7,670	10,000	3,650	2,920	2,030
24	3,000	2,140		1,150	739	800	3,020	7,670		4,000	3,120	
25	2,900	2,140		1,140	776	784	3,020	7,670	11,000	4,000	3,220	2,200
26	3,090	2,300			776	776	3,220	7,200	11,000	3,880	2,430	
27	3,090	3,840	2,560		800	776	3,430	6,900	11,300	4,000	3,650	3,020
28	9,200	3,500	2,560	1,000	776	792	3,430	8,330	11,000	4,120	3,650	2,320
29	17,500	3,090	2,400		-------	800	3,430	11,300	10,200	4,120	3,650	2,030
30	12,300	3,290	2,320		-------	808	3,880	14,200	9,550	4,120	3,540	2,400
31	8,520	-------	2,170		-------	880	-------	17,500	-------	4,240	3,540	-------

NOTE.—Owing to clogged intake, recorder graph not representative of true gage height Oct. 14, 15, 19, 28, 29, Dec. 12, Apr. 3–15, May 15–17, June 3–6, 13, 14, 17–19, 22–24, July 2–4, 12–15, 18, 19, Aug. 4–10, 14, 15, Sept. 6–9, 11–15, 20, 22, and 24–26; discharge determined from results obtained for Skagit River below Ruby Creek plus those for Thunder Creek near Marblemount. Braced figures show mean discharge for periods ndicated.

31986—26†—WSP 552——5

Monthly discharge of Skagit River at Reflector Bar, near Marblemount, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	17,500	1,720	4,070	3.70	4.27	250,000
November	6,960	2,070	3,510	3.19	3.56	209,000
December	38,000	2,170	6,700	6.09	7.02	412,000
January	2,100	----------	1,420	1.29	1.49	87,300
February	1,000	739	876	.796	.83	48,700
March	880	725	785	.714	.82	48,300
April	3,880	947	2,000	1.82	2.03	119,000
May	17,500	3,540	8,150	7.41	8.54	501,000
June	----------	9,550	14,500	13.2	14.73	863,000
July	----------	3,650	5,700	5.18	5.97	350,000
August	4,500	2,700	3,490	3.17	3.66	215,000
September	3,760	1,820	2,530	2.30	2.57	151,000
The year	38,000	725	4,490	4.08	55.49	3,250,000

SKAGIT RIVER AT THE DALLES, NEAR CONCRETE, WASH.

LOCATION.—In NE. ¼ sec. 16, T. 35 N., R. 8 E., at head of canyon known as The Dalles, 1½ miles southwest of Concrete, Skagit County, 52 miles above mouth and 1 mile below Baker River.

DRAINAGE AREA.—2,700 square miles (measured on General Land Office and British Columbia maps).

RECORDS AVAILABLE.—Flood peaks only.

GAGE.—Vertical and inclined staff on right bank installed December 23, 1922.

DISCHARGE MEASUREMENTS.—No equipment available.

CHANNEL AND CONTROL.—Boulder riffle below canyon for low stages; rock canyon forming The Dalles for high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 56.6 feet about 1815 (discharge, 500,000 second-feet). Other floods are known to have occurred about as follows:

Date.	Gage height (Upper Dalles gage).	Discharge (second-feet).
	Feet.	
——, 1856	44.6	350,000
Nov. 19, 1897	38.4	275,000
30, 1909	36.4	260,000
Dec. 30, 1917	33.0	220,000
13, 1921	34.9	240,000

Minimum discharge, about 2,500 second-feet.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Gage installed by Skagit County.

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 of a mile below intake of Beatty's slough, 1½ miles south of Sedro Woolley, Skagit County, 21 miles above mouth, 31 miles below The Dalles, and 32 miles below Baker River.

DRAINAGE AREA.—2,970 square miles, revised; measured on topographic maps and map of Washington National Forest, edition of 1922. Area in British Columbia, 390 square miles.[3]

RECORDS AVAILABLE.—May 1, 1908, to December 31, 1919, and February 1, 1921, to September 30, 1922. Monthly mean discharge for period of missing records computed as described in footnote to tables of monthly discharge.

GAGE.—Vertical staff on upstream draw guard of railway bridge, installed about May 1, 1908, read by E. J. Woods May 1, 1908, to September 26, 1916, and by W. H. Gale beginning February 1, 1921. From September 27, 1916, to September 2, 1919, chain gage on railway bridge, read by E. J. Woods. Temporary vertical staff, installed September 25, 1915, and used until September 26, 1916, whenever stage was below 37 feet. Temporary vertical staff located on downstream side of groups of piles, 50 feet above third concrete pier of railway bridge from left bank; at same datum as original vertical staff. Zero of gages set at elevation of extreme low water in Puget Sound. A staff gage on upstream shoreward side of highway bridge, 1,500 feet above present gage and at different datum, was read September 28 to December 31, 1919.

DISCHARGE MEASUREMENTS.—Made from highway bridge 1,500 feet above gage, or from Northern Pacific Railway bridge at 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, 1922, 54.3 feet at 8 a. m. December 13 (discharge, 210,000 second-feet); minimum stage recorded, 33.5 feet February 2–4 and March 30 (discharge, 4,680 second-feet).

1908–1922: Maximum stage recorded, 56.5 feet at 9 a. m. November 30, 1909 (discharge, 220,000 second-feet);[4] maximum stage and discharge of flood of December, 1917, published in Water-Supply Paper 482, page 45, and Water-Supply Paper 512, page 85, found to be in error. More complete information and additional high-water marks indicate maximum stage was 54.1 feet at 4 a. m. December 30, 1917 (discharge, 195,000 second-feet).

Earlier floods are known to have occurred about as follows:

Between 1805 and 1825, as estimated from Indian tradition, maximum stage 63.5 feet determined by comparison with stage at The Dalles where stage was known by a deposit of flood sand in a protected eddy (discharge, about 400,000 second-feet by comparison with flow at The Dalles).

About 1856, as indicated by the age of trees growing on a bar at an elevation lower than stage of this flood and at a point where high velocity and drift at that time cleared the bar of any trees that may have been growing, and probably December, 1856, as indicated by precipitation at Vancouver, Wash., maximum stage determined at several points near gage, by silt deposits in the bark of cedar trees and by stain on the bark of trees. Stage 60.0 feet according to the records of early settlers and also according to later checks by a United States Geological Survey engineer (discharge, about 300,000 second-feet by comparison with flow at The Dalles).

November 16, 1896, maximum stage determined from high-water marks, 54.8 feet (discharge, 185,000 second-feet).

November 19, 1897, maximum stage determined from high-water marks, 54.9 feet (discharge, 190,000 second-feet).

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

[4] Revised in this report.

November 16, 1906, maximum stage determined from high-water marks, 54.7 feet (discharge, 180,000 second-feet).

Minimum stage recorded, 32.3 feet September 29–30 and October 10–11, 1915 (discharge, 2,830 second-feet).[5]

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 changes frequently. Previous rating curves found to be in error, primarily due to insufficient information regarding behavior of river during floods. Daily discharge from beginning of record revised in this report from rating curves based on slope determinations, high-water marks, and a mass of data obtained from old residents of the valley. Gage read once or twice daily to tenths. Practically no diurnal fluctuation. Daily discharge ascertained by applying daily gage height to rating table. Records prior to 1910 poor, thereafter good below 75,000 second-feet and poor above that discharge, except for peak discharges of 1917 and 1921 which are fair.

COOPERATION.—Skagit County contributed funds for meeting expense of special flood investigation upon which revised results in this report are based.

Discharge measurements of Skagit River near Sedro Woolley, Wash., during the period May 1, 1908, to Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1908		*Feet.*	*Sec.-ft.*	1915		*Feet.*	*Sec.-ft.*
June 12	F. S. and J. C. Greely	46.4	38,400	Jan. 11	I. L. Collier	34.76	9,380
20	F. S. Greely	41.8	19,900	Feb. 26	J. T. Hartson	33.41	5,820
Oct. 10	do	35.8	3,980	27	do	33.32	5,420
Nov. 5	do	39.8	14,300	June 14	C. G. Paulsen	35.14	10,900
1910				July 22	do	35.40	12,300
Aug. 26	Henshaw and Gilkey	37.5	6,840	Sept. 8	do	[a] 32.77	4,930
Sept. 30	Kimble and Gilkey	37.98	8,540	14	do	[a] 32.30	3,650
Oct. 13	do	39.65	15,000	Dec. 12	J. T. Hartson	[a] 36.40	16,000
1911				13	do	[a] 35.85	13,200
Mar. 2	H. P. Gilkey	35.98	4,260	1916			
Apr. 22	do	38.14	11,000	June 22	C. O. Brown	40.00	32,800
May 20	do	40.60	21,900	28	do	42.95	50,300
June 13	do	47.63	61,200	Sept. 27	J. E. Stewart	[a] 35.04	10,900
30	do	41.06	23,200	1917			
Sept. 7	W. W. Clifford	37.98	10,200	May 8	John McCombs	37.48	20,500
Oct. 9	do	36.33	5,050	15	McCombs and Parker	39.57	30,400
Dec. 10	do	38.56	15,800	Aug. 15	John McCombs	36.87	17,100
1912				Dec. 23	T. R. Newell	39.20	28,000
Jan. 18	do	37.55	11,400	26	do	37.02	16,800
Feb. 27	do	36.50	8,990	1918			
Mar. 9	do	35.32	5,840	Jan. 2	do	48.24	91,100
May 21	H. C. Hanson	43.20	46,500	3	do	45.25	66,200
28	do	40.90	30,800	11	do	39.22	23,800
June 6	do	40.75	29,700	Mar. 9	do	34.04	6,500
Oct. 18	F. B. Storey	36.04	9,390	Apr. 30	J. E. Stewart	38.64	24,000
26	do	36.51	11,300	June 18	do	40.20	33,900
1913				Oct. 5	R. B. Kilgore	34.45	7,620
Mar. 13	J. E. Stewart	35.15	8,960	16	do	34.73	7,800
19	do	36.16	11,600	Nov. 26	do	34.66	7,870
July 8	Storey and Hartson	41.38	33,900	Dec. 10	do	36.47	14,000
12	do	40.48	27,800	1919			
Oct. 6	J. E. Stewart	34.13	5,820	Feb. 8	do	34.55	8,570
19	do	36.50	13,500	Mar. 23	do	34.95	9,440
1914				24			
May 4	Parker and Collier	39.60	26,700	June 17	John McCombs	38.63	25,100
Sept. 23	I. L. Collier	35.18	9,530	18	do	38.92	25,700
				Sept. 19	do	34.58	8,330

[a] Temporary staff gage readings, in feet, as follows: Sept. 8, 1915, 33.14; Sept. 14, 1915, 32.67; Dec. 12, 1915, 36.35; Dec. 13, 35.80; and Sept. 27, 34.92.

[5] Revised in this report.

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1908						1908					
1	16,700	15,400	31,500	13,500	6,150	16	12,900	34,600	24,800	10,100	6,150
2	17,800	16,000	37,100	12,400	6,580	17	13,500	28,400	21,700	11,200	5,740
3	17,400	14,800	36,100	11,200	6,360	18	14,800	24,800	23,200	11,200	5,350
4	15,100	15,400	30,600	11,800	6,360	19	17,100	22,500	24,800	11,800	4,980
5	13,500	16,000	24,400	11,800	6,580	20	16,000	20,300	24,800	11,800	4,980
6	13,500	17,400	22,900	12,100	6,580	21	15,400	18,100	26,400	11,200	4,980
7	17,400	21,700	25,600	11,800	6,580	22	15,100	17,100	27,200	10,600	4,980
8	18,800	32,000	30,600	11,200	7,980	23	15,100	16,700	26,400	10,600	4,630
9	16,000	41,300	32,000	11,800	6,800	24	17,400	19,500	24,000	10,900	4,300
10	14,200	45,800	29,200	11,200	6,150	25	22,500	26,400	19,500	8,990	4,140
11	13,500	47,000	28,800	10,600	6,580	26	19,900	27,200	16,000	7,980	3,680
12	12,400	40,200	31,500	10,600	7,030	27	17,400	25,600	13,500	7,030	3,680
13	11,800	35,600	34,200	9,520	6,580	28	17,400	21,000	12,400	10,600	3,540
14	11,500	37,100	34,200	9,520	6,360	29	18,100	18,800	11,200	9,520	3,540
15	11,800	41,300	30,600	9,520	6,150	30	17,400	22,500	11,200	7,500	3,660
						31	15,700		12,400	6,580	

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1908-9												
1	4,300	13,200	8,990	7,500	7,030	6,800	13,200	7,980	34,600	21,000	12,400	7,980
2	6,580	23,600	7,980	7,980	7,500	6,580	11,200	8,990	48,200	21,000	11,200	8,480
3	4,980	27,200	7,500	16,700	8,480	6,360	9,520	11,800	48,200	21,700	10,100	8,990
4	4,460	19,500	7,030	14,200	8,480	7,030	8,480	16,700	37,100	23,200	10,300	9,520
5	3,980	13,200	6,580	10,900	7,980	6,580	7,980	16,000	32,400	22,500	9,520	9,520
6	3,680	10,900	6,360	5,350	7,500	6,150	7,500	13,500	27,600	22,500	8,990	9,520
7	3,540	8,990	6,150	7,740	7,500	6,150	7,260	11,800	25,200	25,600	8,990	8,990
8	3,540	7,980	8,480	7,030	7,030	6,150	7,030	10,600	26,000	22,500	9,250	7,980
9	3,540	7,030	8,730	7,030	6,580	6,150	7,260	10,600	28,800	22,500	8,990	7,030
10	3,680	6,360	7,500	7,030	6,360	5,940	7,740	11,200	33,300	21,000	9,520	7,030
11	3,980	5,940	7,030	8,480	6,150	5,740	7,500	10,600	38,100	22,500	8,730	7,500
12	3,830	5,350	8,730	9,250	5,940	5,540	7,500	10,100	39,100	24,000	8,990	6,150
13	6,150	4,980	13,500	9,520	5,740	5,350	8,480	9,790	31,500	19,500	8,990	5,740
14	7,500	4,800	10,600	9,520	5,350	5,740	8,990	10,600	28,000	18,100	9,250	5,740
15	6,580	4,630	8,990	7,980	5,540	5,740	8,730	11,800	30,600	18,800	10,100	5,350
16	5,740	6,150	7,980	9,250	9,520	5,940	8,480	12,400	29,200	19,500	8,480	5,350
17	5,160	49,400	7,260	14,800	14,800	6,150	7,740	12,900	26,400	16,700	7,980	6,150
18	4,630	92,600	6,580	16,700	11,800	6,150	7,500	12,900	25,200	14,200	8,230	6,150
19	4,630	47,000	6,150	16,000	11,200	6,150	7,030	14,500	26,400	12,900	8,480	5,160
20	4,980	31,000	6,150	26,800	9,790	6,150	6,800	14,200	25,600	13,500	9,790	7,030
21	4,630	28,800	6,150	17,400	8,730	5,740	6,800	12,900	23,200	13,500	8,230	10,900
22	4,300	28,400	6,150	14,200	7,500	5,740	7,030	11,800	21,400	15,400	7,500	8,730
23	4,800	24,000	6,150	11,800	7,260	5,740	7,260	11,800	19,500	16,700	7,030	6,580
24	4,980	18,800	6,150	10,600	7,500	5,740	7,500	14,200	19,500	15,700	6,580	6,580
25	4,800	15,400	6,580	9,520	7,980	6,150	8,990	18,800	18,800	14,800	6,580	6,150
26	4,630	12,900	12,100	8,480	7,500	6,150	10,900	24,800	19,500	12,900	18,400	6,580
27	4,630	11,500	11,800	7,980	7,030	6,580	9,790	25,600	23,200	12,600	14,800	5,740
28	4,630	10,600	15,100	7,500	7,030	7,260	9,250	24,400	19,500	12,400	10,100	5,540
29	7,030	10,100	12,400	7,030		7,500	8,990	22,500	18,100	12,400	8,480	7,260
30	14,200	9,520	10,100	6,580		7,980	8,480	20,600	19,500	13,500	7,980	9,520
31	17,100		8,480	6,580		10,100		27,200		12,900	7,740	

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909–10												
1	7,260	8,480	93,600	9,940	15,700	14,000	13,500	21,700	35,200	19,300	14,400	6,850
2	6,150	21,000	53,100	9,210	13,500	19,800	13,100	20,700	33,400	19,800	12,700	6,850
3	5,740	38,100	37,000	8,500	12,300	23,200	12,300	20,200	27,000	19,800	11,900	7,160
4	5,160	25,200	30,400	8,500	11,500	24,300	11,900	21,200	23,800	19,800	11,900	7,480
5	5,160	16,700	26,000	8,500	10,300	22,700	12,300	23,200	26,500	20,200	12,700	7,160
6	7,980	12,900	23,200	7,810	9,940	18,400	21,200	28,700	27,600	19,800	12,300	6,850
7	10,100	10,600	21,200	7,480	9,570	15,700	18,400	32,200	28,200	20,200	12,300	6,550
8	7,500	10,600	20,200	7,810	9,210	14,000	18,800	37,600	25,400	21,200	13,500	6,260
9	8,480	10,300	18,800	7,160	8,850	12,700	18,800	41,200	22,200	23,200	15,300	5,970
10	12,100	9,520	16,600	7,160	8,850	11,900	18,000	46,600	23,800	27,000	15,700	5,690
11	9,790	8,730	15,700	6,850	8,150	11,500	17,500	68,100	35,200	29,200	14,400	5,420
12	8,480	7,980	53,100	6,850	7,810	12,300	18,000	57,000	49,200	31,600	13,100	4,890
13	8,230	7,500	49,200	6,550	8,150	15,300	18,400	46,600	34,600	29,200	12,300	4,890
14	8,730	6,800	32,200	6,550	8,500	18,400	17,500	38,800	27,000	23,800	11,500	4,890
15	6,800	6,580	24,800	6,550	8,150	18,400	16,200	32,200	24,300	21,200	12,300	5,150
16	6,150	6,360	21,200	6,260	7,810	22,200	14,800	27,000	24,800	20,700	10,300	5,420
17	5,940	6,580	19,300	6,260	7,160	23,200	15,300	27,000	24,300	20,700	9,940	6,260
18	5,350	24,800	17,500	7,160	6,850	27,600	15,700	32,200	21,700	19,800	9,570	6,850
19	5,160	61,200	16,600	8,500	6,550	26,500	18,800	34,000	19,300	17,500	9,940	6,260
20	5,350	36,100	15,700	7,160	6,550	28,700	25,400	29,200	21,200	17,500	11,500	7,160
21	5,740	22,100	14,400	6,850	6,550	28,200	28,200	27,000	21,200	18,800	11,100	8,500
22	6,150	20,600	14,000	12,700	6,260	27,000	23,800	31,600	19,800	19,800	10,700	9,210
23	6,580	68,500	13,100	27,600	5,970	26,500	25,400	40,000	17,500	18,800	8,850	8,850
24	9,790	102,000	12,300	38,200	7,160	23,800	32,200	46,000	16,600	15,300	8,150	7,810
25	7,260	49,400	11,900	27,600	11,500	20,700	43,600	53,800	17,000	14,800	7,160	6,850
26	6,150	28,800	10,700	19,800	9,940	18,400	55,700	47,200	21,200	14,400	6,850	5,970
27	5,740	21,700	10,300	16,600	11,500	17,000	47,900	38,800	21,700	14,000	6,850	5,420
28	5,350	31,500	9,940	16,600	14,000	15,700	37,600	32,200	20,200	14,000	6,550	5,150
29	6,150	118,000	9,570	15,300	-------	14,800	29,200	28,700	18,800	14,400	6,550	5,420
30	6,150	198,000	9,940	15,700	-------	14,000	24,300	28,700	18,400	15,300	6,260	7,810
31	6,580	-------	10,300	19,300	-------	14,000	-------	28,200	-------	14,400	5,970	-------
1910–11												
1	17,000	11,500	17,000	13,600	6,680	4,300	11,900	16,500	47,500	23,300	15,200	11,100
2	18,800	12,700	20,500	12,300	6,390	4,300	12,300	20,000	51,200	23,300	14,400	11,900
3	38,200	14,800	23,300	11,500	6,100	4,300	11,900	22,300	42,300	24,300	14,800	11,900
4	39,400	14,000	20,500	12,300	5,820	4,300	11,100	26,300	31,800	23,300	14,800	11,900
5	29,200	12,300	20,000	12,700	6,100	4,300	10,400	33,000	26,300	23,300	14,800	10,400
6	24,800	14,800	23,300	13,100	5,820	4,300	9,260	29,300	22,300	27,800	14,400	8,570
7	57,000	35,200	23,800	18,700	5,820	4,770	8,910	23,300	22,800	30,800	14,800	10,400
8	32,800	41,800	21,400	17,800	5,550	5,820	8,570	20,000	23,800	27,300	13,600	9,620
9	41,200	26,500	22,300	17,800	5,550	6,680	8,570	20,500	24,800	22,300	12,300	8,910
10	33,400	37,600	19,200	17,400	5,550	6,390	11,100	18,700	28,300	20,000	11,500	8,240
11	25,400	73,800	17,400	14,400	5,550	6,980	10,700	17,000	37,400	19,200	11,500	8,240
12	18,400	40,600	16,100	13,600	5,550	6,390	9,980	16,100	53,100	20,000	11,100	7,910
13	15,300	28,700	14,800	13,600	5,550	5,820	9,260	16,100	60,900	22,300	10,700	15,200
14	13,500	22,700	14,000	13,600	6,100	5,550	8,570	16,100	60,200	26,300	9,980	19,200
15	13,100	18,800	13,600	13,600	5,820	5,550	8,240	16,500	53,100	29,300	9,620	16,500
16	14,000	17,000	14,000	11,100	5,550	6,390	8,240	19,200	49,300	33,500	8,910	21,800
17	21,200	14,800	14,000	10,400	5,280	7,280	8,570	24,800	42,300	33,500	9,260	16,500
18	27,000	14,000	13,100	10,700	5,550	7,910	8,570	23,800	37,400	31,300	9,980	12,300
19	18,400	13,500	12,300	11,900	5,550	8,570	9,260	24,300	33,500	27,800	10,400	9,980
20	14,800	21,200	12,300	10,400	5,280	9,980	8,910	22,300	30,300	25,300	11,900	8,910
21	12,700	89,100	12,700	9,620	5,020	11,100	9,260	20,500	28,800	22,800	14,000	9,620
22	11,500	87,700	11,900	8,570	5,020	11,900	10,700	22,300	27,800	20,000	10,400	10,700
23	10,300	51,200	17,800	8,570	5,020	14,000	11,500	22,300	29,300	17,800	9,980	13,600
24	10,700	38,400	30,800	8,570	4,770	17,400	13,100	20,000	25,300	19,200	9,980	9,260
25	62,300	30,300	21,000	8,570	4,770	17,400	20,000	19,600	23,300	21,400	9,620	8,240
26	38,200	25,300	17,800	7,910	4,530	14,400	19,600	19,600	25,800	22,800	9,620	7,590
27	23,800	21,400	17,800	7,590	4,530	12,700	17,000	18,700	40,600	20,000	8,910	6,980
28	18,400	20,000	16,100	7,590	4,300	11,500	15,700	19,200	33,000	17,400	8,910	6,390
29	15,300	18,300	14,800	7,280	-------	10,400	14,800	21,400	27,800	17,400	8,570	6,100
30	13,500	17,000	15,700	6,980	-------	9,980	15,200	26,800	23,800	17,400	8,570	5,820
31	12,300	-------	15,200	6,680	-------	10,700	-------	35,700	-------	16,500	10,700	-------

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911–12												
1	5,550	3,230	14,200	6,840	20,200	7,570	7,300	11,000	23,000	21,200	15,000	8,600
2	5,280	3,040	13,200	6,330	17,200	7,300	8,120	9,960	22,600	22,100	14,200	9,450
3	5,020	3,040	12,400	6,090	15,300	7,030	8,700	9,630	22,100	23,000	12,700	10,700
4	5,020	3,230	11,200	5,850	13,900	6,770	9,310	9,630	22,100	21,600	12,000	8,330
5	4,770	3,850	12,400	5,620	12,600	6,510	9,000	9,960	23,900	21,200	10,700	7,040
6	4,530	5,020	13,200	5,620	12,600	6,510	9,960	10,300	28,000	22,100	10,400	6,330
7	4,770	9,260	12,000	5,400	13,000	6,260	7,840	11,800	34,600	19,800	10,000	6,100
8	4,770	14,800	12,800	5,180	13,900	6,010	8,120	17,700	43,400	19,400	11,000	8,880
9	5,020	10,400	18,800	5,180	14,300	6,010	8,120	27,500	40,600	18,500	15,400	8,600
10	5,020	7,910	16,100	6,330	26,900	5,530	9,000	25,700	34,600	19,800	13,000	7,540
11	4,770	6,100	14,200	6,090	22,400	5,530	11,400	22,900	34,600	20,300	16,300	7,040
12	4,530	5,280	14,200	6,840	19,700	5,300	10,600	23,400	35,800	20,300	13,400	7,540
13	4,300	5,550	12,400	10,500	16,700	5,080	10,300	28,100	42,700	20,800	11,000	8,330
14	5,550	8,570	11,200	20,500	17,200	5,080	9,630	35,700	36,500	23,000	10,700	8,060
15	8,240	11,100	10,500	19,400	16,200	5,080	9,000	48,400	30,800	20,800	11,000	7,540
16	8,240	8,570	10,800	16,600	18,700	5,300	8,700	39,200	24,400	23,000	17,600	6,560
17	7,590	14,400	10,500	14,200	19,700	5,300	8,700	29,100	23,400	22,600	15,000	6,100
18	6,100	43,400	9,140	11,200	20,200	7,030	8,700	24,900	29,100	22,600	11,300	6,100
19	5,550	65,100	9,470	10,200	19,200	6,510	8,410	25,400	37,200	23,000	11,300	5,880
20	5,020	62,800	10,500	9,140	16,200	5,300	8,410	31,400	49,100	22,100	11,000	5,450
21	4,770	41,400	9,140	11,600	14,300	5,080	8,120	46,200	44,800	19,800	11,000	5,240
22	4,530	30,300	9,470	12,800	12,600	4,870	7,840	37,800	36,500	18,500	11,300	4,840
23	4,300	22,800	16,600	11,600	12,200	4,870	8,120	29,600	31,400	17,200	12,000	5,040
24	4,070	18,800	12,400	10,800	11,400	5,080	8,700	24,900	38,500	16,700	11,300	4,650
25	4,070	16,600	10,800	29,000	10,300	5,080	8,700	24,400	42,000	18,500	12,000	4,290
26	3,850	32,300	9,470	22,200	9,630	5,080	8,700	28,600	46,200	15,800	11,000	4,120
27	3,850	22,200	9,140	17,200	9,310	6,010	8,120	35,800	41,300	14,200	9,450	4,120
28	3,640	18,300	8,510	15,100	8,700	6,510	8,410	31,400	32,600	12,700	8,330	4,120
29	3,430	15,100	7,920	17,800	8,120	7,570	9,000	26,900	23,900	12,300	7,290	4,120
30	3,430	13,700	7,640	37,800	-------	7,570	11,000	23,400	21,200	12,300	6,800	4,120
31	3,230	-------	7,370	26,300	-------	7,030	-------	21,600	-------	12,700	6,800	-------
1912–13												
1	4,290	4,840	10,300	15,200	8,030	7,240	8,300	13,400	49,800	41,300	20,900	10,900
2	5,450	4,650	10,300	13,400	7,500	6,980	7,500	12,400	59,650	35,200	23,300	9,130
3	4,470	4,840	13,100	16,600	7,500	6,980	7,240	11,800	69,100	29,400	22,900	9,130
4	8,060	4,650	19,000	13,400	6,730	7,240	6,980	11,500	68,400	25,000	21,300	41,300
5	5,660	5,660	14,400	11,500	6,480	7,240	7,240	10,900	58,100	28,400	20,900	43,400
6	4,290	6,800	12,100	10,300	6,240	7,760	8,030	10,600	45,500	31,600	20,100	24,200
7	4,120	8,600	10,900	9,990	6,000	8,570	8,030	13,100	43,400	40,600	18,300	18,000
8	4,120	9,160	10,300	10,300	5,540	9,130	7,240	18,300	51,400	35,800	16,600	13,400
9	4,470	11,000	9,990	9,700	5,320	10,300	7,500	25,500	49,800	31,600	19,700	13,800
10	4,120	10,000	9,410	8,570	5,110	9,990	8,030	32,200	43,400	36,500	16,900	14,400
11	3,950	9,450	8,850	8,030	5,110	10,300	10,300	30,500	39,200	37,200	16,900	12,100
12	3,950	13,400	9,130	7,500	4,900	9,700	15,500	28,900	46,200	28,900	16,600	11,500
13	3,780	32,600	9,990	7,240	4,900	9,130	18,000	26,400	44,100	27,900	17,200	10,900
14	3,780	29,100	13,400	6,980	4,900	8,570	17,200	23,700	47,600	24,600	13,800	10,900
15	3,780	18,500	11,200	6,730	9,410	8,030	16,900	22,500	39,200	21,700	12,800	9,700
16	3,780	13,400	10,600	6,480	25,000	7,760	17,200	21,700	33,400	20,500	11,500	8,850
17	10,400	11,000	11,800	6,240	40,600	11,500	15,800	20,500	30,500	20,900	10,900	9,130
18	11,300	14,200	14,100	6,000	27,900	14,400	16,200	19,400	28,400	22,100	13,800	9,990
19	7,800	50,600	14,400	6,000	20,500	12,800	20,500	19,700	32,200	26,000	12,100	13,100
20	7,290	34,600	12,100	5,540	16,600	10,600	22,100	20,900	50,600	33,400	10,600	9,990
21	5,660	23,700	11,200	5,540	14,400	9,410	22,100	21,700	42,000	38,500	10,300	8,850
22	5,040	20,100	9,990	5,540	12,800	8,850	24,200	23,300	39,200	43,400	10,600	12,400
23	6,800	19,400	9,990	5,320	11,500	8,030	20,900	28,900	37,200	39,900	12,800	10,900
24	6,560	17,200	11,500	5,540	10,300	7,760	18,300	37,800	38,500	37,800	14,800	8,850
25	6,560	16,200	10,300	14,100	9,410	6,980	16,900	42,000	34,000	33,400	13,100	8,300
26	11,000	14,100	8,850	15,200	8,850	6,480	16,600	39,200	32,800	28,900	12,800	8,030
27	8,880	12,800	8,570	11,200	8,030	6,240	18,300	50,600	32,800	26,400	12,100	7,500
28	7,040	11,800	10,900	10,300	7,500	6,730	16,600	46,900	33,400	23,700	11,200	7,500
29	6,100	10,900	10,300	9,130	-------	6,730	15,500	39,200	33,400	22,900	11,500	8,570
30	6,100	10,900	16,200	9,130	-------	9,990	14,100	35,200	32,800	19,700	12,100	7,760
31	5,240	-------	15,200	8,570	-------	8,850	-------	39,200	-------	18,600	11,800	-------

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913–14												
1	7,240	8,850	17,600	6,000	10,500	21,200	10,200	15,100	24,800	27,200	12,100	8,150
2	7,240	8,570	15,500	6,000	9,290	21,700	9,590	19,900	32,000	31,400	13,200	7,620
3	7,240	7,760	13,800	6,240	8,710	15,900	10,200	30,300	37,200	31,400	12,500	7,620
4	6,980	7,500	12,400	8,570	8,430	13,900	13,500	30,300	32,000	32,000	12,100	7,360
5	6,240	8,850	11,800	50,600	7,880	12,500	21,700	24,400	24,400	26,700	11,800	7,110
6	6,000	11,500	10,900	74,000	7,110	10,800	23,000	21,200	20,800	23,000	11,800	6,380
7	6,000	13,400	11,200	104,000	6,860	10,200	20,400	20,400	17,900	21 200	12,500	6,380
8	6,000	10,900	10,600	77,100	6,620	10,200	19,100	19,900	18,300	20,800	11,200	7,620
9	6,240	11,800	9,990	42,500	6,620	10,800	19,500	20,400	17,100	21,200	10,500	8,430
10	6,000	16,600	8,850	30,300	6,380	10,500	20,800	20,800	15,500	21,200	9,890	7,360
11	32,800	13,800	8,570	25,300	6,860	9,890	20,400	21,200	15,500	22,200	10,200	6,860
12	46,200	11,500	9,130	21,200	6,860	9,590	19,900	22,200	17,100	22,600	10,800	7,620
13	37,200	9,990	9,130	18,300	7,110	10,500	19,500	24,400	19,900	23,500	11,200	6,620
14	34,000	8,850	8,850	16,700	7,110	19,500	24,800	30,800	22,600	22,200	11,200	6,150
15	21,300	8,300	9,700	15,900	6,860	23,500	29,800	42,500	27,700	19,900	10,800	8,150
16	17,600	21,700	8,570	15,900	6,860	18,700	30,300	38,500	34,800	19,900	10,800	7,880
17	14,800	30,000	8,030	15,100	7,110	23,500	23,500	32,500	39,800	17,900	10,200	7,110
18	13,100	19,400	7,760	14,300	6,860	20,400	19,900	28,700	36,000	19,100	9,000	10,200
19	12,400	15,800	7,500	13,200	6,860	18,700	22,200	27,200	31,400	19,100	9,000	19,900
20	13,400	14,400	7,240	11,800	7,620	17,900	34,800	26,700	26,700	19,900	9,290	20,800
21	12,801	12,800	6,980	11,200	7,880	18,300	26,700	27,700	24,000	17,500	9,590	15,500
22	12,100	11,800	6,730	10,800	11,200	17,900	22,200	30,800	23,500	13,900	9,890	11,500
23	11,200	11,800	6,480	10,200	10,800	16,700	19,900	33,000	19,100	13,500	9,000	9,590
24	13,100	49,100	6,240	9,290	10,800	15,900	18,700	35,400	17,100	12,800	8,710	9,000
25	14,400	40,600	6,000	9,000	10,800	15,100	17,100	32,000	17,900	12,800	9,000	9,000
26	11,800	32,800	6,000	9,590	9,890	13,900	15,960	28,700	17,900	12,800	9,000	9,000
27	13,800	22,500	6,000	10,500	13,500	12,500	15,900	24,400	17,900	12,800	8,710	13,200
28	12,800	20,500	6,000	9,290	13,900	11,500	15,900	22,600	19,500	12,100	9,000	11,200
29	8,850	19,400	6,000	9,000	-------	11,200	14,300	19,100	19,900	11,500	8,710	9,000
30	8,570	20,500	5,770	9,000	-------	10,800	13,900	17,900	23,500	11,500	8,710	8,430
31	8,030	-------	5,770	9,590	-------	10,500	-------	19,100	-------	11,800	9,000	-------
1914–15												
1	7,880	12,800	14,600	6,670	5,510	5,510	9,060	11,000	14,500	11,000	10,300	7,240
2	7,880	38,500	13,900	9,340	5,960	5,510	33,000	10,300	14,100	13,300	10,300	6,980
3	8,150	41,800	13,000	9,630	5,730	5,290	66,500	9,990	12,900	14,100	11,000	6,230
4	7,620	27,700	12,300	9,630	5,730	5,510	45,400	10,300	11,700	14,900	9,660	6,720
5	7,110	32,000	11,100	8,230	5,730	5,960	29,700	11,000	13,300	14,500	8,690	6,980
6	6,620	28,200	10,200	7,430	7,170	5,730	23,900	12,500	16,200	12,900	8,380	6,230
7	6,380	21,500	9,920	7,170	7,430	5,730	21,000	14,500	18,400	12,500	9,010	5,350
8	6,380	17,800	9,630	7,430	6,670	5,510	20,600	17,500	16,200	10,300	8,690	4,610
9	6,380	19,000	9,060	7,690	6,430	5,510	17,500	16,600	13,300	12,500	8,380	4,780
10	6,380	17,000	8,780	7,170	6,920	5,510	15,400	18,400	11,400	9,990	8,380	4,440
11	7,360	16,300	8,230	8,780	6,430	5,510	14,900	17,100	10,700	9,010	9,010	4,280
12	7,360	20,200	7,690	10,500	6,190	5,510	15,800	14,100	10,300	7,510	8,690	4,120
13	10,500	18,500	7,430	9,060	6,190	5,290	18,000	13,300	10,300	7,790	7,790	3,970
14	9,000	18,500	7,170	8,230	5,960	5,960	18,400	12,500	10,700	7,790	8,690	3,970
15	8,150	15,600	7,170	8,230	5,730	15,600	14,900	12,900	11,000	7,510	9,660	3,830
16	7,880	13,900	6,920	7,170	5,290	15,600	14,900	11,000	12,500	11,700	9,330	3,970
17	10,500	12,600	6,670	6,920	5,290	11,700	17,500	10,300	13,300	11,000	9,660	3,830
18	17,100	11,700	6,430	6,430	7,170	11,100	19,300	11,000	11,700	9,330	9,010	3,970
19	29,200	10,500	6,190	6,430	6,430	10,800	20,200	13,300	10,700	8,380	8,380	3,970
20	22,200	13,900	6,190	6,430	6,190	8,230	21,000	14,500	9,990	9,010	9,330	3,970
21	15,100	19,400	6,190	6,430	5,730	8,500	18,800	13,700	9,660	9,990	9,990	3,970
22	11,800	16,300	5,960	6,190	5,730	10,500	15,800	12,900	9,660	11,700	10,700	3,970
23	9,890	16,300	5,730	5,960	5,730	13,600	13,700	12,500	10,700	10,300	11,000	3,970
24	9,000	16,300	5,730	5,960	5,510	13,600	12,900	11,700	11,400	9,660	9,990	4,120
25	8,710	16,300	5,290	5,730	5,960	12,300	12,500	12,900	11,000	9,990	9,990	3,970
26	8,430	19,400	5,510	5,730	5,730	10,200	12,100	11,700	9,660	9,990	9,010	3,500
27	8,150	22,300	5,510	5,510	5,510	9,340	12,500	11,000	8,690	9,660	8,690	3,500
28	7,880	20,200	5,510	5,290	5,510	8,500	11,700	24,800	8,380	9,010	8,380	3,050
29	7,620	18,200	5,510	5,290	-------	8,780	11,700	22,000	8,380	9,010	8,080	2,830
30	7,620	16,300	5,510	5,080	-------	9,920	12,900	16,200	9,660	8,690	9,010	2,830
31	13,200	-------	6,920	5,080	-------	9,630	-------	13,300	-------	9,990	8,690	-------

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1915–16												
1	3,050	33,900	8,260	7,300	5,010	12,200	13,700	20,200	21,000	32,800	25,800	13,300
2	6,990	19,700	7,300	6,990	4,740	11,400	14,400	23,400	21,000	35,500	22,900	12,600
3	7,610	18,800	8,600	6,390	4,960	10,700	14,800	31,700	22,900	42,200	22,000	13,700
4	6,100	16,400	12,900	6,100	5,190	9,990	16,000	35,500	29,700	45,400	20,600	15,600
5	4,480	16,800	12,600	5,820	5,420	8,940	17,600	35,000	31,700	36,600	20,200	13,300
6	5,550	15,600	14,100	5,010	5,650	8,600	16,400	36,000	25,800	35,000	20,200	11,100
7	3,980	12,900	13,700	5,010	5,880	8,260	15,600	36,000	23,900	31,200	20,600	9,640
8	3,500	10,700	23,400	5,550	6,100	11,400	16,400	29,700	25,300	35,000	21,500	8,940
9	3,500	10,300	51,900	5,280	5,550	23,400	16,800	26,700	31,700	44,100	22,000	9,640
10	2,830	9,290	27,700	5,010	8,260	33,900	17,600	22,900	30,200	39,800	20,600	8,260
11	2,830	8,600	20,200	3,980	12,900	29,200	19,300	20,200	25,800	37,700	21,000	7,300
12	3,050	7,930	16,000	3,740	9,290	37,700	19,300	18,400	25,800	42,800	21,500	6,990
13	5,280	6,990	14,100	3,740	7,300	41,000	17,600	17,600	30,700	42,800	22,000	6,990
14	11,100	6,390	12,600	3,500	8,600	29,700	16,800	16,000	38,200	36,000	22,000	6,990
15	8,600	6,100	10,700	3,270	23,900	24,300	19,300	16,000	46,700	30,200	21,000	6,390
16	5,550	6,990	9,640	3,270	54,600	20,600	17,600	18,400	60,200	33,300	19,300	6,390
17	4,480	7,610	9,290	3,430	51,900	20,200	16,400	21,000	71,800	38,200	15,200	6,690
18	4,480	11,800	8,260	3,590	35,000	18,400	16,400	23,400	75,000	37,700	13,300	6,690
19	9,290	15,200	7,930	3,750	28,200	16,800	16,000	23,900	64,400	32,300	12,600	6,690
20	6,690	12,900	9,290	3,910	26,300	16,800	15,200	24,800	46,700	29,200	11,400	6,690
21	10,700	9,640	12,600	4,070	24,800	22,900	14,800	24,300	42,200	32,800	10,300	6,690
22	8,600	11,800	25,800	4,230	22,900	21,500	14,800	22,900	32,800	29,700	10,700	6,690
23	7,300	11,800	18,000	10,700	21,000	22,900	13,700	20,200	36,000	30,200	11,800	6,990
24	9,290	12,600	14,100	13,700	18,800	19,300	12,900	18,800	42,800	27,700	13,300	6,390
25	11,400	10,300	14,800	8,600	16,400	17,600	13,300	18,800	44,100	27,700	14,800	6,100
26	17,600	12,200	12,900	6,990	15,200	16,400	14,800	22,000	46,000	27,700	15,600	6,990
27	23,400	11,400	11,400	5,820	14,800	19,300	18,000	25,300	55,300	24,300	15,600	11,700
28	36,000	9,640	10,700	5,280	13,700	16,400	26,300	25,300	50,600	22,400	15,600	8,550
29	32,800	9,990	9,640	5,820	12,900	15,600	23,400	24,800	48,600	22,400	15,200	7,450
30	18,800	9,640	7,930	5,010	-------	14,100	20,600	22,400	35,500	22,900	14,800	7,030
31	26,700	-------	7,300	5,010	-------	13,300	-------	21,000	-------	25,300	13,700	-------
1916–17												
1	7,030	10,300	7,660	6,250	5,690	6,250	6,630	14,000	45,200	39,000	18,800	11,700
2	6,440	8,780	8,100	5,870	5,870	5,870	6,830	13,300	47,800	45,800	19,200	10,800
3	6,250	14,000	10,600	5,870	6,830	5,870	6,630	13,300	39,000	49,700	21,100	10,300
4	5,870	25,600	11,700	6,060	11,100	5,870	6,630	13,000	31,700	48,400	21,600	10,000
5	5,690	15,500	10,000	12,000	12,300	7,450	13,000	12,600	28,100	52,300	20,600	9,510
6	5,510	11,700	9,020	12,300	12,600	7,240	12,300	13,000	27,600	45,800	19,700	9,510
7	5,510	9,760	8,320	10,600	11,100	6,630	10,800	15,500	30,100	42,000	18,800	9,260
8	5,330	9,020	7,660	9,260	10,300	6,630	12,000	19,200	35,000	39,000	17,500	9,020
9	5,330	31,700	7,450	11,100	10,000	6,250	12,300	26,600	45,800	39,600	16,700	8,780
10	5,160	29,600	7,030	10,600	9,760	6,060	11,400	28,600	42,000	46,400	16,700	9,020
11	5,160	16,700	6,630	9,760	10,000	5,870	12,300	32,200	32,800	43,800	15,900	9,510
12	5,160	12,300	7,030	9,260	12,600	5,870	12,000	33,900	28,100	44,500	16,300	12,000
13	5,330	10,600	7,660	8,550	11,700	5,870	10,800	35,600	26,100	43,200	18,300	10,300
14	5,510	9,510	7,240	7,880	11,100	5,870	10,600	35,000	30,600	40,800	17,900	10,800
15	5,510	9,020	6,830	7,450	10,000	5,690	10,600	30,100	42,000	41,400	17 100	9,260
16	5,510	8,320	6,630	7,030	10,800	5,510	10,000	26,600	57,600	41,400	17,900	9,760
17	5,510	8,100	6,440	6,630	11,400	5,330	9,760	23,100	57,600	45,800	17,900	10,600
18	5,870	7,660	6,630	6,440	10,300	5,330	10,000	19,700	51,600	43,200	17,500	10,300
19	5,330	7,660	8,550	6,440	9,510	5,510	10,000	18,800	47,100	39,600	17,900	9,510
20	5,160	7,240	7,660	6,250	9,260	5,690	10,300	18,800	45,800	38,400	16,300	10,000
21	5,160	7,030	7,450	6,060	8,550	5,870	11,400	19,200	45,200	36,100	17,100	9,760
22	4,820	6,830	7,030	6,060	8,320	5,870	11,400	19,700	45,800	32,800	15,500	9,260
23	4,820	6,830	6,630	5,870	7,660	6,060	11,400	20,600	39,600	28,100	13,600	9,020
24	4,500	6,630	6,440	5,690	7,240	6,830	11,400	22,600	36,100	24,600	13,600	9,760
25	4,820	6,630	6,250	6,630	7,030	6,830	11,400	25,100	42,000	23,600	13,600	7,880
26	5,870	9,260	5,870	7,660	6,830	6,440	12,300	29,100	37,800	24,100	13,000	7,880
27	8,320	8,550	5,690	7,450	6,630	6,250	13,300	37,200	38,400	27,100	12,300	15,500
28	7,030	10,600	5,510	7,240	6,440	7,030	14,400	45,800	40,200	27,100	12,300	12,600
29	7,240	8,780	5,510	6,630	-------	7,660	14,700	51,000	47,100	29,100	12,000	10,600
30	7,880	8,320	5,330	6,440	-------	7,880	14,700	49,700	40,200	23,100	12,300	8,780
31	10,800	-------	5,330	5,690	-------	7,240	-------	45,800	-------	19,700	12,600	-------

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1917–18												
1	8,320	6,440	10,300	119,000	11,900	7,500	17,700	24,300	28,200	27,600	15,400	11,200
2	8,320	7,240	9,510	95,000	11,200	7,250	15,000	26,500	23,200	28,200	16,800	10,900
3	19,200	12,300	9,020	65,800	11,200	7,250	13,400	31,200	19,200	25,400	15,900	9,530
4	17,100	29,600	9,510	60,200	13,800	7,010	12,300	39,600	17,700	22,200	13,000	8,600
5	13,300	17,100	9,510	52,000	26,000	6,770	11,600	38,400	19,200	22,200	12,300	8,310
6	11,100	16,700	9,020	42,500	22,700	6,770	11,200	31,200	24,800	21,700	12,300	8,600
7	10,000	12,600	8,550	53,500	27,000	6,540	10,900	26,000	36,000	22,200	11,900	8,600
8	9,020	10,800	8,320	41,100	20,700	6,320	11,200	23,800	44,500	23,200	11,600	8,310
9	8,320	9,260	9,020	33,600	17,200	6,320	14,600	21,200	44,500	26,500	12,700	8,900
10	8,320	8,780	9,760	27,200	23,200	6,320	20,700	19,200	52,300	32,400	12,300	8,900
11	8,100	7,880	9,760	23,600	24,300	6,110	19,700	19,200	61,100	28,200	18,700	8,900
12	7,880	7,880	10,000	26,000	20,200	6,320	18,700	20,700	53,000	21,700	15,900	8,900
13	7,450	8,320	12,300	23,600	17,200	6,110	18,200	23,200	54,900	19,200	12,700	8,900
14	7,240	7,660	53,000	20,800	15,000	5,900	16,300	26,000	57,600	19,200	12,300	8,600
15	7,450	7,660	43,200	20,300	13,400	5,900	14,600	27,600	45,800	23,200	12,300	8,900
16	7,030	6,830	66,100	17,300	12,300	5,900	13,000	29,400	35,400	29,400	13,800	8,310
17	6,630	6,630	61,800	16,300	11,600	6,320	12,700	27,000	36,600	29,400	11,600	8,310
18	6,250	6,250	51,000	37,200	10,900	10,200	11,600	24,800	34,200	29,400	11,200	8,310
19	6,060	6,440	103,000	29,400	9,850	10,200	11,200	23,200	33,000	27,600	15,900	8,030
20	5,870	6,250	57,600	23,200	9,210	10,200	13,400	22,200	33,600	22,700	12,300	8,600
21	5,690	26,600	34,200	20,200	8,900	11,200	20,700	19,700	39,000	22,200	11,200	8,030
22	6,440	19,200	30,000	18,200	8,600	19,200	24,800	17,200	47,100	17,200	11,200	7,500
23	5,870	14,000	27,600	17,700	8,600	20,200	24,300	15,400	45,800	16,300	13,800	7,250
24	5,870	10,800	21,700	19,200	8,600	21,200	23,200	15,000	40,800	16,300	13,800	6,540
25	6,250	10,000	18,200	22,200	8,030	32,400	23,200	13,800	35,400	15,900	12,700	6,320
26	6,830	9,020	16,300	18,700	8,310	24,800	20,200	13,000	32,400	16,300	11,900	6,110
27	7,450	8,320	28,200	16,300	8,030	18,700	18,200	13,000	32,400	16,300	11,200	6,540
28	7,030	11,700	60,400	15,400	7,500	16,300	18,200	13,800	29,400	15,000	9,850	7,010
29	5,870	10,800	87,800	16,300	-------	15,400	19,700	18,200	25,400	15,400	9,210	7,500
30	6,060	10,600	155,000	13,800	-------	15,900	23,800	21,700	25,400	15,900	9,530	7,500
31	5,870	-------	87,000	12,700	-------	18,700	-------	33,000	-------	15,400	10,200	-------
1918–19												
1	7,760	19,200	8,900	9,060	12,200	8,020	14,500	26,000	27,600	24,500	18,700	11,500
2	6,540	16,300	9,530	8,530	11,200	8,790	15,300	26,000	25,000	27,000	17,800	9,620
3	6,320	15,000	13,800	8,270	10,200	10,800	16,500	22,500	25,500	29,400	16,900	
4	7,010	14,200	61,800	8,270	10,200	9,620	21,500	19,600	27,000	33,600	16,100	
5	7,250	13,400	66,800	8,020	9,620	9,340	23,000	17,800	30,600	35,400	16,500	
6	11,900	11,900	34,200	7,780	9,060	8,790	17,800	16,100	33,000	38,400	15,300	
7	9,530	10,900	24,300	7,540	8,790	8,020	16,900	16,500	30,600	32,400	15,700	
8	7,250	9,850	19,200	7,540	8,530	8,020	15,300	17,800	27,000	27,000	15,700	
9	6,320	9,530	19,200	7,080	12,200	8,020	13,700	21,000	26,500	27,600	15,300	
10	5,900	11,600	14,200	7,780	15,300	7,540	19,600	22,000	26,500	33,600	15,300	
11	13,000	22,700	13,400	7,080	12,600	8,020	22,000	20,000	24,500	34,800	15,300	8,500
12	51,000	14,600	12,300	7,310	11,500	8,020	17,800	20,500	22,000	34,800	16,100	
13	10,500	15,000	17,700	7,080	10,500	7,780	16,100	17,800	22,000	30,000	14,900	
14	12,300	21,200	67,600	7,080	9,620	8,270	14,500	16,100	24,000	28,800	13,300	
15	9,530	18,700	51,000	7,080	9,620	7,780	12,600	17,400	24,500	34,200	12,200	
16	8,030	18,200	31,200	7,540	9,620	8,020	11,500	24,000	24,500	40,800	12,900	
17	9,530	15,000	23,500	9,910	13,300	8,020	11,800	23,000	24,500	38,400	14,500	
18	8,310	13,400	19,600	35,400	10,800	11,500	19,600	20,000	26,000	29,400	14,900	
19	7,760	11,900	17,400	33,600	9,910	11,500	21,500	20,500	31,200	24,500	14,900	8,530
20	9,210	11,200	15,700	28,200	9,340	10,500	20,500	25,500	40,200	23,500	13,700	8,340
21	8,030	10,200	14,100	17,800	9,060	9,910	19,600	28,800	43,200	25,000	13,300	8,160
22	7,760	9,850	12,900	18,700	8,790	9,340	17,800	38,400	40,200	26,500	12,900	7,970
23	7,250	8,900	11,500	42,000	8,530	9,620	16,100	39,000	40,800	25,500	12,200	7,780
24	8,030	8,900	10,800	36,600	8,020	9,340	16,500	33,000	36,600	23,000	10,800	7,590
25	8,900	8,030	10,200	24,500	7,540	9,060	18,700	31,200	34,800	22,500	10,800	7,400
26	7,760	7,760	9,910	24,000	8,270	8,790	18,700	59,700	36,000	20,000	11,200	7,220
27	30,000	8,030	9,340	19,600	8,020	8,530	20,500	62,500	37,200	17,800	10,800	7,030
28	66,100	7,760	9,910	16,900	8,270	8,530	24,000	65,400	33,000	17,800	9,910	6,840
29	40,800	7,500	12,200	16,100	-------	8,790	24,500	56,200	30,000	18,700	9,340	6,380
30	24,800	7,760	10,500	14,500	-------	9,910	25,500	40,200	25,500	19,200	9,620	6,160
31	20,700	-------	9,620	13,300	-------	14,100	-------	32,400	-------	17,800	9,620	-------

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1919				1919				1919			
1	6,610	7,300	10,400	11	6,160	6,380	5,500	21	6,160	21,700	32,800
2	6,380	7,780	9,440	12	6,840	6,160	5,000	22	7,070	23,400	27,400
3	5,940	10,800	8,860	13	7,070	5,940	6,000	23	6,610	25,600	31,600
4	5,940	8,040	8,300	14	6,380	10,800	7,000	24	6,160	20,700	39,400
5	5,500	8,040	7,540	15	6,160	51,700	12,000	25	6,160	16,400	29,200
6	5,500	7,070	7,780	16	5,940	76,600	20,000	26	5,940	14,200	26,200
7	5,500	6,840	7,540	17	5,940	66,500	25,000	27	5,500	13,400	28,000
8	5,940	6,380	7,300	18	5,720	38,700	22,800	28	5,500	12,600	25,000
9	5,940	6,380	6,840	19	5,500	36,100	20,700	29	5,500	12,200	19,700
10	5,940	6,840	6,380	20	5,290	26,800	25,000	30	5,500	10,800	17,800
								31	5,500	----	16,400

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1921								
1	8,270	22,500	9,620	11,200	44,500	49,000	22,500	12,600
2	8,270	20,500	10,200	11,800	47,800	36,600	21,000	13,300
3	8,270	18,200	11,200	11,800	52,300	28,200	19,600	10,500
4	8,020	19,600	10,200	9,620	57,600	24,500	18,700	11,500
5	7,780	17,800	10,200	10,500	64,600	23,000	17,400	9,620
6	7,780	16,100	9,620	11,200	61,800	23,000	16,100	9,060
7	7,780	13,700	9,060	12,900	66,100	23,500	17,800	8,790
8	8,020	12,900	8,790	14,100	74,600	25,500	17,800	9,620
9	8,270	11,200	8,270	13,700	57,600	28,800	17,800	9,620
10	14,900	11,200	8,270	14,900	52,300	25,500	16,900	9,060
11	43,800	11,200	9,620	20,500	45,800	25,500	15,300	8,530
12	85,300	10,500	12,200	18,200	51,000	28,800	15,700	7,780
13	51,600	10,200	16,100	16,800	49,000	28,200	14,100	7,780
14	32,400	9,620	14,900	21,500	42,600	30,600	15,700	5,390
15	23,500	9,620	13,700	28,200	38,400	29,400	14,900	6,640
16	18,700	9,620	11,800	35,400	33,600	25,500	14,100	6,640
17	16,100	12,200	10,500	45,800	30,000	24,000	13,700	6,640
18	14,100	19,200	11,200	44,500	28,200	25,500	19,200	7,780
19	12,900	17,800	11,200	44,500	27,600	26,500	17,400	9,620
20	11,500	14,500	13,700	41,400	33,600	25,500	14,100	18,200
21	10,500	11,500	13,700	40,200	43,200	21,500	13,700	24,500
22	10,500	10,800	19,200	42,600	47,800	20,500	13,700	17,800
23	10,500	10,800	16,900	41,400	42,600	22,500	11,200	13,300
24	12,900	10,800	14,900	41,400	44,500	20,000	10,500	10,500
25	13,700	10,500	13,700	49,700	45,800	25,000	10,200	9,060
26	16,100	10,500	12,900	47,800	42,600	21,500	9,060	19,200
27	15,700	10,500	12,200	38,400	39,600	20,000	9,060	28,800
28	20,500	10,200	11,800	30,600	38,400	20,500	9,620	44,500
29	----	9,620	11,800	26,500	33,600	19,600	9,060	24,000
30	----	9,620	12,600	27,600	38,400	18,200	9,620	16,100
31	----	9,620	----	35,400	----	20,500	10,200	----

Daily discharge, in second-feet, of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1921–22												
1	13,300	35,400	40,200	9,420	5,020	5,200	5,570	13,300	53,500	26,400	12,200	13,300
2	11,800	25,500	38,400	9,420	4,680	5,200	5,980	16,800	62,000	28,100	12,200	15,000
3	9,620	21,000	26,500	7,930	4,680	5,200	5,570	17,300	71,000	28,100	13,000	10,400
4	9,340	18,200	21,500	7,930	4,680	5,380	9,420	22,700	74,600	27,000	12,600	10,400
5	8,790	19,200	17,800	7,930	5,020	5,570	9,740	23,700	58,600	25,900	11,500	11,800
6	8,270	20,500	17,400	7,930	5,200	5,200	8,500	21,700	58,600	23,700	11,100	9,740
7	7,780	34,200	16,900	7,930	5,200	5,200	9,110	18,700	50,300	23,700	10,400	11,800
8	7,780	24,500	15,300	7,930	5,570	5,200	15,900	16,400	42,000	23,200	9,420	13,000
9	7,780	19,600	14,100	7,930	5,980	5,570	12,200	15,400	37,000	23,200	9,740	9,110
10	7,540	16,500	21,500	9,110	5,570	5,570	11,100	13,300	38,400	21,700	10,400	8,500
11	7,540	14,500	56,200	7,930	5,570	5,380	10,400	12,200	36,400	21,700	12,600	9,110
12	7,540	16,100	111,000	7,930	5,570	5,200	9,420	11,800	37,700	20,700	13,300	9,740
13	7,540	14,900	188,000	7,400	5,570	5,200	7,930	11,800	40,500	19,700	11,100	10,400
14	11,200	14,500	125,000	6,890	5,200	5,200	7,400	15,900	43,400	18,700	9,110	9,420
15	17,800	14,500	95,000	6,890	5,200	5,200	7,400	21,700	40,500	18,700	8,800	8,500
16	20,500	13,700	37,000	6,650	5,200	5,200	7,400	30,500	37,000	17,800	15,000	8,500
17	16,100	12,600	29,300	6,200	6,200	4,850	7,400	48,000	35,700	17,800	11,500	11,100
18	17,800	11,200	24,800	6,200	6,200	4,850	6,200	53,500	33,100	16,800	11,100	10,400
19	14,100	10,500	19,700	6,200	5,980	4,850	6,200	45,700	31,200	17,800	11,100	10,400
20	37,200	10,200	19,700	6,200	5,980	5,570	6,200	34,400	30,500	17,300	15,400	10,400
21	23,500	9,620	17,300	5,980	5,980	6,650	6,650	26,400	38,400	16,400	13,000	10,100
22	18,200	12,200	15,000	5,570	5,770	9,110	6,650	25,900	31,800	15,000	10,400	9,420
23	16,900	14,500	13,700	5,200	5,380	7,400	8,500	21,700	29,300	13,300	8,800	11,100
24	16,900	14,500	12,200	5,570	5,200	6,890	12,600	21,200	27,600	13,000	9,420	11,100
25	18,700	17,800	12,200	5,980	5,200	6,420	14,200	20,700	34,400	12,600	10,400	8,800
26	21,500	18,700	11,100	6,420	5,200	5,980	12,200	20,700	36,400	13,000	10,400	8,800
27	18,200	37,200	11,100	5,980	5,200	5,200	11,800	18,700	37,700	13,000	11,100	13,300
28	20,500	37,200	11,100	5,980	5,200	4,850	13,000	20,700	40,500	12,200	11,100	13,700
29	21,500	26,500	11,100	5,980	-------	4,850	12,200	27,600	33,800	12,200	10,800	10,800
30	17,800	28,200	11,100	5,570	-------	4,680	13,000	37,000	29,900	12,200	11,100	13,000
31	44,500	-------	9,420	5,200	-------	5,020	-------	45,700	-------	12,200	10,800	-------

NOTE.—No record Jan. 1, 1920, to Feb. 1, 1921. The above daily-discharge figures supersede those published in previous reports.

Monthly discharge of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922.

[Drainage area, 2,970 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1908						
May	22,500	11,500	15,700	5.29	6.10	965,000
June	47,000	14,800	26,000	8.75	9.76	1,550,000
July	37,100	11,200	25,100	8.45	9.74	1,540,000
August	13,500	6,580	10,500	3.54	4.08	646,000
September	7,980	3,540	5,570	1.88	2.10	331,000
The period						5,030,000
1908–9						
October	17,100	3,540	5,520	1.86	2.14	339,000
November	92,600	4,630	18,700	6.30	7.03	1,110,000
December	15,100	6,150	8,370	2.82	3.25	515,000
January	26,800	5,350	10,600	3.57	4.12	652,000
February	14,800	5,350	7,890	2.66	2.77	438,000
March	10,100	5,350	6,360	2.14	2.47	391,000
April	13,200	6,800	8,360	2.81	3.14	497,000
May	27,200	7,980	14,600	4.92	5.67	898,000
June	48,200	18,100	28,100	9.46	10.56	1,670,000
July	25,600	12,400	17,900	6.03	6.95	1,100,000
August	18,400	6,580	9,380	3.16	3.64	577,000
September	10,900	5,160	7,300	2.46	2.74	434,000
The year	92,600	3,540	11,900	4.01	54.48	8,620,000

Monthly discharge of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1909–10						
October	12,100	5,160	7,010	2.36	2.72	431,000
November	198,000	6,360	33,200	11.2	12.50	1,980,000
December	93,600	9,570	23,600	7.95	9.16	1,450,000
January	38,200	6,260	11,800	3.97	4.58	726,000
February	15,700	5,970	9,220	3.10	3.23	512,000
March	28,700	11,500	19,400	6.53	7.53	1,190,000
April	55,700	11,900	22,800	7.68	8.57	1,360,000
May	68,100	20,200	35,100	11.8	13.60	2,160,000
June	49,200	16,600	24,900	8.38	9.35	1,480,000
July	31,600	14,000	19,900	6.70	7.72	1,220,000
August	15,700	5,970	10,700	3.60	4.15	658,000
September	9,210	4,890	6,500	2.19	2.44	387,000
The year	198,000	4,890	18,700	6.30	85.55	13,600,000
1910–11						
October	62,300	10,300	23,900	8.05	9.28	1,470,000
November	89,100	11,500	29,500	9.93	11.08	1,760,000
December	30,800	11,900	17,600	5.93	6.84	1,080,000
January	18,700	6,680	11,600	3.91	4.51	713,000
February	6,680	4,300	5,470	1.84	1.92	304,000
March	17,400	4,300	8,430	2.84	3.27	518,000
April	20,000	8,240	11,400	3.84	4.28	678,000
May	35,700	16,100	21,700	7.31	8.43	1,330,000
June	60,900	22,300	35,500	12.0	13.39	2,110,000
July	33,500	16,500	23,400	7.88	9.08	1,440,000
August	15,200	8,570	11,400	3.84	4.43	701,000
September	21,800	5,820	10,800	3.64	4.06	643,000
The year	89,100	4,300	17,600	5.93	80.57	12,700,000
1911–12						
October	8,240	3,230	4,930	1.66	1.91	303,000
November	65,100	3,040	17,500	5.89	6.57	1,040,000
December	18,800	7,370	11,500	3.87	4.46	707,000
January	37,800	5,180	12,800	4.31	4.97	787,000
February	26,900	8,120	15,300	5.15	5.55	850,000
March	7,570	4,870	5,990	2.02	2.33	368,000
April	11,400	7,300	8,870	2.99	3.34	528,000
May	48,400	9,630	25,200	8.48	9.78	1,550,000
June	49,100	21,200	33,200	11.2	12.50	1,980,000
July	23,000	12,300	19,300	6.50	7.49	1,190,000
August	17,600	6,800	11,600	3.91	4.51	713,000
September	10,700	4,120	6,490	2.19	2.44	386,000
The year	65,100	3,040	14,400	4.85	65.85	10,400,000
1912–13						
October	11,300	3,780	5,930	2.00	2.31	365,000
November	50,600	4,650	15,100	5.08	5.67	898,000
December	19,000	8,570	11,600	3.91	4.51	713,000
January	16,600	5,320	9,200	3.10	3.57	566,000
February	40,600	4,900	11,000	3.70	3.85	611,000
March	14,400	6,240	8,720	2.94	3.39	536,000
April	24,200	6,980	14,300	4.81	5.37	851,000
May	50,600	10,600	25,700	8.65	9.97	1,580,000
June	69,200	28,400	42,900	14.4	16.07	2,550,000
July	43,400	18,600	30,100	10.1	11.64	1,850,000
August	23,300	10,300	15,200	5.12	5.90	935,000
September	43,400	7,500	13,100	4.41	4.92	780,000
The year	69,200	3,780	16,900	5.69	77.17	12,200,000
1913–14						
October	46,200	6,000	14,000	4.71	5.43	861,000
November	49,100	7,500	16,700	5.62	6.27	994,000
December	17,600	5,770	8,870	2.99	3.45	545,000
January	104,000	6,000	22,000	7.41	8.54	1,350,000
February	13,900	6,380	8,470	2.85	2.97	470,000
March	23,500	9,590	15,000	5.05	5.82	922,000
April	34,800	9,590	19,800	6.67	7.44	1,180,000
May	42,500	15,100	26,100	8.79	10.13	1,600,000
June	39,800	15,500	23,700	7.98	8.90	1,410,000
July	32,000	11,500	19,500	6.57	7.57	1,200,000
August	13,200	8,710	10,300	3.47	4.00	633,000
September	20,800	6,150	9,360	3.15	3.51	557,000
The year	104,000	5,770	16,200	5.45	74.03	11,700,000

Monthly discharge of Skagit River near Sedro Woolley, Wash., for the period May 1 1908, to Sept. 30, 1922—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1914–15						
October	29,200	6,380	9,920	3.34	3.85	610,000
November	41,800	10,500	19,600	6.60	7.36	1,170,000
December	14,600	5,290	7,930	2.67	3.08	488,000
January	10,500	5,080	7,120	2.40	2.77	438,000
February	7,430	5,290	6,060	2.04	2.12	337,000
March	15,600	5,290	8,580	2.89	3.33	528,000
April	66,500	9,060	19,700	6.63	7.40	1,170,000
May	24,800	9,990	13,700	4.61	5.32	842,000
June	18,400	8,380	11,700	3.94	4.40	696,000
July	14,900	7,510	10,400	3.50	4.04	640,000
August	11,000	7,790	9,220	3.10	3.57	567,000
September	7,240	2,830	4,500	1.52	1.70	268,000
The year	66,500	2,830	10,700	3.60	48.94	7,750,000
1915–16						
October	36,000	2,830	10,000	3.37	3.88	615,000
November	33,900	6,100	12,100	4.07	4.54	720,000
December	51,900	7,300	14,300	4.81	5.54	879,000
January	13,700	3,270	5,460	1.84	2.12	336,000
February	54,600	4,740	16,400	5.52	5.95	943,000
March	41,000	8,260	19,100	6.43	7.41	1,170,000
April	26,300	12,900	16,900	5.69	6.35	1,010,000
May	36,000	16,000	24,000	8.08	9.32	1,480,000
June	75,000	21,000	39,400	13.3	14.84	2,340,000
July	45,400	22,400	33,300	11.2	12.91	2,050,000
August	25,800	10,300	17,600	5.93	6.84	1,080,000
September	15,600	6,100	8,620	2.90	3.24	513,000
The year	75,000	2,830	18,100	6.09	82.94	13,100,000
1916–17						
October	10,800	4,500	5,920	1.99	2.29	364,000
November	31,700	6,630	11,400	3.84	4.28	678,000
December	11,700	5,330	7,290	2.45	2.82	448,000
January	12,300	5,690	7,650	2.58	2.97	470,000
February	12,600	5,690	9,320	3.14	3.27	518,000
March	7,880	5,330	6,280	2.11	2.43	386,000
April	14,700	6,630	11,000	3.70	4.13	655,000
May	51,000	12,600	26,100	8.79	10.13	1,600,000
June	57,600	26,100	40,100	13.5	15.06	2,390,000
July	52,300	19,700	37,600	12.7	14.64	2,310,000
August	21,600	12,000	16,500	5.56	6.41	1,010,000
September	15,500	7,880	10,000	3.37	3.76	595,000
The year	57,600	4,500	15,800	5.32	72.19	11,400,000
1917–18						
October	19,200	5,690	8,140	2.74	3.16	501,000
November	29,600	6,250	11,100	3.74	4.17	660,000
December	155,000	8,320	36,800	12.2	14.07	2,230,000
January	119,000	12,700	32,800	11.0	12.68	2,020,000
February	27,000	7,500	14,100	4.75	4.95	783,000
March	32,400	5,900	11,500	3.87	4.46	707,000
April	24,800	10,900	16,800	5.66	6.32	1,000,000
May	39,600	13,000	23,200	7.81	9.00	1,430,000
June	61,100	17,700	36,900	12.4	13.83	2,200,000
July	32,400	15,000	22,100	7.44	8.58	1,360,000
August	18,700	9,210	12,800	4.31	4.97	787,000
September	11,200	6,110	8,260	2.78	3.10	492,000
The year	155,000	5,690	19,600	6.60	89.29	14,200,000
1918–19						
October	66,100	5,900	14,400	4.85	5.59	885,000
November	22,700	7,500	12,600	4.24	4.73	750,000
December	67,600	8,900	21,400	7.21	8.31	1,320,000
January	42,000	7,080	15,300	5.15	5.94	941,000
February	15,300	7,540	10,000	3.37	3.51	555,000
March	14,100	7,540	9,110	3.07	3.54	560,000
April	25,500	11,500	18,100	6.09	6.80	1,080,000
May	65,400	16,100	28,900	9.73	11.22	1,780,000
June	43,200	22,000	30,000	10.1	11.27	1,790,000
July	40,800	17,800	27,800	9.36	10.79	1,710,000
August	18,700	9,340	13,800	4.65	5.36	848,000
September	----------	6,160	8,220	2.77	3.09	489,000
The year	67,600	5,900	17,500	5.89	80.15	12,700,000

Monthly discharge of Skagit River near Sedro Woolley, Wash., for the period May 1, 1908, to Sept. 30, 1922—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919						
October	7,070	5,290	5,990	2.02	2.33	368,000
November	76,600	5,940	19,100	6.43	7.17	1,140,000
December	39,400	5,000	16,900	5.69	6.56	1,040,000
The period						2,550,000
1921						
February	85,300	7,780	18,100	6.09	6.34	1,010,000
March	22,500	9,620	13,000	4.38	5.05	799,000
April	19,200	8,270	12,000	4.04	4.51	714,000
May	49,700	9,620	27,700	9.33	10.76	1,700,000
June	74,600	27,600	45,800	15.4	17.18	2,730,000
July	49,000	18,200	25,400	8.55	9.86	1,560,000
August	22,500	9,060	14,700	4.95	5.71	904,000
September	44,500	5,390	13,200	4.44	4.95	786,000
The period						10,200,000
1921–22						
October	44,500	7,540	15,700	5.29	6.10	965,000
November	37,200	9,620	19,500	6.57	7.33	1,160,000
December	188,000	9,420	34,500	11.6	13.37	2,120,000
January	9,420	5,200	6,950	2.34	2.70	427,000
February	6,200	4,680	5,410	1.82	1.90	300,000
March	9,110	4,680	5,540	1.87	2.16	341,000
April	15,900	5,570	9,330	3.14	3.50	555,000
May	53,500	11,800	24,200	8.15	9.40	1,490,000
June	74,600	27,600	41,700	14.0	15.62	2,480,000
July	28,100	12,200	18,800	6.33	7.30	1,160,000
August	15,400	8,800	11,300	3.80	4.38	695,000
September	15,000	8,500	10,700	3.60	4.02	637,000
The year	188,000	4,680	17,000	5.72	77.78	12,300,000

NOTE.—No record Jan. 1, 1920, to Jan. 31, 1921.

THUNDER CREEK NEAR MARBLEMOUNT, WASH.

LOCATION.—In Whatcom County, a quarter of a mile above junction with Skagit River, 3½ miles from Reflector Bar ranger station, and 20 miles northeast of Marblemount, Skagit County.

DRAINAGE AREA.—111 square miles (measured on Washington National Forest map, edition of 1922).

RECORDS AVAILABLE.—February 15, 1919, to September 30, 1922.

GAGE.—Stevens water-stage recorder on left bank a quarter of a mile above mouth, inspected by F. E. Davis.

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

CHANNEL AND CONTROL.—Control at high stage is at head of falls about 200 feet below gage; at low-stage bed of stream between gage and falls, composed of gravel, forms control; shifting. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from high-water marks in well, 15.5 feet about 4.30 p. m. December 12 (discharge, 9,720 second-feet); minimum stage, from recorder, 2.88 feet from March 14–17 (discharge, 71 second-feet). Discharge probably less in January and February when stage-discharge relation was affected by ice.

1919–1922: Maximum and minimum stages recorded during climatic year 1922.

ICE.—Stage-discharge relation affected by ice during severe winters. Flow estimated from study of observer's notes, weather records, and results at near-by gaging stations.

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Stage-discharge relation changed December 12; affected by ice December 20–29 and January 18 to February 13. Rating curves fairly well defined up to 2,000 second-feet. Operation of water-stage recorder satisfactory, except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily 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 good.

COOPERATION.—Maintained in cooperation with city of Seattle.

Discharge measurements of Thunder Creek near Marblemount, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 2	D. J. F. Calkins	4.38	374	June 9	Parker and Davis	6.53	1,240
Dec. 31	F. E. Davis	3.78	214	13	G. L. Parker	6.96	1,500
Feb. 14	do	3.00	89	Sept. 13	J. E. Stewart	5.99	912
Mar. 14	do	2.88	69.5	13	do	6.45	1,240
Apr. 27	John McCombs	4.24	336	15	do	5.92	940
27	do	4.24	336				

Daily discharge, in second-feet, of Thunder Creek near Marblemount, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	432	950	640	216		74	94	437	1,860	1,620	1,490	1,430
2	387	740	583	204		73	103	437	2,140	1,860	1,400	1,080
3	404	640	488	198		77	129	437	2,510	2,280	1,340	1,060
4	428	602	438	195		80	144	500	2,510	2,430	1,190	1,110
5	411	720	398	186		77	142	500	2,280	2,070	1,110	731
6	355	950	365	182		77	151	468	1,860	1,860	1,080	602
7	346	850	346	180	80	75	179	452	1,580	1,760	1,040	675
8	387	660	328	174		75	195	422	1,340	1,460	1,140	533
9	401	564	337	182		75	184	392	1,280	1,310	1,280	620
10	452	507	943	168		75	179	358	1,370	1,280	1,310	935
11	488	545	3,220	165		74	167	332	1,400	1,310	1,280	1,280
12	488	488	6,330	162		74	160	329	1,520	1,400	1,110	1,310
13	621	435	3,590	155		74	151	392	1,620	1,460	850	1,111
14	800	411	1,680	152	88	73	147	550	1,720	1,400	830	935
15	720	381	1,110	149	88	71	146	1,340	1,580	1,190	1,450	1,010
16	564	355	830	147	88	71	142	1,370	1,460	1,160	1,160	935
17	640	328	694	137	88	71	140	1,930	1,400	1,310	1,160	790
18	526	314	584		87	73	139	1,680	1,250	1,430	1,250	790
19	1,990	286	484		87	80	144	1,160	1,220	1,370	1,280	830
20	2,240	281			87	81	163	910	1,580	1,280	1,160	770
21	1,210	268			88	87	198	750	1,650	1,140	935	602
22	850	268			87	82	221	656	1,400	1,060	890	910
23	700	271			85	80	244	602	1,280	1,010	1,040	602
24	640	265			83	80	266	620	1,370	1,080	1,160	602
25	602	265	300	120	81	78	289	620	1,580	1,190	1,160	675
26	583	278			81	77	312	567	1,790	1,190	1,370	1,060
27	564	526			78	78	335	584	1,860	1,160	1,490	890
28	2,840	488			77	80	332	731	1,930	1,220	1,490	584
29	4,020	432			-------	82	327	985	1,790	1,280	1,520	516
30	2,170	507	220		-------	89	364	1,220	1,620	1,280	1,370	810
31	1,270	-------	216		-------	91	-------	1,620	-------	1,400	1,250	-------

NOTE.—No gage-height record available for Apr. 22-26; discharge ascertained by interpolation. Braced figures show mean discharge for periods indicated.

Monthly discharge of Thunder Creek near Marblemount, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 111 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,020	346	920	8.29	9.56	56,600
November	950	265	486	4.38	4.89	28,900
December	6,330	216	865	7.79	8.98	53,200
January	216	----------	149	1.34	1.54	9,160
February	----------	----------	82.6	.744	.77	4,590
March	91	71	77.5	.698	.80	4,770
April	364	94	196	1.77	1.98	11,700
May	1,930	329	753	6.78	7.82	46,300
June	2,510	1,220	1,660	15.0	16.74	98,800
July	2,430	1,010	1,430	12.9	14.87	87,900
August	1,520	830	1,210	10.9	12.57	74,400
September	1,430	516	860	7.75	8.65	51,200
The year	6,330	----------	728	6.56	89.17	528,000

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, 1922, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by J. Gallivan and J. R. Bruckart. Gage used in 1910 was inclined staff on left bank one-eighth of a 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 recorded during year, from water-stage recorder, 14.65 feet at 4 p. m. December 12 (discharge, 23,000 second-feet); minimum stage, from recorder, 2.49 feet from 11 a. m. to 1 p. m., February 5 (discharge, 193 second-feet).

1918–1922: Maximum stage recorded, that of December 12, 1921. Minimum stage recorded, from water-stage recorder, 2.12 feet at 3 a. m. October 7, 1919 (discharge, 173 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 12; slightly affected by ice January 18–19. Rating curve used prior to change well defined below 4,000 second-feet; latest curve fairly well defined. Intake partially clogged for an indefinite period during summer. 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 daily gage height determined graphically from automatically made record or, for days when there was considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records good.

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

Discharge measurements of Sauk River above Whitechuck River, near Darrington, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 24	4.28	1,560	Sept. 4	3.18	601
Sept. 2	2.99	487	7	4.05	1,410

Daily discharge, in second-feet, of Sauk River above Whitechuck River, near Darrington, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	955	2,090	5,090	601	403	235	373	1,080	4,060	1,770	544	600
2	813	1,590	2,930	601	403	230	391	1,200	4,240	1,840	544	513
3	714	1,320	1,960	576	361	235	488	1,260	4,510	2,040	576	385
4	648	1,230	1,540	544	269	246	694	1,900	4,420	2,040	556	488
5	615	1,650	1,320	531	220	252	673	2,040	3,890	1,840	538	640
6	552	2,160	1,270	507	258	246	660	1,650	3,300	1,590	525	550
7		2,160	1,190	488	298	252	730	1,420	2,900	1,530	519	1,260
8		1,540	1,120	476	338	241	929	1,310	2,530	1,310	500	752
9		1,270	1,230	507	338	241	822	1,130	2,460	1,210	476	582
10	450	1,080	3,980	601	338	241	745	1,020	2,530	1,190	470	544
11		1,060	10,300	550	332	241	702	929	2,320	1,100	458	488
12		1,040	16,700	525	321	241	654	911	2,460	1,040	427	470
13		972	8,860	488	321	246	601	992	2,750	1,040	482	427
14		998	4,420	476	309	241	576	1,420	2,900	1,030	608	373
15		955	3,060	458	303	246	531	2,180	2,460	938	621	355
16		897	2,390	433	303	252	525	3,220	2,320	857	550	321
17		806	1,970	421	338	252	500	4,060	2,320	783	488	298
18		748	1,650	415	391	263	476	3,720	2,110	791	494	263
19	1,200	680	1,360	415	397	427	470	2,820	2,040	814	768	258
20		648	1,210	409	367	458	482	2,320	2,320	775	667	246
21		622	1,120	403	355	576	627	1,970	2,320	716	601	224
22		982	1,010	397	338	673	929	1,770	1,970	660		373
23		972	947	379	315	601	929	1,590	1,770	660		367
24		914	866	367	309	538	866	1,650	1,900	582		292
25		1,160	799	367	298	488	830	1,650	2,320	563		252
26		1,590	760	379	286	439	857	1,530	2,390	556	500	298
27	4,000	3,420	730	427	246	421	929	1,420	2,460	538		488
28		2,090	709	427	235	397	920	1,650	2,390	519		608
29		1,650	667	409	-------	379	911	2,390	2,180	500		494
30	3,090	3,360	654	403	-------	373	929	2,980	1,970	519		531
31	2,610	-------	608	415	-------	373	-------	3,640	-------	531		-------

NOTE.—Gage-height record faulty Oct. 7–29; missing Aug. 22 to Sept. 1; discharge Oct. 7–29 determined from comparison with records of Whitechuck River and Sauk River at Darrington and from comparison with records of Sauk River at Darrington Aug. 22 to Sept. 1. Braced figures show mean discharge for periods indicated.

Monthly discharge of Sauk River above Whitechuck River, near Darrington, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October			1,430	9.41	10.85	87,900
November	3,420	622	1,390	9.14	10.20	82,700
December	16,700	608	2,660	17.5	20.18	164,000
January	601	367	464	3.05	3.52	28,500
February	403	220	321	2.11	2.20	17,800
March	673	230	340	2.24	2.58	20,900
April	929	373	692	4.55	5.08	41,200
May	4,060	911	1,900	12.5	14.41	117,000
June	4,510	1,770	2,680	17.6	19.64	159,000
July	2,040	500	1,030	6.78	7.82	63,300
August	768		529	3.48	4.01	32,500
September	1,260	224	458	3.01	3.36	27,300
The year	16,700	220	1,160	7.63	103.85	842,000

SAUK RIVER AT DARRINGTON, WASH.

LOCATION.—In SE. ¼ sec. 24, T. 32 N., R. 9 E., at suspension footbridge half a mile southeast of Darrington, 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, 1922.

GAGE.—Vertical and inclined staff on right bank at suspension footbridge; installed April 14, 1922. 1914–1918 vertical staff on left bank 700 feet upstream. January 7, 1918, to April 13, 1922, vertical and inclined staff at same site and datum as first gage. Gages read by Paul Schmidt.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge.

CHANNEL AND CONTROL.—Bed composed of gravel and large boulders. Right bank at gage high and not subject to overflow; left bank flat and subject to overflow at extremely high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from high-water mark near gage, 15 feet about 4 p. m. December 12 (discharge, 36,000 second-feet); minimum stage recorded, 1.15 feet on March 26 (discharge, 315 second-feet).

1914–1922: Maximum stage, 15 feet at 9 a. m. December 29, 1917, and 4 p. m. December 12, 1921, determined by levels to high-water mark (discharge, 36,000 second-feet); minimum stage recorded, that of March 26, 1922.

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

DIVERSIONS.—An average diversion of possibly 10 second-feet is made from a point about one-fourth mile above gage for the purpose of driving shingle bolts to mill pond at Darrington.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water December 12, and with change of gages on April 14. Rating curves used prior to April 13 well defined below 12,000 second-feet; that used since April 14 well defined below 6,000 second-feet. Gages read to half-tenths, often to hundredths, once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good except for extremely high discharge.

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

Discharge measurements of Sauk River at Darrington, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage used prior to Apr. 14, 1922.	Present gage.	Discharge.	Date.	Made by—	Gage used prior to Apr. 14, 1922.	Present gage.	Discharge.
		Feet.	*Feet.*	*Sec.-ft.*			*Feet.*	*Feet.*	*Sec.-ft.*
Mar. 17	John McCombs	1.72	1.16	453	May 23	R. B. Kilgore	4.12	3.62	2,590
17	do	1.72	1.16	447	Sept. 1	do	3.01	2.43	1,220
Apr. 15	do	2.34	1.70	756	8	do	3.28	2.68	1,450

Daily discharge, in second-feet, of Sauk River at Darrington, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,430	3,870	8,580	985	520	520	787	1,980	6,610	3,030	1,360	1,190
2	1,240	2,490	4,950	915	478	565	915	2,340	7,080	3,350	1,190	982
3	1,060	2,350	3,670	985	478	565	1,700	2,880	7,320	3,350	1,050	854
4	980	2,630	2,780	1,060	520	520	1,820	3,670	7,080	3,510	918	1,190
5	900	2,630	2,350	1,060	565	478	1,820	3,030	5,940	3,190	918	1,190
6	830	3,290	2,350	1,140	613	478	1,700	2,340	5,110	2,880	918	918
7	765	3,480	2,090	1,220	613	478	1,590	2,220	4,530	2,600	918	2,220
8	765	2,630	2,090	1,220	565	478	1,490	1,870	4,170	2,220	918	1,360
9	710	2,090	4,080	1,400	565	478	1,220	1,550	4,170	1,980	982	1,190
10	710	1,860	11,700	1,310	565	478	1,060	1,450	4,000	1,980	1,050	982
11	664	1,750	19,400	1,140	520	478	985	1,360	3,830	1,980	982	918
12	710	1,860	27,000	985	520	478	915	1,360	4,000	1,980	918	918
13	1,060	1,860	14,000	850	478	478	850	1,870	4,350	1,760	918	918
14	2,780	1,860	5,530	725	478	478	792	2,740	4,530	1,650	918	854
15	3,670	1,860	3,960	613	478	478	732	4,530	4,170	1,550	918	792
16	2,490	1,640	3,270	565	520	478	732	5,940	4,000	1,450	982	675
17	1,430	1,530	2,800	565	565	478	732	6,380	3,830	1,550	1,050	675
18	1,330	1,330	2,360	520	613	478	792	5,110	3,510	1,550	1,120	675
19	2,940	1,240	1,950	565	565	478	918	4,350	3,670	1,550	1,120	618
20	2,490	1,150	1,700	565	565	478	1,050	3,510	3,510	1,550	1,190	562
21	2,090	1,530	1,590	565	565	478	1,190	3,190	3,350	1,450	982	562
22	1,640	2,090	1,490	565	565	444	1,270	2,880	3,190	1,360	918	732
23	1,430	1,970	1,400	565	565	417	1,360	2,470	3,510	1,360	918	675
24	1,330	2,780	1,310	666	478	417	1,450	2,740	3,830	1,270	854	618
25	1,860	3,480	1,220	666	478	364	1,450	2,600	4,350	1,120	918	562
26	2,940	4,080	1,140	666	478	315	1,360	2,470	4,000	1,050	918	562
27	4,080	1,530	1,060	666	478	364	1,450	2,740	4,000	1,050	854	792
28	18,600	3,670	1,060	613	478	444	1,550	3,030	3,830	1,190	854	1,450
29	9,340	5,870	1,060	565	-------	520	1,650	3,830	3,670	1,270	854	982
30	5,180	9,860	985	565	-------	613	1,760	4,720	3,190	1,270	854	982
31	4,290	-------	985	565	-------	666	-------	6,160	-------	1,190	1,120	-------

NOTE.—Gage not read Dec. 11–13; discharge determined from high-water marks and by comparison with records of Sauk River above Whitechuck River.

Monthly discharge of Sauk River at Darrington, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 293 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	18,600	664	2,640	9.01	10.39	162,000
November	9,860	1,150	2,680	9.15	10.21	159,000
December	27,000	985	4,510	15.4	17.75	277,000
January	1,400	520	808	2.76	3.18	49,700
February	613	478	531	1.81	1.88	29,500
March	666	315	479	1.63	1.88	29,500
April	1,820	732	1,240	4.23	4.72	73,800
May	6,380	1,360	3,140	10.7	12.34	193,000
June	7,320	3,190	4,410	15.1	16.85	262,000
July	3,510	1,050	1,880	6.42	7.40	116,000
August	1,360	854	980	3.34	3.85	60,300
September	2,220	562	920	3.14	3.50	54.700
The year	27,000	315	2,030	6.93	93.95	1,470,000

BAKER RIVER BELOW ANDERSON CREEK, NEAR CONCRETE, WASH.

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

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

RECORDS AVAILABLE.—September 10, 1910, to September 30, 1922.

GAGE.—Stevens continuous water-stage recorder referred to inside staff gage, on left bank; installed September 24, 1915; inspected by Charles Bagnell. For description of previous gages see Water-Supply Paper 512.

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 recorded during year from water-stage recorder, 10.8 feet at 4 p. m. December 12 (discharge, 23,600 second-feet); minimum stage, from recorder, 1.83 feet at 6 p. m. March 1 (discharge, 390 second-feet).

1910–1922: Maximum stage recorded, 13.7 feet at 12.30 p. m. December 29, 1917 (discharge, 36,800 second-feet); minimum stage recorded, 1.21 feet on December 15–16, 1919 (discharge, 219 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during flood of December 12. Rating curve used prior to change well defined between 700 and 10,000 second-feet; that used after change fairly well defined below 3,000 second-feet. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined graphically from automatically made record or, for a few days when range of stage was considerable, by averaging results obtained by applying mean gage heights for shorter intervals. Prior to December 12 records of discharge below 10,000 second-feet excellent; good thereafter.

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

Discharge measurements of Baker River below Anderson Creek, near Concrete, Wash., during the year ending Sept. 30, 1922.

[Made by J. E. Stewart.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Sept. 18	3.40	1,320
19	3.14	1,120

Daily discharge, in second-feet, of Baker River below Anderson Creek, near Concrete, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,670	3,530	3,140	806	443	398	595	1,810	6,060	3,580	1,910	3,120
2	1,400	2,500	2,500	740	436	415	652	1,960	6,480	4,040	1,810	2,120
3	1,270	1,970	1,970	686	440	457	1,040	2,240	7,380	4,670	1,760	1,670
4	1,190	1,970	1,620	669	443	454	1,080	3,040	6,770	4,670	1,670	2,020
5	1,110	2,500	1,440	652	429	443	1,010	2,700	5,520	4,140	1,580	1,620
6	1,050	4,900	1,490	625	454	432	1,040	2,180	4,450	3,850	1,490	1,320
7	1,020	3,880	1,400	610	478	429	1,620	1,910	3,850	3,420	1,400	2,020
8	1,030	2,560	1,360	615	493	422	1,580	1,670	3,340	2,900	1,440	1,490
9	1,030	1,970	1,820	879	489	418	1,320	1,400	3,500	2,570	1,490	1,400
10	1,070	1,620	6,030	813	457	436	1,160	1,280	3,760	2,400	2,080	1,670
11	1,150	1,670	14,600	746	446	426	1,080	1,160	3,500	2,400	2,700	1,810
12	1,070	1,620	19,600	698	436	436	965	1,160	3,850	2,460	2,180	1,760
13	1,940	1,580	13,000	669	422	429	872	1,490	4,340	2,700	1,580	1,540
14	2,980	1,490	4,240	636	412	422	826	2,290	4,340	2,460	1,360	1,400
15	4,650	1,400		615	415	418	776	3,420	3,850	2,240	2,040	1,400
16	5,160	1,270		595	570	422	746	5,020	3,760	2,070	2,120	1,320
17	4,540	1,150	1,840	560	590	415	716	6,200	3,580	2,290	1,860	1,200
18	3,370	1,060		535	585	454	698	5,140	3,190	2,400	1,860	1,200
19	4,150	974		530	560	530	698	3,500	3,340	2,290	2,120	1,240
20	4,890	903		525	517	505	865	2,700	4,140	2,070	2,900	1,080
21	3,290	854	1,160	517	489	636	1,120	2,400	4,140	1,860	2,020	950
22	2,320	1,070	1,070	505	468	590	1,580	2,180	3,340	1,670	1,580	2,020
23	1,820	1,070	1,000	489	454	555	1,440	1,960	3,120	1,540	1,490	1,620
24	1,540	1,360	935	485	432	530	1,280	2,070	3,580	1,620	1,580	1,320
25	1,910	1,770	879	501	426	497	1,240	2,020	4,340	1,670	1,670	1,320
26	2,980	1,980	907	575	418	482	1,320	1,860	4,560	1,670	1,810	2,470
27	2,910	4,440	806	555	412	460	1,360	1,960	4,560	1,720	1,860	3,190
28	11,000	3,060	794	509	408	485	1,360	2,760	4,340	1,810	1,860	2,760
29	17,400	2,380	776	485	-------	517	1,360	4,040	3,940	1,860	1,810	2,510
30	10,100	2,910	746	457	-------	525	1,580	4,900	3,670	1,910	1,720	3,190
31	2,910	-------	722	450	-------	575	-------	5,390	-------	1,910	1,960	-------

NOTE.—Recorder not operating for some time, Nov. 2-4 and Dec. 15-20; discharge determined from recorded range of stage and from comparison with records of near-by streams.

Monthly discharge of Baker River below Anderson Creek, near Concrete, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 184 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	17,400	1,020	3,350	18.2	20.98	206,000
November	4,900	854	2,050	11.1	12.38	122,000
December	19,600	722	3,070	16.7	19.25	189,000
January	879	450	604	3.28	3.78	37,100
February	590	408	465	2.53	2.64	25,800
March	636	398	471	2.56	2.95	29,000
April	1,620	595	1,100	5.98	6.67	65,500
May	6,200	1,160	2,700	14.7	16.95	166,000
June	7,380	3,120	4,290	23.3	26.00	255,000
July	4,670	1,540	2,540	13.8	15.91	156,000
August	2,900	1,360	1,830	9.95	11.47	113,000
September	3,190	950	1,790	9.73	10.86	107,000
The year	19,600	398	2,030	11.0	149.84	1,470,000

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 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, 1922.

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 mean daily stage recorded during year, 35.45 feet June 17–18 (discharge, 244,000 second-feet); minimum mean daily stage recorded, 8.05 feet March 9 (discharge, 14,200 second-feet).

1913–1922: 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.

DIVERSION.—A small amount of water is diverted above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily 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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 9	Alex Pirie	8.06	13,700	July 18	Beeston and Pirie	26.85	166,000
10	do	8.11	14,300	Sept. 18	do	17.89	79,200
11	Beeston and Pirie	8.09	13,500				

Daily discharge, in second-feet, of Columbia River at Trail, B. C., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	43,800	46,700	38,800	23,200	18,400	14,900	15,100	31,600	158,000	209,000	121,000	98,800
2	43,500	47,100	37,900	23,100	18,200	14,800	15,300	34,300	169,000	207,000	121,000	99,400
3	43,300	47,700	37,000	22,900	18,100	14,700	15,500	36,800	181,000	205,000	121,000	100,000
4	43,500	48,400	36,100	22,800	17,900	14,700	15,800	39,400	194,000	205,000	122,000	101,000
5	43,600	48,900	35,100	22,600	17,800	14,600	16,200	42,100	207,000	205,000	122,000	101,000
6	43,300	49,500	34,200	22,500	17,800	14,500	16,600	44,600	217,000	205,000	122,000	99,900
7	42,900	49,900	33,100	22,400	17,600	14,400	17,000	46,700	228,000	207,000	123,000	97,500
8	42,400	50,200	31,600	22,300	17,500	14,300	17,400	48,900	230,000	204,000	124,000	95,300
9	41,900	50,700	30,000	22,000	17,400	14,200	17,700	50,200	232,000	200,000	123,000	93,000
10	41,600	50,900	29,200	21,800	17,200	14,400	17,900	51,600	232,000	195,000	122,000	91,200
11	41,200	51,000	28,600	21,500	17,100	14,300	18,200	52,900	233,000	189,000	122,000	89,000
12	40,800	51,200	28,100	21,300	17,000	14,300	18,500	54,000	234,000	184,000	121,000	87,100
13	40,500	50,900	27,600	21,200	16,800	14,300	18,600	55,200	235,000	179,000	121,000	85,300
14	40,400	50,600	27,100	21,200	16,700	14,400	19,000	58,600	239,000	173,000	120,000	83,000
15	40,400	50,100	26,800	20,800	16,600	14,500	19,400	62,600	242,000	168,000	119,000	80,900
16	40,500	49,500	27,000	20,600	16,500	14,500	19,800	66,800	243,000	163,000	116,000	78,300
17	40,500	48,800	27,100	20,500	16,400	14,600	20,300	71,200	244,000	160,000	112,000	76,900
18	40,400	48,000	27,400	20,300	16,300	14,600	20,700	79,400	244,000	156,000	109,000	75,200
19	40,600	47,300	27,800	20,200	16,200	14,600	21,300	86,400	241,000	157,000	108,000	74,000
20	40,900	46,100	27,700	20,100	16,100	14,600	21,900	93,000	236,000	151,000	107,000	73,400
21	41,200	45,400	27,900	19,900	15,900	14,600	22,500	101,000	232,000	148,000	107,000	72,800
22	41,700	44,700	28,000	19,800	15,800	14,600	23,100	104,000	230,000	146,000	106,000	72,400
23	42,200	44,100	27,900	19,600	15,600	14,700	23,700	109,000	228,000	143,000	104,000	71,800
24	42,700	43,300	27,400	19,500	15,500	14,700	24,400	114,000	224,000	140,000	104,000	71,200
25	43,200	42,500	26,900	19,400	15,400	14,700	25,200	119,000	222,000	138,000	102,000	70,400
26	43,700	41,800	26,200	19,200	15,200	14,700	26,100	123,000	219,000	134,000	102,000	69,000
27	44,100	41,100	25,600	19,100	15,100	14,800	27,100	128,000	215,000	130,000	101,000	66,800
28	44,600	40,600	25,100	18,900	15,000	14,900	27,900	131,000	213,000	128,000	100,000	65,000
29	45,100	40,000	24,500	18,700	-------	15,000	28,800	136,000	212,000	126,000	99,400	63,600
30	45,500	39,500	24,000	18,600	-------	15,000	29,500	141,000	210,000	123,000	98,800	61,600
31	46,000	-------	23,500	18,500	-------	15,000	-------	149,000	-------	122,000	98,400	-------

Monthly discharge of Columbia River at Trail, B. C., for the year ending Sept. 30, 1922.

[Drainage area, 34,000 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	46,000	40,400	42,500	1.25	1.44	2,610,000
November	51,200	39,500	46,900	1.38	1.54	2,790,000
December	38,800	23,500	29,200	.86	.99	1,800,000
January	23,200	18,500	20,800	.61	.70	1,280,000
February	18,400	15,000	16,700	.49	.51	928,000
March	15,000	14,200	14,600	.43	.50	898,000
April	29,500	15,100	20,700	.61	.68	1,230,000
May	149,000	31,600	79,400	2.34	2.70	4,880,000
June	244,000	158,000	221,000	6.50	7.25	13,100,000
July	209,000	122,000	168,000	4.94	5.70	10,300,000
August	124,000	98,400	113,000	3.32	3.83	6,950,000
September	101,000	61,600	82,200	2.42	2.70	4,890,000
The year	244,000	14,200	71,300	2.10	28.54	51,700,000

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, Benton County.

DRAINAGE AREA.—95,500 square miles. (Areas in the United States measured on topographic maps and on maps issued by United States Geological Survey, 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 Kootenai 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, 1922; daily discharge ascertained from May 1, 1913, to September 30, 1922. 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. For description of previous gages see Water-Supply Paper 512. 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, 28.8 feet, from June 15 to 18 (discharge, 424,000 second-feet); minimum stage recorded, 0.21 foot on March 1 (discharge, 27,200 second-feet; discharge estimated at 27,200 second-feet for February 28, while stage-discharge relation was affected by ice.

1913–1922: 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 feet, June 7, 1894 (estimated discharge by extending rating curve, 710,000 second-feet). The Chief of Engineers, United States Army,[6] gives a crest elevation of the 1894 flood and an elevation of zero on the Weather Bureau gage from which it appears that the gage height was 59.8 feet (estimated discharge, by extending rating curve, 740,000 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.

DIVERSION.—Some water diverted for irrigation.

REGULATION.—None.

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[6] U. S. Army Rept., 1895, pt. 5, p. 3542.

ACCURACY.—Stage-discharge relation permanent; affected by ice January 4 to February 19 and February 22–28. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Records excellent except for periods of ice effect.

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

Discharge measurements of Columbia River at Vernita, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 23	G. L. Parker	4.70	55,800	Feb. 17	John McCombs	[a] 1.20	31,700
Jan. 24	John McCombs	[a] 3.58	33,100	May 10	do	11.37	113,000
Feb. 5	do	[a] 2.30	29,200				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Columbia River at Vernita, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	58,900	63,800	53,400	47,100		27,200	35,700	83,800	300,000	339,000	156,000	116,000
2	58,100	64,600	53,400	46,400		28,800	36,300	84,700	319,000	332,000	153,000	115,000
3	58,100	65,400	53,400	45,800		29,400	38,700	87,400	337,000	328,000	152,000	114,000
4	58,100	65,400	55,700		28,900	29,400	39,300	93,000	359,000	319,000	149,000	114,000
5	58,100	65,400	55,000			29,400	40,600	97,800	377,000	313,000	148,000	114,000
6	58,100	66,300	55,000	44,500		29,400	43,200	102,000	396,000	306,000	148,000	114,000
7	57,300	66,300	53,400			30,000	45,200	106,000	405,000	302,000	147,000	115,000
8	56,500	66,300	53,400			30,000	47,100	110,000	417,000	300,000	148,000	113,000
9	56,500	67,200	52,700			30,000	48,400	115,000	419,000	298,000	147,000	113,000
10	55,700	68,000	52,000			29,400	49,800	117,000	419,000	290,000	147,000	111,000
11	55,000	68,000	52,000		30,400	29,400	52,700	119,000	419,000	284,000	145,000	108,000
12	55,000	67,200	56,500			29,400	55,000	120,000	419,000	278,000	144,000	105,000
13	54,200	66,300	73,100			30,000	56,500	123,000	417,000	267,000	142,000	101,000
14	53,400	65,400	80,200	40,400		30,000	57,300	124,000	417,000	259,000	140,000	98,700
15	53,400	64,600	75,700			29,400	55,700	127,000	422,000	248,000	140,000	95,800
16	53,400	63,800	73,100		30,900	29,400	55,700	136,000	424,000	241,000	140,000	93,000
17	52,700	62,900	68,800			29,400	55,000	143,000	424,000	231,000	138,000	91,100
18	52,700	62,100	68,800			29,400	55,700	168,000	424,000	224,000	136,000	89,200
19	52,700	61,300	67,200			30,000	55,700	190,000	422,000	216,000	133,000	90,200
20	53,400	60,500	62,900		31,000	30,500	55,000	202,000	415,000	210,000	131,000	89,200
21	54,200	58,100	62,100	32,600		30,500	54,200	213,000	410,000	205,000	128,000	87,400
22	55,000	56,500	60,500		30,500	31,600	54,200	219,000	405,000	199,000	126,000	86,500
23	55,000	55,700	55,700			33,300	56,500	222,000	396,000	196,000	125,000	86,500
24	56,500	55,000	52,700			34,500	59,700	226,000	391,000	193,000	125,000	85,600
25	56,500	54,200	53,400		28,500	36,300	65,400	234,000	382,000	187,000	124,000	85,600
26	56,500	52,000	53,400			35,100	69,700	241,000	375,000	182,000	123,000	83,800
27	56,500	49,800	52,700	33,600		35,100	71,400	246,000	366,000	178,000	122,000	82,900
28	56,500	52,000	52,000			34,500	74,800	254,000	359,000	172,000	120,000	81,100
29	58,100	52,000	50,500		-------	34,500	78,400	261,000	352,000	168,000	118,000	79,300
30	62,100	52,000	50,500		-------	35,100	82,000	268,000	345,000	164,000	117,000	77,500
31	62,100	-------	49,100		-------	35,100	-------	282,000	-------	160,000	116,000	-------

NOTE.—Braced figures indicate mean discharge for periods affected by ice.

Monthly discharge of Columbia River at Vernita, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 95,500 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	62,100	52,700	56,100	0.587	0.68	3,450,000
November	68,000	49,800	61,300	.642	.72	3,650,000
December	80,200	49,100	58,300	.610	.70	3,580,000
January	47,100	----------	38,600	.404	.47	2,370,000
February	----------	----------	29,700	.311	.32	1,650,000
March	36,300	27,200	31,100	.326	.38	1,910,000
April	82,000	35,700	54,800	.574	.64	3,260,000
May	282,000	83,800	165,000	1.73	1.99	10,100,000
June	424,000	300,000	391,000	4.09	4.56	23,300,000
July	339,000	160,000	245,000	2.57	2.96	15,100,000
August	156,000	116,000	136,000	1.42	1.64	8,360,000
September	116,000	77,500	97,900	1.02	1.14	5,830,000
The year	424,000	27,200	114,000	1.19	16.20	82,600,000

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, 1922.

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, 13.45 feet June 6 (discharge, 69,200 second-feet); minimum stage, January 17 (discharge measurement, 2,190 second-feet).

1910–1922: 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).

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

DIVERSIONS.—None of importance.

ACCURACY.—Stage-discharge relation permanent except when affected by ice. Rating curve well defined 2,500 to 40,000 second-feet and fairly well defined above 40,000 second-feet. Gage usually read to hundredths once daily except Sunday. Daily discharge ascertained by applying daily gage height to rating table. Discharge interpolated for days of no gage reading. Records good.

Discharge measurements of Kootenai River at Libby, Mont., during the year ending Sept. 30, 1922.

[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.*
Jan 17	a3.09	2,190	Mar. 2	a2.32	2,870	June 20	9.19	34,900
Feb. 5	a3.38	2,490	25	2.31	3,220			

a Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Kootenai River at Libby, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6,160	5,700	5,020		2,880	8,740	40,500	23,600	9,500	7,430
2	5,730	6,000	4,860		3,000	10,700	47,900	22,000	9,500	6,910
3	5,550	5,910	4,860		3,040	12,600	54,700	20,500	9,500	6,890
4	5,430	5,760	4,420		3,600	12,600	60,100	20,500	9,730	6,870
5	5,430	5,550	3,970		3,880	14,500	65,500	20,500	9,460	6,850
6	5,250	5,520	3,780		3,970	14,700	69,200	21,100	9,440	6,650
7	5,200	5,550	3,730		4,170	14,600	67,100	19,600	9,430	6,970
8	5,140	5,820	3,920		5,080	14,400	60,900	18,200	9,280	6,880
9	5,080	6,090	3,880		5,020	12,600	49,900	17,500	9,030	6,850
10	5,020	5,880	3,920		4,970	12,100	43,100	16,800	8,880	6,410
11	4,970	5,580	6,080		4,640	11,900	40,800	16,000	8,710	5,970
12	4,910	5,400	8,230		4,370	12,200	38,600	14,900	8,710	5,940
13	4,970	5,340	12,200		4,070	12,800	42,600	14,300	8,800	5,670
14	5,020	5,220	10,500		4,070	13,900	46,400	13,500	8,880	5,610
15	5,020	5,280	8,790	3,440	3,730	15,000	46,400	13,400	9,140	6,530
16	5,080	5,050	7,080	3,370	3,640	17,900	46,300	13,300	8,780	6,280
17	5,140	4,860	5,370	3,380	3,550	25,500	43,000	13,200	8,540	6,120
18	5,200	4,480		3,380	3,600	36,200	39,500	12,400	8,430	5,970
19	5,250	3,660		3,390	3,510	41,300	36,000	12,100	8,230	5,970
20	5,430	3,120		3,400	3,640	42,600	33,500	11,900	8,160	5,790
21	5,550	2,590		3,440	4,430	40,000	31,400	11,900	8,090	5,670
22	5,670	2,210		3,480	5,850	37,500	31,300	11,800	8,430	5,550
23	5,790	3,080		3,620	6,870	32,900	31,600	11,500	8,370	5,370
24	5,910	3,560		3,250	7,890	28,800	28,700	11,200	7,960	5,310
25	5,670	4,040		3,140	8,030	28,700	26,400	10,600	7,630	5,250
26	5,550	5,000		3,040	7,630	34,300	24,100	10,000	7,360	4,970
27	5,370	5,000		2,940	7,630	40,100	23,000	9,950	7,220	4,910
28	5,340	5,000		2,860	7,910	37,400	22,500	9,950	7,070	4,800
29	5,340	5,000		2,780	8,190	34,700	23,500	9,840	7,070	4,800
30	5,440	5,000		2,780	8,460	34,200	23,800	9,720	7,230	4,750
31	5,550			2,780		33,600		9,610	7,360	

NOTE.—Stage-discharge relation affected by ice Dec. 18 to Mar. 14; discharge not computed.

Monthly discharge of Kootenai River at Libby, Mont., for the year ending Sept. 30, 1922.

[Drainage area, 11,000 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	6,160	4,910	5,360	0.487	0.56	330,000
November	6,090	2,210	4,880	.444	.50	290,000
December 1–17	12,200	3,730	5,920	.538	.34	200,000
March 15–31	3,620	2,780	3,200	.291	.18	108,000
April	8,460	2,880	5,040	.458	.51	300,000
May	42,600	8,740	23,800	2.16	2.49	1,460,000
June	69,200	22,500	41,300	3.75	4.18	2,460,000
July	23,600	9,610	14,600	1.33	1.53	898,000
August	9,730	7,070	8,510	.774	.89	523,000
September	7,430	4,750	6,000	.545	.61	357,000

NOTE.—See footnote to table of daily discharge.

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, 1922, at present site; March 10, 1911, to February 20, 1912, at railway bridge, 1 mile downstream.

GAGE.—Vertical staff and inclined staff on left bank, 150 feet west of Snyder ranger station installed October 21, 1919; read by W. O. Blackman, J. J. Keane, and L. A. Lahey. For description of previous gages see Water-Supply Paper 512.

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. Stage of zero flow determined September 29, 1922, gage height 1.9 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.8 feet at 7.30 a. m. June 4 (discharge, 5,010 second-feet); minimum discharge occurred during winter when stage-discharge relation was affected by ice.

1911–1916; 1919–1922: Maximum stage recorded, 11 feet at 4 p. m. June 19, 1916 (discharge, 10,800 second-feet); minimum stage recorded, 2.80 feet October 25 and 26, 1919 (discharge, 56 second-feet). Discharge probably lower in December, 1919, and in January and February, 1922, when stage-discharge relation was affected by ice.

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

ACCURACY.—Stage-discharge relation permanent; affected by ice November 20–26 and December 17 to March 11. Rating curves well defined below 4,500 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except for period when stage-discharge relation was affected by ice.

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

Discharge measurements of Moyie River at Snyder, Idaho, during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 31	John McCombs	6.99	3,710
31	----do	6.92	3,590
Sept. 29	J. E. Stewart	2.90	72.4

Daily discharge, in second-feet, of Moyie River at Snyder, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	106	131	151				142	990	4,050	498	142	91
2	103	122	151				164	1,380	4,520	468	137	93
3	103	125	154				194	1,290	4,840	440	137	91
4	103	122	151				217	1,380	4,840	412	134	88
5	101	114	151				232	1,900	4,680	412	134	88
6	101	120	148			90	257	1,680	4,360	412	131	98
7	101	151	137				310	1,680	4,050	386	131	120
8	101	149	137	110	70		386	1,580	3,750	359	122	120
9	101	140	137				359	1,380	3,750	386	120	109
10	101	137	137				334	1,380	3,310	359	114	103
11	101	137	157				334	1,480	2,890	334	112	103
12	101	137	240			114	301	1,480	2,630	310	114	101
13	101	137	527			109	283	1,680	2,630	301	114	93
14	101	137	412			109	274	1,900	2,370	288	114	91
15	109	140	359			109	265	2,250	2,130	270	109	91
16	112	137	283			114	253	3,030	1,900	253	109	88
17	109	120				114	249	4,050	1,680	240	109	88
18	109	103				114	240	4,520	1,580	224	106	84
19	109	93				125	265	4,680	1,380	217	103	84
20	112					122	386	4,680	1,290	202	103	79
21	109					128	558	4,360	1,120	194	98	79
22	114				80	137	870	4,050	1,070	187	98	74
23	112	90		60		131	870	3,450	990	180	96	74
24	112		120			134	794	3,310	910	177	93	74
25	112					125	758	3,750	832	174	93	74
26	114					117	832	3,750	758	170	91	74
27	114	177				112	950	3,750	688	170	91	72
28	114	164				122	910	3,600	654	167	91	72
29	120	151			-------	131	832	3,520	589	161	88	72
30	128	148			-------	134	794	3,450	527	154	88	72
31	128	-------			-------	137	-------	3,750	-------	151	91	-------

NOTE.—Gage not read May 29; discharge estimated by interpolation. Braced figures show mean discharge for periods indicated.

Monthly discharge of Moyie River at Snyder, Idaho, for the year ending Sept. 30, 1922.

[Drainage area, 717 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	128	101	108	0.151	0.17	6,640
November	177	----------	124	.173	.19	7,380
December	527	----------	169	.236	.27	10,400
January	----------	----------	84.2	.117	.13	5,180
February	----------	----------	74.6	.104	.11	4,140
March	137	----------	111	.155	.18	6,820
April	950	142	454	.633	.71	27,000
May	4,680	990	2,750	3.84	4.43	169,000
June	4,840	527	2,360	3.29	3.67	140,000
July	498	151	279	.389	.45	17,200
August	142	88	110	.153	.18	6,760
September	120	72	88.0	.123	.14	5,240
The year	4,840	----------	561	.782	10.63	406,000

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.—10,500 square miles.

RECORDS AVAILABLE.—October 26, 1910, to September 30, 1922.

GAGE.—Vertical staff in two sections on left bank at old ferry landing; read once daily by Archie McLeod and H. M. Miller.

DISCHARGE MEASUREMENTS.—Made from highway bridge above mouth of St. Regis River since 1918. Flow of St. Regis River added to obtain flow passing the gage.

CHANNEL AND CONTROL.—Bed is permanent both above and below station. Banks 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 gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 16.5 feet June 8 and 9 (discharge, 47,200 second-feet); minimum stage 3.0 feet November 21 and February 5 (discharge, 1,330 second-feet).

1910–1922: Maximum stage recorded, 19.1 feet May 30–31, 1913 (discharge, 62,800 second-feet); minimum stage, 3.0 feet February 29, March 1, 1920, November 21, 1921, and February 5, 1922 (discharge, 1,330 second-feet).

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

DIVERSIONS.—Water diverted from several of the tributaries to irrigate land in Bitterroot Valley and near Missoula.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 2,000 and 60,000 second-feet. Gage read once daily to tenths. Daily discharge determined by applying daily gage height to rating table. Gage not read July 16 to August 27. Discharge estimated by comparison with station near Plains for period July 16–31. Records good.

Discharge measurements of Clark Fork at St. Regis, Mont., during the year ending Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Feb. 22	4.25	2,650
June 24	11.71	24,100

Daily discharge, in second-feet, of Clark Fork at St. Regis, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,590	3,320	4,420	3,850	2,590	2,460	3,670	10,500	29,300	12,900	-------	3,400
2	3,160	3,320	4,620	3,670	2,340	2,340	4,040	11,400	31,200	12,000	-------	3,400
3	3,010	3,320	5,030	3,160	2,100	2,220	4,820	12,300	33,100	10,800	-------	3,320
4	3,850	3,160	4,620	3,160	1,780	2,340	5,680	12,300	36,000	10,500	-------	3,160
5	3,490	3,160	4,040	3,010	1,330	2,340	6,560	13,800	40,100	9,970	-------	3,320
6	3,160	3,010	3,670	3,010	1,410	2,340	6,340	14,500	43,400	9,450	-------	3,320
7	3,010	2,860	3,670	3,160	1,500	2,340	6,560	15,900	46,700	9,200	-------	3,320
8	2,860	3,010	3,490	3,160	2,720	2,590	7,000	15,900	47,200	8,950	-------	3,400
9	2,860	3,010	3,160	3,160	2,720	2,590	7,960	15,900	47,200	8,700	-------	3,400
10	3,160	2,860	3,010	3,160	3,010	2,590	7,480	15,600	45,600	8,700	-------	3,320
11	2,340	2,860	3,490	3,320	2,720	2,720	6,780	11,400	45,600	9,200	-------	3,240
12	2,720	2,860	3,160	3,160	2,590	2,720	6,340	13,800	41,800	9,200	-------	3,160
13	3,010	3,010	7,240	3,010	2,590	2,590	6,120	13,500	39,000	8,950	-------	3,240
14	2,860	3,010	7,000	2,860	2,720	2,590	5,680	10,800	38,000	8,450	-------	3,240
15	2,860	3,010	6,780	2,860	2,590	2,590	5,460	15,200	37,000	7,960	-------	3,160
16	2,720	3,010	5,900	2,720	2,460	2,590	5,240	16,200	37,000		-------	3,160
17	2,860	3,010	5,030	2,590	2,590	2,720	5,030	23,400	40,100		-------	3,160
18	2,860	2,860	4,820	2,460	2,590	2,720	4,820	30,200	38,000		-------	3,010
19	2,860	2,860	2,860	2,340	2,590	3,010	4,820	36,000	35,500		-------	2,940
20	3,850	2,590	2,590	1,880	2,860	3,010	4,820	39,600	33,100		-------	2,860
21	3,490	1,330	2,720	1,680	2,720	3,160	5,460	42,300	31,200		-------	2,860
22	2,860	1,500	2,590	2,100	2,590	3,490	7,240	40,100	29,300		-------	2,790
23	3,010	1,880	2,720	2,590	2,460	4,230	9,200	40,100	26,300		-------	2,790
24	3,010	2,100	2,460	2,720	2,340	4,620	9,700	37,000	24,200	5,250	-------	2,720
25	3,010	2,590	3,160	2,720	2,220	4,230	10,200	36,500	21,000		-------	2,660
26	3,010	2,340	3,320	2,720	2,340	4,040	10,500	40,100	17,700		-------	2,660
27	3,010	2,590	3,670	2,720	2,460	3,670	9,970	42,800	17,300		3,320	2,660
28	3,010	3,160	3,490	2,860	2,590	3,490	9,970	41,800	15,900		3,320	2,590
29	2,860	3,670	3,490	2,720	-------	3,490	10,200	37,000	14,800		3,320	2,590
30	3,160	3,670	3,670	2,720	-------	3,490	10,500	32,600	13,800		3,400	2,590
31	3,160	-------	3,850	2,590	-------	3,490	-------	29,800	-------		3,400	-------

NOTE.—Gage not read July 16 to Aug. 26. Braced figures represent mean discharge for period. Discharge not computed Aug. 1–26.

Monthly discharge of Clark Fork at St. Regis, Mont., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	3,850	2,340	3,020	186,000
November	3,670	1,330	2,830	168,000
December	7,240	2,460	3,990	245,000
January	3,850	1,680	2,830	174,000
February	3,010	1,330	2,410	134,000
March	4,620	2,220	2,990	184,000
April	10,500	3,670	6,940	413,000
May	42,800	10,500	24,800	1,520,000
June	47,200	13,800	33,200	1,980,000
July	12,900	----------	7,380	454,000
August 27–31	3,400	3,320	3,350	33,200
September	3,400	2,590	3,050	181,000

CLARK FORK NEAR PLAINS, MONT.

LOCATION.—On lot 7, sec. 7, 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, 1922.

GAGE.—Barratt & Lawrence water-stage recorder; inspected by A. L. Steiner.

DISCHARGE MEASUREMENTS.—Made from cable.

CHANNEL AND CONTROL.—River deep and current only moderately swift even at flood stages. Banks high and are not overflowed. Bed is practically permanent. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.2 feet at 11 a. m. June 9 (discharge, by indirect method, 114,000 second-feet); minimum flow, February 5–7 (stage-discharge relation affected by ice; discharge computed 4,890 second-feet).

1910–1922: Maximum stage recorded, 17.9 feet June 5, 1913, and July 2, 1916 (discharge, 115,000 second-feet); minimum stage, during open water, 3.7 feet several times during October and November, 1919 (discharge, 4,890 second-feet); lower flow probably occurred during the ice periods.

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

DIVERSIONS.—Numerous diversions are made 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 not permanent; shifted June 17; affected by ice December 19 to March 18. Two rating curves used during year, one applicable October 1 to June 16 well defined below 60,000 second-feet and fairly well defined above, the other applicable June 17 to September 30 is fairly well defined below 90,000 second-feet. Daily gage heights obtained by inspection of graph of Barrett & Lawrence gage. Daily discharge for open channel ascertained by applying mean daily gage height to rating table except June 6–16, when indirect method was used. Record for open water, good; others, fair.

Discharge measurements of Clark Fork near Plains, Mont., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 21	W. A. Lamb	5.45	[a] 5,840	June 23	W. A. Lamb	13.56	75,100
June 22	do	13.81	[b] 79,100	July 30	Grant and Tuttle	6.40	16,800

[a] Stage-discharge relation affected by ice.
[b] Surface velocities only taken.

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Daily discharge, in second-feet, of Clark Fork near Plains, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7,560	6,840	7,740	8,800	6,190	5,520	6,840	16,400	73,400	47,500	15,800	9,880
2	7,370	6,840	8,710	8,800	6,360	5,360	7,190	17,200	75,500	45,600	15,400	9,670
3	7,370	6,840	8,710	8,000	5,850	5,200	7,930	18,200	78,700	42,900	15,100	9,670
4	7,370	6,840	8,510	8,000	5,200	5,200	8,710	19,200	84,000	40,300	14,900	9,470
5	7,370	6,840	8,320	7,620	4,890	5,200	9,310	20,500	91,500	39,000	14,400	9,270
6	7,370	6,660	8,120	7,620	4,890	5,200	9,720	22,200	100,000	37,400	14,200	9,270
7	7,190	6,660	7,740	7,620	4,890	5,200	9,720	24,500	107,000	35,800	14,200	9,080
8	7,190	6,660	7,560	7,440	5,850	5,200	9,920	25,100	111,000	34,200	13,800	9,080
9	7,010	6,660	7,560	7,250	6,190	5,360	11,400	26,100	113,000	33,000	13,600	9,080
10	7,010	6,660	7,190	7,250	6,190	5,520	11,200	26,400	112,000	32,700	13,100	9,080
11	6,840	6,660	7,010	7,250	6,020	5,520	10,300	26,100	111,000	31,900	12,700	9,080
12	6,840	6,660	7,930	7,250	6,020	5,850	9,920	25,800	108,000	31,600	12,700	9,080
13	6,660	6,490	9,720	7,440	5,850	6,190	9,720	25,800	103,000	30,200	12,500	9,080
14	6,660	6,490	10,600	7,440	5,850	6,190	9,110	26,700	99,700	29,100	12,500	8,880
15	6,490	6,660	11,000	7,250	5,850	6,540	8,910	28,600	98,800	27,400	12,200	8,880
16	6,320	6,840	10,800	6,890	5,520	6,540	8,710	31,400	100,000	26,500	12,000	8,880
17	6,320	7,010	10,100	6,540	5,200	6,540	8,710	37,100	102,000	25,800	12,000	8,690
18	6,490	6,840	9,110	6,540	5,200	6,720	8,710	46,800	97,600	24,900	12,000	8,690
19	6,320	6,490	8,000	6,540	5,520	6,840	8,510	56,600	93,200	23,700	11,800	8,500
20	6,490	6,160	7,250	5,850	5,850	6,840	8,510	64,800	88,800	22,600	11,600	8,500
21	6,660	6,160	6,890	5,520	5,850	7,010	8,710	70,100	87,400	21,800	11,400	8,500
22	6,660	6,160	6,540	5,680	5,780	7,010	10,100	72,800	79,200	21,200	11,400	8,500
23	6,660	6,160	6,190	6,020	5,520	7,010	12,000	74,400	76,100	20,700	11,100	8,320
24	6,660	6,320	6,190	6,540	5,520	7,190	13,600	72,300	70,800	20,100	10,900	8,320
25	6,660	6,490	6,890	6,540	5,360	7,190	14,300	73,400	66,600	19,600	10,900	8,140
26	6,490	7,190	7,250	6,540	5,250	7,190	14,500	80,800	62,400	19,300	10,700	7,790
27	6,660	7,930	8,000	6,540	5,520	6,840	14,700	89,400	59,300	18,500	10,500	7,620
28	6,490	8,320	7,810	6,540	5,780	6,660	14,700	90,500	56,300	18,000	10,300	7,620
29	6,490	7,930	7,810	6,540	-------	6,660	15,200	86,200	53,300	17,500	10,100	7,280
30	6,660	7,370	8,400	6,360	-------	6,660	16,200	78,700	50,400	17,000	10,100	7,280
31	6,840	-------	8,600	6,190	-------	6,660	-------	73,400	-------	16,500	9,880	-------

NOTE.—Stage-discharge relation seriously affected by ice Dec. 19 to Mar. 18; discharge computed from discharge measurement, observer's notes for ice, temperature records, and by comparison with the combined flow of Flathead River, near Polson and Clark Fork at St. Regis. Discharge for June 6–16 obained by indirect method for shifting control.

Monthly discharge of Clark Fork near Plains, Mont., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	7,560	6,320	6,810	419,000
November	8,320	6,160	6,790	404,000
December	11,000	6,190	8,140	501,000
January	8,800	5,520	6,980	429,000
February	6,360	4,890	5,640	313,000
March	7,190	5,200	6,220	382,000
April	16,200	6,840	10,600	631,000
May	90,500	16,400	46,700	2,870,000
June	113,000	50,400	86,900	5,170,000
July	47,500	16,500	28,100	1,730,000
August	15,800	9,880	12,400	762,000
September	9,880	7,280	8,710	518,000
The year	113,000	4,890	19,500	14,100,000

PEND OREILLE LAKE AT HOPE, IDAHO.

LOCATION.—In lot 2, sec. 35, T. 57 N., R. 1 E. Boise meridian, at floating dock near Northern Pacific Railway station at Hope, in Bonner County.

DRAINAGE AREA.—22,900 square miles. (Areas in United States measured on maps issued by United States Geological Survey, 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.—September 17, 1921, to September 30, 1922.

GAGE.—Vertical staff in three sections on piles at floating dock; read by Capt. E. E. Moore. Zero of gage at elevation 2,048.88 feet, referred to bench mark at Hope described in United States Geological Survey Bulletin 567; zero of gage at elevation 2,045.67 feet, referred to Coast and Geodetic Survey datum.

EXTREMES OF STAGE.—Maximum stage recorded during period September 17, 1921, to September 30, 1922, 19 feet on June 14; minimum stage recorded, 1.50 feet March 14 and 15.

ICE.—Ice conditions not serious at this station.

DIVERSIONS.—Considerable water diverted from tributaries of Clark Fork for irrigation.

REGULATION.—None.

ACCURACY.—Gage read to hundredths once each day for which gage height is shown.

COOPERATION.—Record furnished by United States Forest Service.

Daily gage height, in feet, of Pend Oreille Lake at Hope, Idaho, for the period Sept. 17 to Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	------	1.98	2.16	------	2.00	1.64	2.08	4.65	16.00	15.40	5.75	------
2	------	1.98	2.22	------	1.98	1.60	------	------	16.15	------	5.60	3.12
3	------	1.98	2.30	------	1.98	1.58	2.14	5.00	16.30	13.65	5.40	------
4	------	1.98	------	------	1.98	1.58	2.30	------	------	------	------	------
5	2.20	1.98	2.30	------	------	------	2.38	------	16.75	12.80	5.15	------
6	2.20	------	2.32	------	1.94	1.54	2.50	5.80	17.10	12.30	------	3.06
7	2.18	1.98	1.30	------	1.90	1.52	2.60	------	17.40	11.75	4.95	3.02
8	2.18	1.98	2.18	------	1.88	1.52	2.78	------	17.80	11.50	4.80	2.98
9	------	1.98	2.16	2.62	1.90	1.52	------	6.60	18.10	------	4.70	2.96
10	2.16	1.99	2.16	2.60	1.90	1.52	3.10	6.80	18.40	10.90	4.60	------
11	2.14	2.00	------	2.60	------	1.52	------	7.00	------	10.50	4.50	2.92
12	2.12	------	------	2.56	------	------	3.30	7.20	18.85	10.30	------	2.88
13	2.12	------	------	2.56	1.90	------	3.36	7.35	18.90	10.00	------	2.82
14	2.10	2.00	2.90	2.54	1.90	1.50	3.38	------	19.00	9.70	4.20	2.78
15	2.10	2.00	3.08	------	1.90	1.50	3.40	7.65	18.95	9.45	------	2.74
16	------	2.00	3.15	2.40	1.90	1.52	------	------	18.90	------	4.05	2.70
17	2.08	2.00	3.26	2.38	1.90	1.52	3.40	8.35	18.90	8.90	3.95	------
18	2.06	2.00	------	2.36	1.90	1.52	------	------	------	8.65	3.85	2.64
19	2.04	1.98	3.26	2.30	------	------	3.36	8.60	18.65	8.40	3.75	2.60
20	2.04	------	------	2.26	1.88	1.60	3.30	------	18.50	8.20	------	2.56
21	2.02	------	3.20	2.20	1.86	------	3.30	------	18.35	8.00	3.70	------
22	2.00	1.98	3.10	------	1.82	1.68	------	11.85	18.10	------	3.65	------
23	------	2.00	3.04	2.16	1.80	1.76	------	------	17.85	------	3.60	2.46
24	1.98	------	2.98	2.12	1.78	1.80	3.48	13.05	17.45	7.25	3.50	------
25	1.96	2.00	------	2.10	1.76	1.84	3.70	------	------	7.00	3.45	2.40
26	1.96	2.00	2.94	2.10	------	------	3.80	14.10	16.75	6.85	3.40	2.34
27	2.10	------	2.90	2.10	1.70	1.98	4.00	------	16.30	6.60	------	------
28	2.12	2.04	2.90	2.10	1.68	2.00	4.15	------	15.90	6.45	3.35	------
29	2.00	2.08	------	------	------	2.00	4.40	15.40	15.40	6.25	3.28	------
30	------	2.12	2.88	1.98	------	2.02	------	15.70	15.00	------	3.24	2.28
31	1.98	------	2.86	2.00	------	2.04	------	15.90	------	5.90	------	------

NOTE.—Gage read 2.48 feet on Sept. 17, 1921.

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, 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, 1922.

GAGE.—Vertical staff in two sections on pile at municipal wharf, read by A. J. Sund. Zero of gage at elevation 2,045.58 feet, referred to bench marks described in United States Geological Survey Bulletin 567; elevation 2,042.38 feet, referred to United States Coast and Geodetic Survey datum.

EXTREMES OF STAGE.—Maximum stage recorded during year, 22.4 feet June 14; minimum stage recorded, 5.3 feet October 22 and November 2, 5, 9, 12, 16, 19, 23, and 26.

1914–1922: Maximum stage recorded, 26.0 feet July 6, 1916; minimum stage recorded, 4.43 feet 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.

ACCURACY.—Gage read to tenths, sometimes hundredths, once on each day for which gage height is shown.

COOPERATION.—Record furnished by United States Forest Service.

Daily gage height, in feet, of Pend Oreille Lake at Sandpoint, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Apr.	May.	June.	July.	Aug.	Sept.
1							17.7		
2		5.30						8.90	6.50
3			5.65			19.7			
4									
5	5.65	5.30						8.40	
6					9.10				
7			5.70						
8	5.50				9.65		14.5		
9		5.30		6.30				8.00	
10						22.2			
11									
12	5.45	5.30							
13					10.7		13.3		
14						22.4			
15	5.40			6.70			12.5		
16		5.30						7.40	6.05
17					12.4	22.1			
18							11.9		
19	5.40	5.30						7.10	
20									
21									
22	5.30			6.70		21.5	11.1		
23		5.30						6.90	
24					16.4				
25									
26		5.30							
27							10.0		
28					18.4				
29				7.90			9.6		
30		5.50							5.55
31									

CLARK FORK AT METALINE FALLS, WASH.

LOCATION.—In SE. ¼ sec. 21, T. 39 N., R. 43 E., three-eighths of a 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, 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, 1922.

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 Leland and C. N. West. For history of previous gages see Water-Supply Paper 462.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths of a mile above 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, the drop over which is 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, 33 feet June 15–17 (discharge, 107,000 second-feet); minimum stage recorded, 2.13 feet February 25 and 26 (discharge 7,780 second-feet).

1912–1922: Maximum stage recorded, 41.2 feet June 16, 1913 (discharge, 139,000 second-feet); minimum stage recorded, −2.4 feet December 12, 1919 (discharge, 2,500 second-feet).

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

DIVERSIONS.—Numerous small diversions from upper tributaries for irrigation.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined above 8,000 second-feet. Gage read from October to March once daily to half-tenths, thereafter to hundredths. No diurnal fluctuation. Daily discharge ascertained by applying daily gage height to rating table. Records excellent.

COOPERATION.—Station maintained in cooperation with Dominion Water Power Branch. Gage-height record furnished by Hugh L. Cooper Co.

The following discharge measurement was made by John McCombs:

June 5, 1922: Gage height, 29.77 feet; discharge, 90,400 second-feet.

Daily discharge, in second-feet, of Clark Fork at Metaline Falls, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9,920	9,300	9,920	11,900	10,100	8,880	10,400	21,300	85,800	80,800	26,400	13,500
2	10,100	9,300	10,400	12,100	9,760	8,740	10,700	22,200	87,200	77,500	25,500	13,300
3	9,920	9,160	10,600	12,600	9,600	8,880	11,000	22,000	88,100	74,400	24,600	13,100
4	9,760	9,160	10,600	12,100	9,160	9,300	12,100	23,300	89,000	71,300	24,000	13,600
5	9,600	9,020	10,600	12,100	9,160	9,300	12,200	24,400	90,500	68,200	23,100	12,600
6	9,600	9,020	10,700	12,100	9,760	9,160	12,600	25,300	91,900	66,000	22,700	12,200
7	9,600	9,160	10,700	11,700	9,760	8,600	13,000	27,300	93,300	63,400	22,000	12,400
8	9,600	9,160	10,900	12,100	9,920	8,740	13,700	27,500	95,700	60,900	21,300	12,600
9	9,440	9,020	10,900	12,100	10,200	8,740	14,100	28,600	97,700	58,400	20,900	12,400
10	9,440	9,020	10,600	12,100	9,760	9,160	14,900	27,500	100,000	55,600	20,500	12,100
11	9,440	9,160	10,700	12,100	9,600	8,880	15,100	30,800	102,000	54,000	19,600	11,900
12	9,440	9,300	11,000	11,500	9,600	8,740	15,300	31,800	104,000	51,600	19,400	11,900
13	9,440	9,160	11,400	11,700	9,440	8,460	15,300	32,700	105,000	49,700	18,700	11,700
14	9,440	9,020	12,100	11,000	9,760	8,320	15,700	34,000	106,000	47,900	18,300	11,500
15	9,440	9,020	12,600	10,700	9,920	8,600	16,100	34,800	107,000	45,800	18,300	11,400
16	9,300	9,020	13,300	10,600	10,100	8,600	16,100	36,100	107,000	44,400	17,700	11,400
17	9,300	9,160	14,100	10,600	10,200	8,460	16,100	37,400	107,000	43,100	17,300	11,400
18	9,160	9,300	14,500	8,880	10,400	8,320	15,700	39,200	106,000	41,400	17,100	11,200
19	9,160	9,160	14,500	9,440	10,200	8,600	15,700	42,200	105,000	40,200	16,900	11,000
20	9,020	9,160	10,900	9,920	10,100	8,460	15,700	44,800	105,000	38,700	16,500	10,900
21	9,020	9,020	9,920	10,200	9,920	8,740	16,100	49,000	104,000	37,600	15,700	10,700
22	8,880	8,740	9,920	10,200	9,760	8,880	16,100	53,200	103,000	36,300	15,700	10,700
23	8,880	8,740	10,100	10,200	9,760	8,880	16,300	58,000	101,000	34,800	15,300	10,200
24	8,880	8,880	11,000	10,200	8,600	9,300	16,700	62,600	99,700	34,000	15,100	10,200
25	9,020	8,880	12,100	10,200	7,780	9,440	17,100	66,500	97,700	32,700	14,900	10,200
26	9,160	9,020	11,400	10,400	7,780	9,600	17,900	69,500	95,700	31,800	14,700	10,100
27	9,300	9,300	11,700	10,400	8,180	9,600	18,500	72,600	92,900	31,000	14,500	10,100
28	9,300	9,440	11,700	10,600	8,740	9,600	18,900	75,700	90,000	29,400	14,300	9,600
29	9,440	9,440	12,600	10,600	-------	10,100	19,800	78,900	87,200	28,900	14,100	9,600
30	9,440	9,600	12,200	10,400	-------	10,200	21,100	82,100	83,500	27,900	13,900	9,600
31	9,300	-------	11,700	10,400	-------	10,200	-------	83,500	-------	27,100	13,700	-------

Monthly discharge of Clark Fork at Metaline Falls, Wash., for the year ending Sept. 30, 1922.

[Drianage area, 25,100 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	10,100	8,880	9,380	0.374	0.43	577,000
November	9,600	8,740	9,130	.364	.41	543,000
December	14,500	9,920	11,500	.458	.53	707,000
January	12,600	8,880	11,000	.438	.50	676,000
February	10,400	7,780	9,540	.380	.40	530,000
March	10,200	8,320	9,020	.359	.41	555,000
April	21,100	10,400	15,300	.610	.68	910,000
May	83,500	21,300	44,000	1.75	2.02	2,710,000
June	107,000	83,500	97,600	3.89	4.34	5,810,000
July	80,800	27,100	47,900	1.91	2.20	2,950,000
August	26,400	13,700	18,500	.737	.85	1,140,000
September	13,500	9,600	11,400	.454	.51	678,000
The year	107,000	7,780	24,500	.976	13.28	17,800,000

ROCK CREEK NEAR QUIGLEY, MONT.

LOCATION.—In SW. ¼ sec. 36, T. 10 N., R. 17 W. (unsurveyed), at highway bridge one-fourth of a mile above mouth of Ranch Creek and 2½ miles south of Quigley, Granite County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 1, 1922, to September 30, 1922.

GAGE.—Standard wire and weight on downstream side of highway bridge; read by H. D. Hastings and Harvey Shields.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of heavy boulders. Two channels at high stages. Control is bed of stream for several hundred feet below gage; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period May 1 to September 30, 6.32 feet at 4.15 p. m. June 5 (discharge, 6,260 second-feet); minimum stage, 1.32 feet September 26–30 (discharge, 192 second-feet).

ICE.—No ice during period of record.

DIVERSIONS.—None of importance.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 150 and 3,500 second-feet. Daily gage heights are mean of two readings daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Maintained in cooperation with Rock Creek Power Co.

Discharge measurements of Rock Creek near Quigley, Mont., during the period May 1 to Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 1	2.14	452	June 26	3.71	1,620
25	4.74	3,170	Sept. 21	1.34	197

Daily discharge, in second-feet, of Rock Creek near Quigley, Mont., for the period May 1 to Sept. 30, 1922.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	415	2,350	1,010	358	254	16	990	4,670	477	328	229
2	520	2,670	938	351	246	17	1,580	3,960	477	315	224
3	520	3,050	861	345	240	18	2,000	3,600	461	302	224
4	534	3,650	802	338	235	19	2,460	3,420	445	299	229
5	834	5,170	747	345	240	20	2,650	3,200	437	296	213
6	888	4,930	729	345	252	21	2,930	3,050	411	290	205
7	777	4,970	695	338	257	22	2,760	2,750	411	290	203
8	821	4,730	684	331	263	23	2,640	2,400	411	290	203
9	684	4,440	684	325	257	24	2,680	2,020	411	284	203
10	615	4,690	723	325	257	25	3,140	1,740	396	278	203
11	543	4,320	701	331	252	26	3,720	1,580	396	266	192
12	586	3,780	662	331	235	27	3,540	1,440	396	266	192
13	557	3,740	636	331	229	28	2,930	1,330	390	260	192
14	641	3,690	548	325	224	29	2,480	1,240	376	252	192
15	765	4,510	511	318	229	30	2,260	1,170	376	260	192
						31	2,210	-------	368	260	-------

Monthly discharge of Rock Creek near Quigley, Mont., for the period May 1 to Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
May	3,720	415	1,630	100,000
June	5,170	1,170	3,280	195,000
July	1,010	368	567	34,900
August	358	252	309	19,000
September	263	192	226	13,400

RANCH CREEK NEAR QUIGLEY, MONT.

LOCATION.—In NE. ¼ sec. 36, T. 10 N., R. 17 W. (unsurveyed), one-fourth mile above mouth and 2¼ miles south of Quigley, Granite County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 2, 1922, to September 30, 1922.

GAGE.—Vertical staff with enamel face on right abutment of highway bridge; read by H. D. Hastings and Harvey Shields.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of cobblestones. Control is riffle 20 feet below gage, fairly permanent. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period May 2 to September 30, 1.50 feet May 19 and 20 (discharge, 238 second-feet); minimum stage recorded, 0.66 foot September 16 and 22–30 (discharge, 23 second-feet).

ICE.—None during period of record.

DIVERSIONS.—None of importance.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 20 and 220 second-feet. Daily gage heights are mean of two readings daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Maintained in cooperation with Rock Creek Power Co.

Discharge measurements of Ranch Creek near Quigley, Mont., during the period May 1 to Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 1	0.86	47.8	June 26	1.05	103
25	1.40	207	Sept. 21	.66	22.3

Daily discharge, in second-feet, of Ranch Creek near Quigley, Mont., for the period May 1 to Sept. 30, 1922.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	------	133	81	38	28	16	142	167	56	31	23
2	76	145	81	38	26	17	192	148	51	31	24
3	76	173	73	38	28	18	232	145	51	31	24
4	81	204	70	38	27	19	238	139	51	31	24
5	145	219	68	38	28	20	238	139	51	31	24
6	109	226	65	38	28	21	219	136	47	31	24
7	103	226	63	36	31	22	185	130	47	31	23
8	103	210	60	33	28	23	173	118	47	28	23
9	100	198	60	33	24	24	173	115	47	28	23
10	86	207	63	33	27	25	207	115	42	26	23
11	78	198	63	33	28	26	219	100	42	26	23
12	76	176	60	33	26	27	182	98	42	26	23
13	78	176	60	33	26	28	154	86	42	28	23
14	92	170	60	31	26	29	145	86	38	28	23
15	115	167	60	31	24	30	136	86	38	30	23
						31	127	------	38	30	------

Monthly discharge of Ranch Creek near Quigley, Mont., for the period May 2 to Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
May 2-31	238	76	143	8,510
June	226	86	155	9,220
July	81	38	55.4	3,410
August	38	26	32.0	1,970
September	31	23	25.2	1,500

BLACKFOOT RIVER AT CLEARWATER, MONT.

LOCATION.—In sec. 16, T. 14 N., R. 14 W., 300 feet above mouth of Clearwater River, 200 feet above highway bridge, and 1 mile south of Clearwater post office, Missoula County.

DRAINAGE AREA.—1,320 square miles (measured on Forest Service map).

RECORDS AVAILABLE.—June 9, 1921, to September 30, 1922.

GAGE.—Overhanging wire gage on right bank 200 feet above highway bridge; read by Lue Parker.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of large boulders and gravel. Banks high and covered with timber. Control is riffle of heavy boulders below highway bridge, probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.4 feet at 11 a. m. June 6 (discharge, 7,820 second-feet); minimum stage, 1.05 feet September 27–30 (discharge, 435 second-feet).

1921–1922: Maximum stage recorded, that of June 6, 1922; minimum stage, that of September 27–30, 1922.

ICE.—Records discontinued during winter.

DIVERSIONS.—Several small ditches divert water for irrigation above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 500 and 6,500 second-feet. Gage read to half-tenths once daily except Sunday and July 4. Daily discharge obtained by applying daily gage height to rating table for days of gage readings and by interpolation for other days. Records good.

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Discharge measurements of Blackfoot River at Clearwater, Mont., during the year ending Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 23	5.44	6,000
June 26	2.93	2,280

Daily discharge, in second-feet, of Blackfoot River at Clearwater, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	514	514	-------	937	4,490	1,680	772	543
2	514	514	-------	984	4,890	1,590	736	543
3	514	514	-------	1,080	5,530	1,500	700	543
4	514	514	-------	1,130	6,500	1,420	700	543
5	487	514	-------	1,180	7,480	1,330	700	543
6	487	500	-------	1,280	7,820	1,280	688	543
7	487	487	-------	1,300	7,480	1,280	677	543
8	487	487	-------	1,330	7,400	1,230	677	572
9	500	487	-------	1,440	6,970	1,280	677	572
10	514	487	-------	1,330	6,290	1,330	634	558
11	514	487	-------	1,280	6,200	1,330	634	543
12	514	487	-------	1,230	6,120	1,230	634	543
13	514	500	-------	1,180	5,950	1,230	634	514
14	514	514	-------	1,280	5,860	1,130	634	514
15	514	514	-------	1,380	5,780	1,030	677	514
16	528	514	-------	1,620	5,780	1,010	677	514
17	543	514	-------	2,630	5,780	984	700	500
18	543	514	-------	4,010	5,380	984	677	487
19	543	514	-------	4,970	4,970	937	634	487
20	543	-------	-------	6,200	4,330	937	634	487
21	543	-------	-------	6,240	3,850	894	634	460
22	543	-------	-------	6,290	3,530	894	634	460
23	528	-------	-------	6,200	3,230	872	603	460
24	514	-------	-------	6,460	2,930	851	603	460
25	514	-------	-------	6,720	2,600	851	572	460
26	514	-------	1,030	7,480	2,270	812	572	460
27	514	-------	1,030	7,400	2,200	812	573	435
28	514	-------	984	6,500	2,000	812	572	435
29	514	-------	984	5,610	1,860	772	572	435
30	514	-------	960	4,810	1,740	772	543	435
31	514	-------	-------	4,650	-------	772	543	-------

NOTE.—No record Nov. 20 to Apr. 25.

Monthly discharge of Blackfoot River at Clearwater, Mont., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	543	487	517	31,800
November 1–19	514	487	504	19,000
April 26–30	1,030	960	998	9,900
May	7,480	937	3,420	210,000
June	7,820	1,740	4,910	292,000
July	1,680	772	1,090	67,000
August	772	543	642	39,500
September	572	435	504	30,000

NOTE.—No record Nov. 20 to Apr. 25.

NORTH FORK OF BLACKFOOT RIVER NEAR OVANDO, MONT.

LOCATION.—In NW. ¼ sec. 22, T. 15 N., R. 11 W., at Pitkin's ranch, 11 miles northeast of Ovando, Powell County.

DRAINAGE AREA.—227 square miles (measured on topographic map).

RECORDS AVAILABLE.—June 8, 1921, to September 30, 1922.

GAGE.—Wire gage with enamel face on left bank, 400 feet north of observer's house; read twice daily by James Pitkin.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed of stream composed of large boulders. Control not well defined, but not subject to shift. Left bank high and timbered. Right bank covered with heavy brush and timber; subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.58 feet at 7.30 a. m. June 5 (discharge, 2,900 second-feet); minimum stage, 2.44 feet November 6–16 (discharge, 27 second-feet).

1921–22: Maximum stage recorded, that of June 5, 1922; minimum stage, that of November 6–16, 1922.

ICE.—Stage-discharge relation seriously affected; records discontinued during winter.

DIVERSIONS.—Two small ditches divert water for irrigation above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 40 and 2,600 second-feet. Gage read to hundredths twice daily. Daily discharge determined by applying mean daily gage height to rating table. Records good.

Discharge measurements of North Fork of Blackfoot River near Ovando, Mont., during the year ending Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 22	6.38	1,850
June 27	4.96	692

Daily discharge, in second-feet, of North Fork of Blackfoot River near Ovando, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	38	30		57	1,510	498	124	63
2	37	30		58	1,700	442	124	63
3	37	29		59	2,140	400	115	63
4	37	29		62	2,570	376	121	64
5	37	29		66	2,820	361	113	66
6	37	27		71	2,780	350	110	67
7	37	27		72	2,520	332	107	67
8	36	27		76	2,270	339	107	66
9	36	27		78	2,250	339	107	62
10	36	27		78	2,000	332	107	58
11	36	27		79	1,940	325	99	57
12	35	27		83	1,940	315	91	55
13	35	27		91	1,980	274	91	53
14	35	27		107	1,960	245	91	52
15	36	27		144	1,850	234	94	50
16	35	27		339	1,720	226	91	50
17	35			1,110	1,700	213	91	50
18	35			1,380	1,620	200	88	50
19	35			1,800	1,480	188	88	50
20	34			1,940	1,400	188	91	48
21	33			2,070	1,320	170	91	48
22	33			1,830	1,160	166	84	47
23	33			1,630	1,010	166	84	47
24	33			1,720	886	170	78	47
25	33			2,320	800	177	78	47
26	33			2,590	735	177	72	45
27	32			2,000	698	161	70	45
28	32			1,560	661	144	67	44
29	30		51	1,370	604	140	65	44
30	30		53	1,240	539	134	65	43
31	30			1,260		128	63	

NOTE.—No record from Nov. 17 to Apr. 28.

Monthly discharge of North Fork of Blackfoot River near Ovando, Mont., for the year ending Sept. 30, 1922.

[Drainage area, 227 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	38	30	34.5	0.152	0.18	2,120
November 1–16	30	27	27.8	.122	.07	882
May	2,590	57	882	3.89	4.48	54,200
June	2,820	539	1,620	7.14	7.97	96,400
July	498	128	255	1.12	1.29	15,700
August	124	63	92.5	.407	.47	5,690
September	67	43	53.7	.237	.26	3,200

NOTE.—No record from Nov. 17 to Apr. 28.

CLEARWATER RIVER AT CLEARWATER, MONT.

LOCATION.—In sec. 16, T. 14 N., R. 14 W., 400 feet above mouth and 1 mile south of Clearwater post office, Missoula County.

DRAINAGE AREA.—398 square miles (measured on Forest Service map).

RECORDS AVAILABLE.—June 9, 1921, to September 30, 1922

GAGE.—Overhanging wire gage on left bank; read by Lue Parker.

DISCHARGE MEASUREMENTS.—Made by wading at gage or from highway bridge at Clearwater, 1 mile above gage.

CHANNEL AND CONTROL.—Bed composed of heavy boulders and gravel. Control not well defined, but probably formed by channel below gage; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.9 feet at 1.30 p. m. May 26 (discharge, 2,400 second-feet); minimum stage 0.8 foot November 7–12 (discharge, 45 second-feet).

1921–22: Maximum stage recorded, that of May 26, 1922; minimum stage, 0.8 foot September 9 and 10 and November 7–12, 1921 (discharge, 45 second-feet).

ICE.—Records discontinued during winter.

DIVERSIONS.—Some water is diverted for irrigation above gage.

REGULATION.—Dam at Seeley Lake may be used to regulate flow but has not been operated for several years.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 40 and 2,400 second-feet. Gage read to half-tenths once daily except Sunday and July 4. Daily discharge obtained by applying daily gage height to rating table for days of gage readings and by interpolation for other days. Records good.

Discharge measurements of Clearwater River at Clearwater, Mont., during the year ending Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 23	3.79	2,290
June 26	1.94	551

Daily discharge, in second-feet, of Clearwater River at Clearwater, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	55	55	------	615	1,450	470	155	90
2	55	55	------	695	1,500	438	120	90
3	55	55	------	860	1,550	405	120	90
4	55	55	------	950	1,900	405	105	90
5	55	55	------	1,040	2,250	405	105	90
6	55	50	------	1,040	2,200	405	98	90
7	55	45	------	1,130	2,150	375	90	90
8	55	45	------	1,220	2,100	345	90	78
9	55	45	------	1,310	2,000	345	90	78
10	55	45	------	1,260	1,900	345	90	78
11	55	45	------	1,220	1,650	345	78	78
12	55	45	------	1,220	1,400	345	78	78
13	55	50	------	1,220	1,220	318	78	65
14	55	55	------	1,260	1,220	290	78	65
15	55	55	------	1,310	1,220	290	78	65
16	55	55	------	1,360	1,180	304	90	65
17	55	55	------	1,400	1,180	318	90	65
18	55	55	------	1,600	1,160	290	78	65
19	55	55	------	1,900	1,130	290	78	65
20	55	------	------	2,300	1,040	290	78	65
21	55	------	------	2,300	950	265	78	65
22	55	------	------	2,300	860	265	78	65
23	55	------	------	2,300	775	252	78	65
24	55	------	------	2,200	775	240	78	65
25	55	------	------	2,100	695	240	65	65
26	55	------	318	2,400	615	218	65	65
27	55	------	275	2,350	578	195	78	65
28	55	------	405	2,180	540	155	90	65
29	55	------	540	2,000	540	155	90	65
30	55	------	578	1,700	505	155	90	65
31	55	------	------	1,600	------	155	90	------

NOTE.—No record Nov. 20 to Apr. 25.

Monthly discharge of Clearwater River at Clearwater, Mont., for the year ending Sept. 30, 1922.

[Drainage area, 398 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	55	55	55.0	0.138	0.16	3,380
November 1–19	55	45	51.3	.129	.09	1,930
April 26–31	578	318	443	1.11	.21	4,390
May	2,400	615	1,560	3.92	4.52	95,900
June	2,250	505	1,270	3.19	3.56	75,600
July	470	155	300	7.54	.87	18,400
August	155	65	88.6	.223	.26	5,450
September	90	65	73.0	.183	.20	4,340

NOTE.—No record Nov. 20 to Apr. 25.

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, 1920, to September 30, 1922.

GAGE.—Vertical staff with enamel face on downstream end of left abutment of bridge; read by J. S. Brennan.

DISCHARGE MEASUREMENTS.—Made by wading near gage or from farm bridge half a mile below gage.

CHANNEL AND CONTROL.—Bed composed of boulders and cobblestones for several hundred feet above and below gage. Control is same for all stages. One channel at all stages. Banks high and not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.80 feet at 8 a. m. June 14 (discharge, 1,110 second-feet); minimum stage, 1.30 feet April 16 (discharge, 27 second-feet).

1920–1922: Maximum stage recorded, that of June 14, 1922; minimum stage, 1.30 feet April 21–25, 1920, March 1–4, 6, 8, 9, 1921, and April 16, 1922 (discharge, 27 second-feet).

ICE.—Stage-discharge relation seriously affected by ice; record discontinued during winter.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 25 and 400 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Skalkaho Creek near Hamilton, Mont., during the year ending Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 24	2.46	265
June 25	2.75	368
Sept. 22	1.52	36.4

Daily discharge, in second-feet, of Skalkaho Creek near Hamilton, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	37	34	30	37	341	243	82	54
2	37	34	30	37	411	226	78	51
3	37	34	30	37	509	217	78	49
4	37	34	30	39	635	210	69	47
5	37	34	30	54	792	204	69	50
6	37	34	28	54	831	204	69	60
7	37	34	30	54	870	186	69	54
8	37	34	30	57	870	195	69	57
9	34	34	30	57	792	195	69	54
10	34	34	30	50	792	186	69	50
11	34	34	30	47	755	174	60	47
12	34	34	28	47	718	158	60	45
13	34	32	28	57	777	152	60	42
14	34	32	30	69	950	147	64	42
15	34	32	28	74	1,070	138	69	42
16	34	32	27	105	910	138	64	42
17	34	32	28	180	808	130	60	45
18	37	-------	28	243	792	125	60	39
19	37	-------	28	261	755	125	60	37
20	37	-------	30	261	755	125	60	37
21	37	-------	34	261	733	125	57	37
22	37	-------	37	279	635	120	54	38
23	37	-------	37	261	532	120	54	37
24	37	-------	37	299	463	112	54	37
25	37	-------	37	421	411	105	54	37
26	37	-------	37	474	411	100	47	37
27	37	-------	37	363	373	96	47	37
28	37	-------	37	272	341	96	47	37
29	37	-------	37	272	272	89	54	37
30	37	-------	37	279	243	89	60	37
31	34	-------	-------	299	-------	89	57	-------

NOTE.—No record Nov. 18 to Mar. 31.

Monthly discharge of Skalkaho Creek near Hamilton, Mont., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	37	34	36.0	2,210
November 1–17	34	32	33.4	1,130
April	37	27	31.7	1,890
May	474	37	171	10,500
June	1,070	243	652	38,800
July	243	89	149	9,160
August	82	47	62.0	3,810
September	60	37	43.8	2,610

NOTE.—No record Nov. 18 to Mar. 31.

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, 1920, to September 30, 1922.

GAGE.—Vertical staff with enamel face located 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 gage.

CHANNEL AND CONTROL.—Bed of stream is composed of boulders and cobblestones; shifting occasionally. One channel at all stages. Banks not subject to overflow. Control not well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.20 feet at 7 p. m. June 15 (discharge, 130 second-feet); minimum stage, 0.56 foot November 8–19 and March 30 to April 5 (discharge, 4.7 second-feet).

1920–1922: Maximum stage, that of June 15, 1922; minimum stage, 0.56 foot November 8–19, 1921, and March 29 to April 5, 1922 (discharge, 4.7 second-feet).

ICE.—Stage-discharge relations affected by ice; records discontinued during winter.

DIVERSIONS.—One ditch diverts a small quantity of water above gage.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined between 7 and 80 second-feet. Gage read twice daily May 1 to September 30 and once daily October 1 to December 31, 1921, and March 29 to April 30, 1922. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of Willow Creek near Corvallis, Mont., during the year ending Sept. 30, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 24	1.14	38.0
June 25	1.60	78
September 22	.67	6.4

Daily discharge, in second-feet, of Willow Creek near Corvallis, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7.1	5.2		4.7	10	40	45	14	7.1
2	7.1	5.2		4.7	10	48	41	14	7.1
3	6.4	5.2		4.7	10	55	37	14	7.1
4	6.4	5.2		4.7	11	61	36	16	7.1
5	6.4	5.2		4.7	12	69	34	18	7.1
6	6.4	5.2		5.7	12	79	33	18	12
7	6.4	5.2		5.2	13	88	33	18	11
8	6.4	4.7		5.2	12	92	33	18	9.3
9	6.4	4.7		5.2	11	103	33	18	9.3
10	6.4	4.7		5.2	11	103	33	18	9.3
11	6.4	4.7		5.7	10	95	33	18	9.3
12	6.4	4.7		6.4	10	95	32	15	9.3
13	6.4	4.7		6.4	10	98	30	13	8.6
14	6.4	4.7		5.2	12	110	24	12	8.6
15	6.4	4.7		5.2	21	125	24	12	8.6
16	6.4	4.7		5.2	26	122	24	12	8.6
17	6.4	4.7		5.2	27	116	23	11	8.6
18	6.4	4.7		5.2	38	117	23	11	8.6
19	6.4	4.7		5.7	41	118	21	10	7.9
20	6.4			6.4	41	105	21	10	7.9
21	6.4			6.4	40	100	20	9.3	8.0
22	6.4			9.3	38	100	19	9.3	8.2
23	6.1			9.3	36	91	19	8.6	7.9
24	6.1			9.3	36	82	19	8.6	7.9
25	6.1			9.3	46	74	19	7.9	7.9
26	5.7			9.3	48	68	18	7.9	7.9
27	5.7			8.6	41	65	17	7.9	7.9
28	5.7			8.6	34	59	16	7.9	7.9
29	5.7			8.6	33	53	15	9.8	7.9
30	5.7		4.7	9.3	33	49	15	8.2	7.9
31	5.2		4.7		34		15	7.9	

NOTE.—Stage-discharge relation affected by ice Nov. 20 to Dec. 31; discharge not computed. No record Jan. 1 to Mar. 29.

Monthly discharge of Willow Creek near Corvallis, Mont., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	7.1	5.2	6.26	385
November 1–19	5.2	4.7	4.88	183
April	9.3	4.7	6.49	386
May	48	10	24.7	1,520
June	125	40	86.0	5,120
July	45	15	26.0	1,600
August	18	7.9	12.4	762
September	12	7.1	8.39	499

NOTE.—See footnote to table of daily discharge.

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 9, 1920, to September 30, 1922. Records fragmentary.

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. Jack Blake.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading below gage. One channel at all stages at the gage. Banks are high and not subject to overflow.

CHANNEL AND CONTROL.—Bed composed of cobblestones and gravel; fairly smooth and not subject to shift. One channel at all stages; straight for 50 feet above and below gage. Banks not subject to overflow. 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 during the period April 30 to September 22, 2.64 feet at 7 a. m. June 10 (discharge, 620 second-feet); minimum stage, 0.61 foot September 22 (discharge from meter measurement, 23 second-feet).

1920–1922: Maximum stage, that of June 10, 1922; minimum stage, that of September 22, 1922 (discharge, 23 second-feet).

ICE.—None during period of record.

DIVERSIONS.—One or two small diversions above gage.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 15 and 300 second-feet. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Maintained in cooperation with Bitterroot Valley Irrigation District.

Discharge measurements of Burnt Fork Creek near Stevensville, Mont., during the period Apr. 30 to Sept. 22, 1922.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 30	0.92	52	June 25	1.75	224
May 24	2.02	319	Sept. 22	.61	23.0

Daily discharge, in second-feet, of Burnt Fork Creek near Stevensville, Mont., for the period Apr. 30 to Sept. 22, 1922.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1			317	135	43		16		206	610	57		
2			384	123	40		17		354	545	55		
3			432	108	45		18		442	478	52		
4			460	104	43		19		488	460	53		
5			555	96	39		20		414	432	49		
6			595	92			21		406	419	47		
7		111	590	96			22		359	384	45		23
8		113	595	88			23		309	305	44		
9		92	585	83			24		297	246	41		
10		80	615	84			25		442	222	40		
11		70	507	84			26		450	218	38		
12		72	516	78			27		376	203	36		
13		80	536	73			28		313	187	37		
14		111	570	68			29		253	167	34		
15		135	595	63			30	50	260	148	34		
							31		289		41		

NOTE.—No record May 1–6 and Aug. 6 to Sept. 21.

Monthly discharge of Burnt Fork Creek near Stevensville, Mont., for period May 7 to Aug. 5, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
May 7–31	488	70	261	12,900
June	615	148	429	25,500
July	135	34	67.0	4,120
August 1–5	45	39	42.0	417

FLATHEAD RIVER AT COLUMBIA FALLS, MONT.

LOCATION.—At highway bridge on Roosevelt Highway at Columbia Falls, Flathead County, 6 miles below mouth of South Fork of Flathead River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 14, 1922, to August 25, 1922.

GAGE.—Wire gage on upstream guardrail of highway bridge.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel. Right bank high, clean, and not subject to overflow. Left bank, heavily timbered and subject to overflow at high stages. Current swift at all stages. Control not well defined and probably is the channel for half a mile below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period May 14 to August 25, 15.7 feet June 5 (discharge, 82,200 second-feet); minimum stage, 2.06 feet August 25 (discharge, 2,680 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 2,620 and 12,000 second-feet and fairly well defined to 74,000 second-feet. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table. Daily discharge interpolated for days of no gage readings July 23–25, August 3–4, 8, 10–11, and 15–16. Records fair.

Discharge measurements of Flathead River at Columbia Falls, Mont., during period Apr. 27 to Aug. 25, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 27	W. A. Lamb	5.06	9,170	July 26	Grant and Tuttle	3.57	4,840
May 27	do	14.00	62,900	Aug. 20	W. A. Lamb	2.60	3,490
June 19	do	10.65	34,400				

Daily discharge, in second-feet, of Flathead River at Columbia Falls, Mont., for the period May 14 to Aug. 25, 1922.

Day.	May.	June.	July.	Aug.	Day.	May.	June.	July.	Aug.
1			15,300	4,000	16	41,200	41,600	7,110	3,420
2			14,300	3,850	17	57,900	40,400	6,860	3,450
3			13,200	3,850	18	72,800	38,200	6,490	3,420
4			12,000	3,850	19	77,400	34,200	6,130	3,420
5		82,200	11,400	3,850	20	75,200	32,100	5,900	3,300
6		81,000	10,900	3,690	21	65,100	31,500	5,680	3,110
7		67,300	10,500	3,690	22	56,900	29,100	5,570	2,950
8		59,900	9,980	3,680	23	45,100	25,300	5,400	2,850
9		47,600	9,470	3,660	24	43,900	22,400	5,230	2,760
10		45,100	8,980	3,610	25	59,400	20,100	5,060	2,680
11		42,700	8,820	3,560	26	77,400	18,800	4,890	
12		45,900	8,510	3,510	27	59,900	18,400	4,810	
13		48,400	8,210	3,510	28	45,500	17,800	4,590	
14	26,100	46,800	7,920	3,360	29	35,800	16,800	4,380	
15	30,300	42,700	7,370	3,390	30	39,700	15,900	4,280	
					31			4,110	

Monthly discharge of Flathead River at Columbia Falls, Mont., for the period May 14 to Aug. 25, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
May 14–30	77,400	26,100	53,500	1,800,000
June 4–30	82,200	15,900	38,900	2,010,000
July	15,300	4,110	7,850	483,000
August 1–25	4,000	2,680	3,460	172,000

FLATHEAD LAKE AT SOMERS, MONT.

LOCATION.—In NE. ¼ sec. 26, T. 27 N., R. 21 W., at steamboat dock at Somers, Lake County.

RECORDS AVAILABLE.—April 25, 1922, to September 30, 1922.

GAGE.—Stevens water-stage recorder in wooden shelter referenced to staff gage in well set at sea-level datum.

EXTREMES OF STAGE.—Maximum stage recorded during year, 2,892.75 feet at 7 p. m. June 10; minimum stage, 2,882.70 feet at 6.30 p. m. April 25.

ACCURACY.—Records good.

Daily gage height, in feet, of Flathead Lake at Somers, Mont., for the period Apr. 25 to Sept. 30, 1922.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1		83.6	90.7	89.3	84.82	83.4	16			92.4	86.6	83.85	83.05
2		83.8	90.7	89.05	84.7	83.35	17			92.3	86.5	83.8	83.05
3		84.0	90.9	88.8	84.6	83.35	18			92.2	86.4	83.8	83.0
4		84.2	91.1	88.55	84.45	83.3	19			92.0	86.25	83.8	83.0
5		84.4	91.5	88.35	84.45	83.3	20			91.9	86.15	83.8	83.0
6		84.6	91.8	88.15	84.4	83.25	21			91.7	86.05	83.7	82.95
7		84.7	92.2	87.95	84.35	83.25	22			91.5	85.9	83.7	82.95
8		84.8	92.5	87.75	84.3	83.25	23			91.3	85.75	83.7	82.9
9		85.0	92.6	87.65	84.25	83.2	23			91.1	85.65	83.65	82.85
10		85.1	92.7	87.45	84.2	83.15	25	82.7		90.8	85.5	83.6	82.85
11		85.25	92.7	87.35	84.15	83.15	26	82.8		90.55	85.35	83.55	82.8
12		85.35	92.7	87.2	84.07	83.15	27	82.9	90.7	90.3	85.35	83.5	82.8
13		85.45	92.5	87.05	84.0	83.1	28	83.1	90.8	90.05	85.3	83.45	82.8
14		85.55	92.5	86.95	83.96	83.1	29	83.3	90.9	89.75	85.25	83.45	82.75
15		85.7	92.5	86.8	83.9	83.05	30	83.5	90.9	89.55	85.05	83.4	82.75
							31		90.8		84.93	83.4	

NOTE.—Add 2,800 feet to reduce to sea level. No record May 16–26.

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, Lake County.

RECORDS AVAILABLE.—August 23, 1908, to September 30, 1922.

GAGE.—Stevens water-stage recorder installed April 23, 1922, in wooden shelter and referenced to inside staff gage set at sea-level datum. Original staff gage on pile at datum 3 feet higher (2,803 feet added to reduce readings to sea level).

EXTREMES OF STAGE.—Maximum stage recorded during the year, 2,892.65 feet at 1.30 p. m. June 9; minimum stage, 2,881.9 feet March 7–25.

1908–1922: Maximum stage recorded, 2,895.7 feet (sea-level datum) July 1, 2, and 4, 1916; minimum stage, 2,881.5 feet (sea-level datum) February 16–22, 1913.

COOPERATION.—Gage reading for staff gage furnished by United States Bureau of Reclamation.

Daily gage height, in feet, of Flathead Lake at Polson, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	82.6	82.4	82.4	82.7	82.4	82.0	82.0	83.4	90.6	89.3	84.8	83.2
2	82.6	82.4	82.5	82.8	82.4	82.0	82.0	83.4	90.6	89.0	84.7	83.2
3	82.6	82.4	82.5	82.8	82.3	82.0	82.1	85.7	90.7	88.8	84.6	83.2
4	82.6	82.4	82.5	82.9	82.3	82.0	82.1	85.9	90.9	88.6	84.6	83.2
5	82.6	82.4	82.5	82.9	82.3	82.0	82.1	84.0	91.2	88.4	84.5	83.2
6	82.6	82.4	82.4	82.9	82.3	82.0	82.2	84.3	91.6	88.2	84.4	83.25
7	82.5	82.4	82.4	82.8	82.3	81.9	82.2	85.5	92.1	88.0	84.4	83.05
8	82.5	82.4	82.4	82.8	82.3	81.9	82.2	84.8	92.3	87.6	84.3	83.05
9	82.5	82.4	82.3	82.8	82.3	81.9	82.3	84.9	92.5	87.6	84.2	83.05
10	82.5	82.4	82.3	82.8	82.3	81.9	82.3	85.0	92.5	87.4	84.2	83.05
11	82.5	82.3	82.3	82.8	82.3	81.9	82.3	85.1	92.5	87.3	84.1	83.0
12	82.5	82.3	82.3	82.7	82.3	81.9	82.3	85.3	92.3	87.1	84.0	83.0
13	82.5	82.3	82.3	82.7	82.3	81.9	82.3	85.4	92.3	87.0	84.0	82.95
14	82.5	82.3	82.3	82.7	82.3	81.9	82.3	85.5	92.2	86.8	83.9	82.95
15	82.4	82.3	82.3	82.7	82.2	81.9	82.3	85.7	92.15	86.7	83.9	82.95
16	82.4	82.3	82.3	82.7	82.2	81.9	82.3	85.8	92.1	86.5	83.9	82.9
17	82.4	82.3	82.3	82.6	82.2	81.9	82.3	86.2	91.9	86.4	83.8	82.85
18	82.4	82.3	82.3	82.6	82.2	81.9	82.3	86.7	92.1	86.2	83.8	82.85
19	82.4	82.3	82.3	82.6	82.2	81.9	82.4	87.2	92.0	86.1	83.8	82.85
20	82.4	82.3	82.3	82.6	82.2	81.9	82.4	87.9	91.8	85.9	83.7	82.8
21	82.4	82.3	82.3	82.6	82.1	81.9	82.4	88.6	91.6	85.8	83.7	82.75
22	82.4	82.3	82.3	82.5	82.1	81.9	82.4	89.0	91.4	85.7	83.6	82.7
23	82.4	82.3	82.3	82.5	82.1	81.9	82.4	89.4	91.2	85.6	83.5	82.65
24	82.4	82.3	82.3	82.5	82.1	81.9	82.5	89.6	91.0	85.5	83.5	82.55
25	82.4	82.3	82.4	82.5	82.1	81.9	82.6	89.8	90.9	85.4	83.5	82.45
26	82.4	82.3	82.4	82.5	82.1	82.0	82.7	90.0	90.5	85.3	83.45	82.45
27	82.4	82.3	82.5	82.4	82.0	82.0	82.8	90.4	90.3	85.2	83.4	82.3
28	82.4	82.3	82.5	82.4	82.0	82.0	82.9	90.8	90.0	85.1	83.4	82.2
29	82.4	82.4	82.6	82.4	-------	82.0	83.1	90.8	89.8	85.0	83.35	82.2
30	82.4	82.4	82.6	82.4	-------	82.0	83.2	90.7	89.5	84.9	83.35	82.25
31	82.4	-------	82.7	82.4	-------	82.0	-------	90.6	-------	84.8	83.25	-------

NOTE.—Observer's readings on original staff gage reduced to sea-level datum, Oct. 1 to Apr. 29, May 8–29, and June 18 to Aug. 22. Add 2,803 feet to reduce to sea level.

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, Lake County.

DRAINAGE AREA.—7,010 square miles.

RECORDS AVAILABLE.—July 23, 1907, to September 30, 1922.

GAGE.—Chain gage on downstream side of bridge; installed March 10, 1921; read by Mrs. Jennie Wigen. April 9, 1916, to March 10, 1921, vertical staff in four sections on left bank. July 23, 1907, to April 9, 1916, a chain gage on right bank. All gages at same datum.

DISCHARGE MEASUREMENTS.—Made from highway bridge at site of old ferry.

CHANNEL AND CONTROL.—Control not well defined but apparently permanent. Current fairly swift. Banks high.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.5 feet June 10 and 11 (discharge, 56,400 second-feet); minimum stage, 1.50 feet March 15–18 (discharge, 2,700 second-feet).

1907–1922: Maximum stage recorded, 16.4 feet June 13, 1913 (discharge, 75,400 second-feet); minimum stage recorded, −0.1 foot December 9–14, 1919, and March 14, 1920 (discharge, 1,360 second-feet).

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

DIVERSIONS.—Several small diversions from tributaries above Flathead Lake.

REGULATION.—Flathead Lake forms a natural regulation.

ACCURACY.—Stage-discharge relation permanent except during period affected by ice. Rating curve well defined between 5,000 and 50,000 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table except for periods affected by ice.

COOPERATION.—Gage heights furnished by United States Bureau of Reclamation; computations by United States Geological Survey.

Discharge measurements of Flathead River near Polson, Mont., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 29	W. A. Lamb	3.32	5,390	June 22	W. A. Lamb	12.35	48,200
May 30	do	11.72	45,200	July 29	Grant and Tuttle	5.90	12,600

Daily discharge, in second-feet, of Flathead River near Polson, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,650	3,510	3,380	4,750	3,570	2,930	2,760	6,120	43,700	35,100	11,500	5,700
2	3,800	3,510	3,380	4,750	3,570	2,940	2,740	6,430	43,800	33,900	11,000	5,660
3	3,800	3,380	3,650	4,750	3,410	2,940	2,740	7,490	44,200	29,900	10,900	5,680
4	3,800	3,380	3,650	4,580	3,250	2,930	2,740	9,000	45,200	31,000	10,400	5,500
5	3,950	3,380	3,650	4,580	3,250	2,820	2,740	8,980	47,100	29,900	10,200	5,500
6	4,260	3,380	3,650	4,420	3,250	2,800	2,790	9,410	49,900	28,600	10,000	5,300
7	4,100	3,250	3,650	4,310	3,250	2,770	2,810	10,700	52,700	23,600	9,710	5,110
8	3,950	3,250	3,510	4,260	3,250	2,770	3,020	11,700	55,000	25,600	9,500	5,110
9	3,950	3,250	3,380	4,180	3,250	2,790	3,130	12,300	56,100	25,500	9,410	4,930
10	3,950	3,250	3,380	4,100	3,250	2,790	3,020	13,000	56,400	24,800	8,830	4,930
11	3,800	3,250	3,380	4,260	3,250	2,790	3,130	13,500	56,400	23,900	8,750	4,930
12	3,800	3,250	3,380	4,310	3,130	2,760	3,130	13,900	55,700	23,000	8,660	4,930
13	3,650	3,510	3,380	4,420	3,130	2,760	3,130	14,100	55,300	18,000	8,270	4,930
14	3,650	3,800	3,650	4,260	3,130	2,740	3,250	14,700	55,200	19,500	8,550	4,930
15	3,650	3,800	3,950	4,100	3,130	2,700	3,250	15,900	54,800	19,800	8,410	4,750
16	3,650	3,650	4,580	4,100	2,800	2,700	3,250	16,400	54,600	20,400	8,270	4,750
17	3,650	3,510	4,750	4,100	2,730	2,700	3,250	17,300	53,700	21,000	7,490	4,650
18	3,650	3,510	3,950	3,950	2,800	2,700	3,250	19,800	53,000	21,600	7,250	4,610
19	3,650	3,510	3,800	3,950	2,960	2,710	3,250	23,000	52,000	22,000	7,200	4,580
20	3,510	3,510	3,600	3,760	3,020	2,710	3,390	25,200	51,400	17,100	7,010	4,550
21	3,510	3,510	3,600	3,760	3,020	2,710	3,510	29,700	49,800	16,900	7,010	4,520
22	3,510	3,510	3,600	3,660	3,030	2,720	3,540	33,100	48,600	16,800	7,010	4,260
23	3,510	3,510	3,600	3,650	3,030	2,720	3,590	35,700	47,700	15,400	6,690	4,260
24	3,510	3,380	3,600	3,650	3,030	2,720	3,800	36,900	46,100	14,900	6,340	4,290
25	3,510	3,380	3,800	3,650	3,030	2,720	3,950	38,100	44,700	14,100	6,340	4,360
26	3,510	3,380	4,000	3,650	3,020	2,730	4,100	39,400	42,800	13,700	6,470	4,100
27	3,510	3,380	4,260	3,650	3,010	2,730	4,420	42,300	41,300	13,500	6,120	3,950
28	3,510	3,250	4,260	3,650	2,930	2,730	4,750	44,000	46,100	12,900	6,120	3,800
29	3,510	3,250	4,260	3,650	-------	2,740	5,500	44,600	44,700	12,500	6,120	3,800
30	3,510	3,250	4,580	3,650	-------	2,750	5,800	44,800	36,700	12,200	6,020	3,800
31	3,510	-------	4,750	3,650	-------	2,760	-------	44,400	-------	11,800	5,700	-------

NOTE.—Stage-discharge relation affected by ice Dec. 20–26; discharge estimated.

Monthly discharge of Flathead River near Polson, Mont., for the year ending Sept. 30, 1922.

[Drainage area 7,010 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,260	3,510	3,690	0.526	0.61	227,000
November	3,800	3,250	3,420	.488	.54	204,000
December	4,750	3,380	3,810	.544	.63	234,000
January	4,750	3,650	4,070	.581	.67	250,000
February	3,570	2,730	3,120	.445	.46	173,000
March	2,940	2,700	2,770	.395	.46	170,000
April	5,800	2,740	3,460	.494	.55	206,000
May	44,800	6,120	22,600	3.22	3.71	1,390,000
June	56,400	36,700	49,500	7.06	7.88	2,950,000
July	35,100	11,800	20,900	2.98	3.44	1,290,000
August	11,500	5,700	8,100	1.16	1.34	498,000
September	5,700	3,800	4,740	.676	.75	282,000
The year	56,400	2,700	10,900	1.55	21.04	7,870,000

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 MacDonald outlet.

DRAINAGE AREA.—900 square miles.

RECORDS AVAILABLE.—October 5, 1910, to September 30, 1922.

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, 12.8 feet June 5 (discharge, 22,100 second-feet); minimum stage, 0.7 foot March 19–28 (discharge, 122 second-feet).

1910–1922: Maximum stage recorded, 20.0 feet June 21, 1916 (discharge determined by extension of rating curve, 49,000 second-feet); minimum stage, that of March 19–28, 1922.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except when affected by ice. Rating curve well defined between 325 and 20,000 second-feet. Gage read once daily to tenths, occasionally to half-tenths. Daily discharge ascertained by applying daily gage height to rating table. Records good.

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

Daily discharge, in second-feet, of Middle Fork of Flathead River at Belton, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	580	430	430	475	640	-------	152	1,550	15,300	3,470	1,010	430
2	580	430	410	475	580	-------	152	1,550	17,100	3,470	940	430
3	580	430	390	475	525	-------	152	2,400	18,900	3,260	940	430
4	580	430	390	700	430	-------	170	2,800	20,800	3,000	940	430
5	580	430	390	640	390	-------	190	3,260	22,100	2,740	940	410
6	580	430	355	820	390	-------	190	4,450	20,200	2,510	940	390
7	580	430	355	940	390	-------	210	5,000	18,900	2,510	940	390
8	580	430	372	1,010	390	452	210	5,780	17,100	2,510	940	390
9	580	390	390	1,080	390	475	210	6,190	13,400	2,870	940	390
10	580	390	410	1,080	390	475	320	6,820	11,500	3,260	940	430
11	580	390	430	1,080	390	475	390	7,360	9,540	2,940	940	430
12	580	390	1,080	1,040	390	580	390	7,690	9,060	2,510	940	430
13	475	390	5,980	1,040	320	410	475	8,140	9,060	2,090	940	430
14	475	390	6,610	1,010	320	320	475	8,600	8,600	1,820	940	525
15	430	390	5,380	1,010	320	260	475	12,600	8,140	1,820	880	525
16	430	390	2,400	1,010	320	210	525	14,500	8,020	1,780	700	525
17	430	390	1,730	1,010	320	170	580	14,500	8,020	1,640	580	580
18	430	355	1,550	1,010	320	136	580	15,800	7,800	1,640	525	580
19	430	320	1,310	1,010	372	122	580	16,800	7,030	1,470	525	580
20	430	320	1,080	1,010	372	122	700	19,200	6,820	1,390	475	580
21	430	320	1,010	1,010	-------	122	820	18,000	7,030	1,310	475	580
22	430	320	700	1,010	-------	122	940	17,100	7,030	1,310	475	580
23	430	320	525	1,010	-------	122	940	15,900	6,400	1,310	475	580
24	430	320	390	940	-------	122	940	14,500	6,190	1,310	475	580
25	430	390	390	940	-------	122	1,010	13,400	5,780	1,310	475	640
26	430	430	390	940	-------	122	1,040	13,100	5,580	1,310	475	580
27	430	430	390	850	-------	122	1,040	12,600	4,810	1,310	475	580
28	430	430	452	820	-------	122	1,040	12,600	4,120	1,310	430	430
29	430	430	430	820	-------	136	1,230	12,600	4,200	1,310	430	390
30	430	430	475	700	-------	136	1,390	13,400	3,610	1,310	430	320
31	430	-------	475	700	-------	136	-------	14,200	-------	1,160	430	-------

NOTE.—Stage-discharge relation affected by ice Feb. 21 to Mar. 7; discharge not computed.

Monthly discharge of Middle Fork of Flathead River at Belton, Mont., for the year ending Sept. 30, 1922.

[Drainage area, 900 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	580	430	491	0.546	0.63	30,200
November	430	320	392	.436	.49	23,300
December	6,610	355	1,200	1.33	1.53	73,800
January	1,080	475	892	.991	1.14	54,800
February 1–20	640	320	398	.442	.33	15,800
March 8–31	580	122	233	.259	.23	11,100
April	1,390	152	584	.649	.72	34,800
May	19,200	1,550	10,400	11.6	13.37	640,000
June	22,100	3,610	10,400	11.6	12.94	619,000
July	3,470	1,160	2,030	2.26	2.61	125,000
August	1,010	430	708	.787	.91	43,500
September	640	320	486	.540	.60	28,900

STILLWATER RIVER NEAR KALISPELL, MONT.

LOCATION.—In NE. ¼ NE. sec. 14, T. 29 N., R. 22 W., at highway bridge 3 miles north of Kalispell, Flathead County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 27, 1922, to August 31, 1922.

GAGE.—Vertical staff with enamel face on downstream side of right abutment of bridge; read by F. W. Rogers.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of heavy clay with some boulders. Banks high and not subject to overflow. No definite control; probably the entire channel below gage acts as control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period April 27 to August 31, 10.50 feet at 7.50 a. m. May 22 (discharge, 2,750 second-feet); minimum stage, 1.14 feet August 30 and 31 (discharge, 184 second-feet).

ICE.—None during the period of record.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during period of record. Rating curve well defined between 250 and 2,000 second-feet. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table. Records, except during period affected by log jams, good.

Discharge measurements of Stillwater River near Kalispell, Mont., during the period Apr. 27 to Aug. 31, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 27	W. A. Lamb	2.45	348	June 19	W. A. Lamb	4.48	696
May 27	do	7.38	1,580	July 24	Grant and Tuttle	1.98	274

Daily discharge, in second-feet, of Stillwater River near Kalispell, Mont., for the period Apr. 27 to Aug. 31, 1922.

Day.	Apr.	May.	June.	July.	Aug.	Day.	Apr.	May.	June.	July.	Aug.
1		504	1,860	387	230	16		625	1,200	471	218
2		466	1,450	366	226	17		926	504	434	212
3		334	1,790	558	226	18		1,300	827	387	204
4		540	1,360	576	224	19		1,770	736	356	202
5		381	1,120	460	220	20		2,240	558	331	208
6		540	1,040	366	220	21		2,710	595	311	208
7		636	1,150	441	218	22		2,750	733	292	206
8		883	1,380	479	216	23		2,550	595	275	202
9		1,060	1,400	471	214	24		2,190	855	273	198
10		1,090	1,180	636	212	25		1,990	926	265	194
11		985	1,310	540	212	26		1,940	827	261	192
12		1,080	1,450	522	210	27	338	1,590	495	250	190
13		1,170	1,040	531	210	28	234	1,610	431	239	188
14		988	1,180	647	212	29	234	1,900	408	234	186
15		806	941	549	214	30	239	2,080	370	220	184
						31		1,990		224	184

NOTE.—Backwater from log jam May 12, 14, 15, 19, and 20; discharge interpolated.

Monthly discharge of Stillwater River near Kalispell, Mont., for the period Apr. 27 to Aug. 31, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
April 27-30	338	234	261	2,070
May	2,750	334	1,340	82,400
June	1,860	370	990	58,900
July	647	220	398	24,500
August	230	184	208	12,800

SWAN RIVER NEAR BIG FORK, MONT.

LOCATION.—In NW. ¼ sec. 14, T. 26 N., R. 19 W., at outlet of Swan Lake, 7 miles southeast of Big Fork, Flathead County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 28, 1922, to September 30, 1922.

GAGE.—Vertical staff with enamel face fastened to pier on left bank 1,000 feet below outlet of the lake; read by Pat Murphy.

DISCHARGE MEASUREMENTS.—Made from highway bridge three-fourths of a mile below gage or from boat.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel. Banks subject to overflow at high stages. Control is rock ledge about 300 feet below gage, probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage reported during the period April 28 to September 30, 4.85 feet at 7 a. m. June 8 (discharge, 5,500 second-feet); minimum stage, 0.67 foot September 30 (discharge, 424 second-feet).

ICE.—None during 1922.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during the period. Rating curve very well defined between 300 and 4,500 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 Swan River near Big Fork, Mont., during the period Apr. 28 to Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 28	W. A. Lamb	2.08	1,540	June 21	W. A. Lamb	3.60	3,500
May 26	do	3.97	4,120	July 23	Grant and Tuttle	1.37	897

Daily discharge, in second-feet, of Swan River near Big Fork, Mont., for the period Apr. 28 to Sept. 30, 1922.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1		1,840	3,140	1,980	768	538	16		1,950	4,160	1,110	681	502
2		1,860	3,180	1,900	746	544	17		2,120	4,050	1,090	661	490
3		1,950	3,390	1,840	738	538	18		2,850	3,970	1,050	647	490
4		2,020	3,780	1,750	731	520	19		3,480	3,830	1,020	640	490
5		2,100	4,370	1,670	738	532	20		4,100	3,690	975	627	479
6		2,220	4,960	1,630	724	520	21		4,420	3,460	950	627	468
7		2,220	5,330	1,580	724	550	22		4,530	3,390	933	627	451
8		2,220	5,440	1,510	710	562	23		4,400	3,280	900	607	446
9		2,220	5,280	1,570	717	562	24		4,070	3,030	892	588	435
10		2,170	5,030	1,530	647	556	25		3,870	2,820	860	575	435
11		2,100	4,750	1,480	634	550	26		4,110	2,580	876	569	435
12		1,980	4,450	1,410	647	544	27		4,480	2,350	852	556	435
13		1,900	4,370	1,340	647	532	28	1,540	4,450	2,220	836	550	435
14		1,840	4,310	1,280	620	520	29	1,680	4,100	2,120	821	538	435
15		1,880	4,270	1,170	681	508	30	1,700	3,630	2,040	806	526	424
							31		3,270		783	550	

Monthly discharge of Swan River near Big Fork, Mont., for the period Apr. 28 to Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
April 28–30	1,700	1,540	1,640	9,760
May	4,530	1,840	2,910	179,000
June	5,440	2,040	3,770	224,000
July	1,980	783	1,240	76,200
August	768	526	646	39,700
September	562	424	498	29,600

BIG CREEK NEAR POLSON, MONT.

LOCATION.—In SW. ¼ sec. 4, T. 22 N., R. 19 W., just below power house of Mission Range Power Co., three-fourths of a mile above mouth, and 7 miles east of Polson, Flathead County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 1, 1917, to September 30, 1922.

GAGE.—Stevens eight-day water-stage recorder on left bank, used since June 14, 1917; prior to that date temporary gage on left bank 2 feet below. Recorder inspected by employees of Mission Range Power Co.

CHANNEL AND CONTROL.—An artificial control about 200 feet below gage; repaired August 18, 1917, but 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 year, 2.38 feet May 20 (canal carrying 1.0 second-foot; total discharge, 49 second-feet); minimum stage, 1.27 feet November 6 (discharge, 2.7 second-feet).

1917–1922: Maximum stage recorded, 2.4 feet June 9, 1917 (discharge from extended rating curve, 104 second-feet); minimum discharge, 0.6 second-foot September 7, 1919.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—United States Bureau of Reclamation Polson A canal diverts water between power house and gage.

REGULATION.—Operation of power plant materially affects flow, maximum effect is during low-water period.

ACCURACY.—Stage-discharge relation affected by ice; otherwise practically permanent during year. Rating curve well defined between 2 and 30 second-feet. Daily gage heights determined by straight-line method from graph of Stevens eight-day recorder October 1 to November 17, April 22 to June 24, and July 22 to September 30. Daily discharge ascertained by applying mean daily gage height to rating table and adding flow of canal or by reducing total kilowatt-hours for day to equivalent second-feet for 24 hours. Records fair.

Discharge measurements of Big Creek near Polson, Mont., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 28	W. A. Lamb	1.47	7.1	June 21	W. A. Lamb	1.60	12.2
May 26	do	1.99	28.6	July 22	Grant and Tuttle	1.28	2.4

Daily discharge, in second-feet, of Big Creek near Polson, Mont., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.4	4.6		4.0	4.7	5.3	4.3	5.5	10.6	5.5	5.4	4.4
2	3.2	4.6		3.8	4.0	5.3	3.3	5.8	25	4.5	5.4	4.3
3	4.4	4.6		5.3	3.9	5.2	3.3	5.0	32	4.0	5.2	2.8
4	4.6	4.6		5.4	4.4	4.7	4.2	4.8	40	3.9	5.9	3.8
5	4.6	4.6		5.2	3.8	3.3	4.4	4.8	26	4.6	5.9	4.2
6	4.6	2.7		5.4	4.9	3.8	4.4	5.5	36	4.7	5.0	4.2
7	4.6	4.1		5.2	4.5	3.9	4.8	5.5	38	5.1	5.2	4.5
8	4.4	4.4		3.8	4.9	4.7	4.4	6.1	28	5.3	6.1	4.3
9	3.0	4.1		5.0	4.8	4.7	3.4	6.1	19.4	3.6	6.1	4.3
10	4.6	4.1		5.2	4.8	4.4	4.4	6.1	9.2	4.8	5.8	3.2
11	4.4	4.1		4.3	5.2	4.4	4.4	5.5	15.9	5.3	6.2	4.0
12	4.1	4.6		5.0	3.9	3.2	4.3	5.5	19.1	5.2	6.0	4.3
13	4.1	3.2		4.2	4.5	4.1	4.2	5.5	14.5	4.8	5.1	4.1
14	4.1	4.6		5.0	4.9	4.9	4.4	4.8	13.4	4.7	4.9	4.3
15	4.6	4.1		3.8	5.0	3.8	4.4	6.6	11.3	5.1	6.7	4.3
16	3.0	4.1	5.1	4.0	5.0	4.7	3.3	9.3	11.6	3.6	6.7	4.2
17	4.1	4.1		5.1	5.2	3.7	4.3	28	10.3	3.9	6.6	3.1
18	4.1			4.0	5.2	3.6	4.3	30	11.1	4.9	5.8	4.1
19	4.1			5.2	3.3	3.4	4.6	32	10.6	5.3	5.8	4.1
20	4.1			4.5	4.8	4.4	4.4	38	9.1	5.2	4.2	4.2
21	4.1			5.0	5.1	3.3	4.5	30	12.8	4.2	4.3	4.3
22	4.1			3.8	5.1	3.5	5.5	27	10.6	5.1	6.0	4.4
23	3.0			5.0	5.0	4.3	4.6	19.3	7.7	3.9	5.7	4.3
24	4.4	6.8		4.3	4.9	3.6	5.3	17.7	7.7	5.2	4.9	3.1
25	4.4			4.5	4.9	4.1	5.5	22	3.9	5.2	4.2	4.2
26	4.1			4.0	3.9	3.3	5.5	27	4.2	5.5	4.2	4.5
27	4.4			5.1	5.1	4.1	5.5	29	4.9	5.4	3.2	4.5
28	4.4			4.3	5.3	3.4	5.5	16.4	5.2	5.3	5.4	4.6
29	4.6			3.8	------	4.3	6.6	11.9	5.5	6.9	5.3	4.6
30	3.2			5.1	------	4.2	4.6	8.7	5.6	7.7	4.4	4.2
31	4.6	------		3.9	------	3.1	------	9.6	------	8.4	4.5	------

NOTE.—Braced figures indicate mean daily discharge for period computed from the kilowatt-hours output of power plant. Jan. 1 to Apr. 21 and June 25 to July 21 daily discharge computed from kilowatt-hours of power plant. Daily discharge of canal added to that of creek for period of canal operation to obtain total discharge Apr. 22 to June 24 and July 22 to Sept. 30. Stage-discharge relation affected by ice Nov. 18 to Apr. 21.

Monthly discharge of Big Creek near Polson, Mont., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	4.6	3.0	4.14	255
November	6.8	2.7	5.32	317
December			5.10	314
January	5.4	3.8	4.59	282
February	5.3	3.3	4.68	260
March	5.3	3.1	4.09	251
April	6.6	3.3	4.55	271
May	38	4.8	14.2	873
June	40	3.9	15.3	910
July	8.4	3.6	5.06	311
August	6.7	3.2	5.36	330
September	4.6	2.8	4.11	245
The year	40	2.7	6.38	4,620

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, Bonner County.

DRAINAGE AREA.—572 square miles.

RECORDS AVAILABLE.—June 18, 1911, to September 30, 1918; May 1, 1919, to September 30, 1922.

GAGE.—Stevens water-stage recorder on right bank 600 feet below outlet; installed November 24, 1914; inspected by J. K. Ward and F. S. Williamson. For history of previous gages see Water-Supply Paper 512.

DISCHARGE MEASUREMENTS.—Prior to September 17, 1913, made from a boat at outlet; after that date, 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 which cause backwater.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 5.3 feet on June 5–8 (discharge, 5,120 second-feet); minimum stage, from recorder, 0.44 foot for few hours on October 24 and 25 (discharge, 233 second-feet).

1911–1922: Maximum stage recorded from water-stage recorder, 6.83 feet at 1.30 p. m. May 30, 1917 (discharge, 7,290 second-feet); minimum stage, from recorder, 0.29 foot November 1 and 2, 1917 (discharge, 172 second-feet).

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 permanent; affected by logs May 6–21. Rating curve 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 mean daily gage height determined graphically from automatically made record. Records excellent except for periods represented by flat estimates of discharge.

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 year ending Sept. 30, 1922.

[Made by John McCombs.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 1	4.94	4,510
2	4.98	4,720

Daily discharge, in second-feet, of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	274	334	426	558	439	358	362	1,070	4,480	1,880	604	366
2	272	334	426	553	439	354	362	1,150	4,640	1,780	589	370
3	270	338	421	543	444	358	370	1,230	4,800	1,730	563	366
4	268	342	412	528	448	362	378	1,360	4,960	1,650	553	354
5	265	350	408	519	439	361	378	1,460	4,960	1,570	548	350
6	263	350	408	514	434	359	378		5,120	1,480	533	346
7	261	358	399	499	430	358	391		5,120	1,400	524	374
8	259	361	395	495	426	359	416		5,120	1,320	509	374
9	258	363	395	490	426	360	430		4,960	1,280	504	366
10	256	366	416	480	416	361	444	1,600	4,800	1,230	480	354
11	255	362	430	471	412	362	466		4,640	1,190	476	346
12	254	358	466	466	412	366	471		4,640	1,140	471	342
13	252	350	509	452	408	374	490		4,480	1,100	466	338
14	251	350	538	448	408	371	504		4,330	1,050	457	338
15	249	358	558	434	404	368	524		4,180	1,010	452	334
16	248	358	563	434	408	364	538		4,030	964	444	326
17	251	354	573	430	408	361	533		3,730	920	434	322
18	255	346	594	426	404	358	533	3,000	3,590	875	430	319
19	248	330	573	426	395	370	533		3,450	847	412	319
20	251	326	548	426	395	374	543		3,240	820	404	307
21	248	330	553	430	395	378	548		3,100	788	404	300
22	244	338	563	430	378	387	584	4,800	2,900	757	399	296
23	236	342	553	426	374	383	625	4,800	2,840	744	391	292
24	236	346	563	426	373	387	663	4,640	2,700	726	383	288
25	250	354	558	426	371	374	708	4,640	2,520	714	378	285
26	259	366	553	434	370	366	757	4,640	2,400	708	374	277
27	270	374	553	439	366	358	808	4,480	2,290	686	366	270
28	296	378	553	448	362	346	868	4,330	2,180	674	362	266
29	300	395	553	452	-------	350	974	4,330	2,030	657	358	259
30	311	416	553	448	-------	358	1,050	4,330	1,930	636	362	248
31	330	-------	543	444	-------	354	-------	4,330	-------	620	358	-------

NOTE.—Water-stage recorder not operating Oct. 2–15, Nov. 8, 9, Feb. 24–28, Mar. 1, 5, 6, 8–10, 14–17, July 4–17, Sept. 22 and 23; discharge determined from occasional staff gage readings or estimated by interpolation. Discharge for period May 6–21, during which stage-discharge relation was affected by logs determined from assumed gage-height graph and observer's notes.

Monthly discharge of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the year ending Sept. 30, 1922.

[Drainage area, 572 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	330	236	263	0.460	0.53	16,200
November	416	326	354	.619	.69	21,100
December	594	395	502	.878	1.01	30,900
January	558	426	464	.811	.94	28,500
February	448	362	407	.712	.74	22,600
March	387	346	364	.636	.73	22,400
April	1,050	362	554	.969	1.08	33,000
May	4,800	1,070	2,850	4.98	5.74	175,000
June	5,120	1,930	3,810	6.66	7.43	227,000
July	1,880	620	1,060	1.85	2.13	65,200
August	604	358	451	.788	.91	27,700
September	374	248	323	.565	.63	19,200
The year	5,120	236	951	1.66	22.56	689,000

SULLIVAN LAKE NEAR METALINE FALLS, WASH.

LOCATION.—About 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, Pend Oreille County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 16, 1912, to September 30, 1922.

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, 25.5 feet from June 23 to July 3; minimum stage recorded, 3.8 feet from May 4–6.

1912–1922: Maximum stage recorded, 26.6 feet June 17–20, 1916, and May 23, 1919; minimum stage recorded, 0.7 foot on April 9–10, 1920.

REGULATION.—Most of surplus flow of Sullivan Creek is diverted into 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 gage sills.

COOPERATION.—Gage-height record furnished by Inland Portland Cement Co.

Daily gage height, in feet, of Sullivan Lake near Metaline Falls, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	18.5	16.2	13.9	12.1	11.1	7.85	5.1	4.1	16.6	25.5	23.75	21.85
2	18.2	16.1	13.9	12.1	11.1	7.8	5.05	4.1	17.0	25.5	23.75	21.75
3	18.0	16.0	13.8	12.1	11.0	7.75	5.0	4.0	17.5	25.5	23.7	21.65
4	17.8	15.9	13.75	12.1	10.9	7.7	5.0	3.8	18.55	25.4	23.65	21.6
5	17.7	15.8	13.7	12.05	10.8	7.65	4.95	3.8	19.1	25.25	23.6	21.5
6	17.6	15.75	13.65	12.05	10.65	7.6	4.9	3.8	19.5	25.05	23.5	21.5
7	17.5	15.7	13.6	12.0	10.45	7.5	4.85	3.9	19.95	25.0	23.5	21.5
8	17.45	15.6	13.5	11.95	10.3	7.4	4.8	3.9	20.35	24.9	23.5	21.5
9	17.4	15.5	13.4	11.9	10.15	7.3	4.7	4.0	21.0	24.8	23.4	21.5
10	17.35	15.4	13.3	11.9	10.0	7.2	4.7	4.1	22.2	24.75	23.35	21.5
11	17.3	15.3	13.25	11.9	9.9	7.1	4.6	4.3	23.1	24.7	23.3	21.5
12	17.25	15.2	13.2	11.8	9.75	7.0	4.5	4.45	23.35	24.65	23.2	21.4
13	17.2	15.1	13.1	11.7	9.6	6.95	4.4	4.6	23.7	24.6	23.1	21.3
14	17.15	15.0	13.0	11.65	9.45	6.9	4.3	4.95	24.0	24.55	23.0	21.25
15	17.1	14.9	12.95	11.7	9.3	6.8	4.2	5.5	24.3	24.5	22.95	21.2
16	17.05	14.8	12.9	11.65	9.15	6.7	4.2	6.9	24.6	24.45	22.9	21.1
17	17.0	14.75	12.85	11.6	9.0	6.6	4.15	7.8	24.8	24.4	22.8	20.9
18	16.95	14.7	12.8	11.55	8.9	6.5	4.1	8.6	25.1	24.35	22.7	20.85
19	16.9	14.6	12.8	11.5	8.8	6.4	4.05	9.3	25.3	24.3	22.7	20.8
20	16.85	14.5	12.8	11.5	8.7	6.3	4.0	9.8	25.4	24.3	22.65	20.75
21	16.8	14.4	12.7	11.45	8.6	6.2	4.0	10.3	25.4	24.25	22.6	20.65
22	16.7	14.35	12.65	11.45	8.5	6.1	3.95	10.7	25.4	24.2	22.55	20.6
23	16.65	14.3	12.65	11.4	8.4	6.0	4.0	11.3	25.5	24.15	22.5	20.5
24	16.6	14.25	12.45	11.35	8.3	5.8	4.0	11.9	25.5	24.1	22.45	20.4
25	16.5	14.2	------	11.35	8.2	5.6	4.0	12.5	25.5	24.0	22.45	20.3
26	16.45	14.15	12.25	11.3	8.1	5.55	4.1	13.0	25.5	24.0	22.4	20.2
27	16.4	14.1	12.2	11.3	8.0	5.5	4.1	13.6	25.5	23.95	22.4	20.1
28	16.4	14.05	12.2	11.25	7.9	5.45	4.1	13.95	25.5	23.9	22.35	20.05
29	16.35	14.0	12.15	11.2	------	5.4	4.1	14.3	25.5	23.85	22.2	20.0
30	16.3	13.95	12.15	11.15	------	5.3	4.1	14.9	25.5	23.85	22.15	19.95
31	16.25	------	12.1	11.1	------	5.2	------	15.8	------	23.8	22.0	------

SULLIVAN CREEK NEAR METALINE FALLS, WASH.

LOCATION.—In sec. 30, T. 39 N., R. 44 E., one-eighth of a 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, 1922.

GAGE.—Inclined staff on left bank installed October 27, 1919; read by A. J. McDougall. Previous gages as follows: May 16, 1912, to September 20, 1917, vertical staff on right bank directly opposite present gage and at same datum; September 21, 1917, to May 17, 1919, vertical staff in four sections at site and datum of present gage. Temporary staff gage installed May 25, 1919, and read until October 26, 1919. Readings on temporary gage referred to datum of previous gage.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 40 feet below gage.

CHANNEL AND CONTROL.—Bed composed of cobblestones and coarse gravel; shifting. Banks high and not subject to overflow. Gradient steep. Stage of zero flow according to measurements made October 2, 1920, gage height —0. 3 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.82 feet at 7.30 a. m. June 4 (discharge, 850 second-feet); minimum stage recorded, 0.80 foot April 17–19 (discharge, 41 second-feet).

1912–1922: Maximum stage recorded, 4.2 feet June 2, 1913 (discharge, 1,650 second-feet); minimum stage recorded, that of April 17–19, 1922.

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

DIVERSION.—Water is diverted from Sullivan Creek about 1 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 permanent; not affected by ice. Rating curve fairly well defined up to 1,500 second-feet. Gage read to hundredths once daily. Surge makes it difficult to read gage accurately. Daily discharge ascertained by applying daily gage height to rating table. Records good.

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 year ending Sept. 30, 1922.

[Made by John McCombs.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 4	2.77	824
4	2.74	815

Daily discharge, in second-feet, of Sullivan Creek near Metaline Falls, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	77	82	89	75	75	382	85	80	632	213	96	94
2	75	75	89	75	75	382	89	92	724	213	92	92
3	75	75	78	75	75	434	89	96	786	213	92	92
4	75	78	78	75	75	434	89	126	850	170	92	92
5	75	78	78	75	75	434	89	131	850	134	92	92
6	75	78	78	75	74	434	89	113	850	145	92	96
7	75	78	78	75	72	434	87	109	698	139	75	102
8	75	78	90	75	84	382	87	104	662	139	61	96
9	75	78	90	75	96	382	84	102	572	139	61	96
10	75	78	92	75	94	434	84	96	602	126	84	92
11	75	78	92	75	94	434	82	96	488	126	96	92
12	75	78	98	75	92	92	78	106	488	121	98	87
13	75	78	102	72	92	92	75	113	488	118	102	84
14	75	78	96	72	92	92	75	145	434	118	96	80
15	75	78	92	72	92	92	75	177	434	118	87	80
16	78	92	92	72	92	92	75	244	461	118	87	75
17	78	89	89	72	92	92	41	332	332	118	87	77
18	77	84	89	68	92	92	41	544	286	118	87	75
19	78	84	78	68	92	92	41	662	286	111	84	74
20	78	84	78	68	92	90	61	693	286	109	84	74
21	78	84	75	68	92	89	92	461	286	109	84	82
22	78	84	75	68	286	89	92	382	278	109	84	92
23	78	84	75	68	286	89	94	357	278	109	84	92
24	78	89	75	68	382	89	94	357	273	109	80	92
25	78	89	75	68	382	89	96	382	252	109	80	92
26	78	89	75	68	382	89	100	434	273	109	80	92
27	78	89	78	68	382	89	102	488	266	109	80	92
28	82	89	78	68	382	89	126	488	244	102	80	92
29	82	89	78	75	-------	89	92	544	244	102	75	75
30	82	89	78	75	-------	85	84	544	236	98	87	92
31	82	-------	75	75	-------	85	-------	602	-------	96	90	-------

NOTE.—Gage not read Dec. 25; discharge interpolated.

Monthly discharge of Sullivan Creek near Metaline Falls, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	82	75	77.1	4,740
November	92	75	82.5	4,910
December	102	75	88.3	5,120
January	75	68	72.0	4,430
February	382	72	153	8,500
March	434	85	206	12,600
April	126	41	82.9	4,930
May	693	80	297	18,300
June	850	236	461	27,400
July	213	96	129	7,930
August	102	61	85.5	5,260
September	102	74	87.8	5,220
The year	850	41	151	109,000

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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 of a mile above mouth, and three-fourths of a mile northwest of Inchelium, 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, 1922.

GAGE.—Stevens water-stage recorder on right bank half a mile above highway bridge, since August 27, 1916; inspected by H. G. Parmeter. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable 15 feet downstream from gage or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders; shifts at extremely high stages. 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 recorded during year, from water-stage recorder, 3.62 feet at 3.30 p. m. May 18 (discharge, 531 second-feet). Minimum discharge not determined; probably occurred during period January to March while station was not in operation.

1912–1922: 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, when stage-discharge relation was affected by ice; discharge estimated at 4 second-feet.

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

DIVERSION.—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 period October 30 to April 6 while station was not in operation; not affected by ice during period of actual record. Rating curve fairly 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 mean daily gage height determined graphically from recorder graph. Records good except for periods when recorder was not operating.

Discharge measurements of Hall Creek at Inchelium, Wash., during the year ending Sept. 30, 1922

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 8	R. B. Kilgore	2.33	103	May 25	John McCombs	3.08	293
8	do	2.33	107	25	do	3.08	290

Daily discharge, in second-feet, of Hall Creek at Inchelium, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	22							260	228	52	22	19
2	22							303	225	48	21	20
3	22							320	215	45	20	18
4	21						70	306	207	43	21	16
5	20							310	200	42	21	17
6	20							313	190	39	21	20
7	20						96	316	177	39	20	21
8							107	316	168	38	20	21
9							97	293	165	37	19	19
10							94	269	152	36	18	18
11							93	255	140	35	18	17
12	20						85	252	131	33	22	16
13							80	266	120	32	25	16
14							77	296	110	32	24	16
15							72	342	105	29	27	16
		25	27	24	22	30						
16							69	379	99	28	27	15
17	20						67	450	93	27	23	15
18							67	498	88	27	20	15
19							70	482	85	26	19	15
20							88	420	82	26	19	15
21							136	379	77	25	19	15
22							207	358	76	25	18	15
23	25						241	323	73	25	18	15
24							230	303	69	25	17	15
25							233	290	65	24	17	15
26							249	278	63	25	16	15
27							269	263	59	26	16	15
28							263	252	58	25	16	15
29	29						258	244	55	23	15	16
30	30						246	235	54	22	15	16
31	30							233		22	16	

NOTE.—Water-stage recorder not operating Oct. 8 to Apr. 6. Discharge estimated after careful study of records of Nespelem River at Nespelem. Braced figures show mean discharge for periods indicated.

Monthly discharge of Hall Creek at Inchelium, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October			22.9	1,410
November			25	1,490
December			27	1,660
January			24	1,480
February			22	1,220
March			30	1,840
April	269		130	7,740
May	498	233	316	19,400
June	228	54	121	7,200
July	52	22	31.6	1,940
August	27	15	19.7	1,210
September	21	15	16.6	988
The year	498		65.8	47,600

NOTE.—Mean discharge October to March determined from comparison with records of Nespelem River at Nespelem, Wash.

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, 1922.

GAGE.—Vertical staff on right bank 15 feet downstream from bridge; read by E. J. Sparling and J. P. Collogan.

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, 1.76 feet at 6 p. m. May 19 (discharge, 126 second-feet). Minimum stage recorded, 0.20 foot October 4–8 and 20–22 (discharge, 1.6 second-feet). Discharge may have been lower during winter while records were temporarily discontinued.

1916–1922: Maximum stage recorded, 2.0 feet from 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, when creek was frozen almost solid.

ICE.—Stage-discharge relation affected by ice; observations discontinued during winter.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation not permanent; shifted during high water in May. 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 table. Records good October, November, and July to September; excellent April to June.

Discharge measurements of Stranger Creek at Meteor, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 7	R. B. Kilgore	0.64	15.6
7	——do	.64	16.1
May 26	John McCombs	1.50	94.4

Daily discharge, in second-feet, of Stranger Creek at Meteor, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.7	2.7						67	63	13	4.3	2.6
2	1.7	2.9						72	58	12	4.3	2.6
3	1.7	2.9						77	52	12	3.8	2.6
4	1.6	2.7					12	82	49	11	3.8	2.3
5	1.6	2.7						88	46	11	3.8	2.1
6	1.6	2.9						88	44	11	3.8	2.1
7	1.6	2.9					16	93	43	9.9	3.4	2.6
8	1.6	2.7					16	99	41	9.9	3.4	2.3
9	1.7	2.7					20	99	38	9.9	3.8	2.0
10	1.7	2.5					18	99	36	9.2	3.6	2.0
11	1.7	2.5					18	99	34	9.2	3.4	2.0
12	1.7	2.5					17	99	32	8.4	3.4	2.0
13	1.7	2.5					17	93	29	8.4	3.4	1.7
14	1.7	2.9					17	93	28	8.1	3.8	1.7
15	1.7	2.9			3		17	93	26	7.8	4.3	1.7
16	1.7	2.9	4	4		5	19	99	25	7.8	3.8	1.7
17	1.7	3.3					19	105	24	7.1	3.6	1.7
18	1.7	3.3					21	112	22	6.8	3.4	1.7
19	1.7	3.3					23	125	21	6.5	3.2	1.7
20	1.6	3.8					23	125	20	6.5	3.0	1.7
21	1.6	3.3					25	118	19	5.9	3.0	1.7
22	1.6	3.1					29	112	18	5.9	3.0	1.7
23	1.7	2.9					30	105	18	5.9	3.0	1.7
24	1.7	2.7					31	105	17	5.6	2.6	1.7
25	1.8	2.7					37	99	17	5.3	2.6	1.7
26	3.5	3.1					40	93	16	5.3	2.6	1.7
27	2.7						46	87	16	5.0	2.3	1.7
28	2.5	3					52	81	15	4.8	2.0	2.0
29	2.1				-------		57	81	14	4.8	2.0	2.0
30	2.3				-------		67	76	13	4.8	2.0	1.7
31	2.5	-------			-------		-------	67	-------	4.3	2.3	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated, determined from comparison with records of Nespelem River at Nespelem, Wash.

Monthly discharge of Stranger Creek at Meteor, Wash., for the year ending Sept. 30, 1922.

Month	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	3.5	1.6	1.85	114
November	----------	2.5	2.91	173
December	----------	----------	4	246
January	----------	----------	4	246
February	----------	----------	3	166
March	----------	----------	5	307
April	67	----------	24.9	1,480
May	125	67	94.5	5,810
June	63	13	29.8	1,770
July	13	4.3	7.84	482
August	4.3	2.0	3.25	200
September	2.6	1.7	1.95	116
The year	125	----------	15.4	11,100

NOTE.—Mean discharge from December to March determined from comparison with records of Nespelem River at Nespelem, Wash.

SPOKANE RIVER BASIN.

COEUR D'ALENE RIVER NEAR CATALDO, IDAHO.

LOCATION.—In sec. 26, T. 49 N., R. 1 E. Boise meridian, in Shoshone County, 1½ miles above Cataldo, Kootenai County, and 3 miles below junction of North and South forks.

DRAINAGE AREA.—1,220 square miles (measured by engineers of Washington Water Power Co. on map of Spokane River drainage basin compiled from best information available).

RECORDS AVAILABLE.—April 25, 1911, to December 31, 1912; July 29, 1920, to September 30, 1922.

GAGE.—Inclined staff on right bank, 1½ miles above Cataldo; installed August 4, 1921. Previous gages as follows: April 25, 1911, to December 31, 1912, vertical staff in two sections on right bank just below present site; July 29, 1920, to February 11, 1921, temporary vertical and inclined staff in two sections at site of present gage; February 12 to August 4, 1921, gage height obtained from reference points at same site and datum. Gages read by William Petznick. Elevation of gage datum about 2,100 feet above sea level.

DISCHARGE MEASUREMENTS.—Made from cable about 50 feet above gage or by wading.

CHANNEL AND CONTROL.—Channel straight for 500 feet above and 1,500 feet below gage. Left bank high and wooded; not subject to overflow. Right bank subject to overflow at gage height about 50 feet. Low-water control is boulder and gravel riffle about 1,500 feet below gage; high-water control not well defined but is probably long stretch of river channel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 47.7 feet on December 13 (discharge, 18,100 second-feet); minimum stage recorded, 37.4 feet October 11, November 21, 22, September 16–19, and 21–28 (discharge, 315 second-feet).

1911–1912 and 1920–1922: Maximum stage recorded, 49.0 feet on March 18, 1921 (discharge, 22,000 second-feet); minimum stage recorded, 2.0 feet (original gage), October 24, 26, October 29 to November 3, and November 11–12, 1911 (discharge, 300 second-feet).

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

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice January 17–23, January 30 to February 6, and February 23–26, and by backwater from Coeur d'Alene Lake May 3–31. Rating curve fairly well defined below 15,000 second-feet. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Shifting-control method used May 3–31. Records good except for extremely high water and for periods of shifting control.

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

Discharge measurements of Coeur d'Alene River near Cataldo, Idaho, during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 14	E. H. Collins	44.50	9,270	May 26	E. H. Collins	43.68	7,220
Feb. 13	John McCombs	37.87	513	June 7	John McCombs	41.94	4,130
Apr. 26	Collins and Godfrey	43.68	7,320	8	do	41.66	3,730
May 6	E. H. Collins	45.90	12,700	16	do	40.15	2,000
21	McCombs and Ford	44.82	9,110	Aug. 3	J. L. Ford	37.74	460
22	do	44.25	8,040	Sept. 21	Parker and Collins	37.40	306

...ge, in second-feet, of Coeur d'Alene River near Cataldo, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	355	465	4,510	850		490	1,580	6,800	6,000	1,030	490	418
2	355	465	4,200	850		465	1,900	10,200	6,200	970	490	418
3	335	395	2,470	910		465	2,670	9,980	6,200	910	490	418
4	355	395	1,820	790	480	465	5,810	10,800	5,810	910	465	418
5	335	395	1,360	790		440	4,860	14,400	5,240	850	465	418
6	355	395	1,290	790		440	4,050	12,700	4,640	850	465	418
7	335	395	1,090	790	515	440	4,680	10,800	4,050	790	465	440
8	335	375	970	790	515	440	9,720	9,980	3,770	850	440	418
9	335	395	910	790	565	440	7,640	8,510	3,370	850	440	418
10	335	395	850	790	540	440	5,240	7,010	3,000	910	440	418
11	315	395	2,570	690	565	490	4,200	6,600	2,890	850	440	418
12	335	395	13,200	590	540	515	3,370	6,600	2,670	790	440	395
13	335	355	18,100	540	515	490	2,890	7,010	2,470	790	565	375
14	335	375	9,220	490	490	490	2,670	7,850	2,470	740	540	355
15	375	395	6,400	515	490	515	2,270	11,300	2,170	740	490	335
16	355	418	3,770	515	515	565	2,270	13,500	2,080	690	440	315
17	375	418	3,120		515	640	2,080	17,000	1,990	690	440	315
18	418	395	2,570		565	790	2,080	17,600	1,820	690	418	315
19	395	395	1,900		515	910	2,270	14,400	1,740	690	440	315
20	465	355	1,660	500	490	1,030	2,470	11,000	1,740	690	440	335
21	640	315	1,430		465	1,150	3,910	8,980	1,580	640	418	315
22	565	315	1,220		440	1,660	7,430	7,850	1,580	640	418	315
23	465	490	1,360			1,820	9,220	7,220	1,430	615	395	315
24	440	540	1,290	615		1,660	7,640	7,010	1,430	590	395	315
25	440	590	1,290	615	450	1,430	7,010	7,850	1,430	565	375	315
26	440	640	1,150	615		1,220	7,430	7,430	1,290	565	375	315
27	490	740	1,090	615	465	1,150	8,290	5,810	1,220	565	355	315
28	540	970	1,090	615	490	1,150	8,290	5,050	1,150	540	335	315
29	540	970	1,090	615	-------	1,090	7,220	4,860	1,090	540	335	335
30	515	1,090	1,030	590	-------	1,150	6,400	4,680	1,090	515	375	335
31	490	-------	850	440	-------	1,290	-------	5,240	-------	515	375	-------

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

Monthly discharge of Coeur d'Alene River near Cataldo, Idaho, for the year ending Sept. 30, 1922.

[Drainage area, 1,220 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	640	315	410	0.336	0.39	25,200
November	1,090	315	488	.400	.45	29,000
December	18,100	850	3,060	2.51	2.89	188,000
January	910	----------	635	.520	.60	39,000
February	565	----------	496	.407	.42	27,500
March	1,820	440	830	.680	.78	51,000
April	9,720	1,580	4,920	4.03	4.50	293,000
May	17,600	4,680	9,230	7.57	8.73	568,000
June	6,200	1,090	2,790	2.29	2.56	166,000
July	1,030	515	728	.597	.69	44,800
August	565	335	434	.356	.41	26,700
September	440	315	362	.297	.33	21,500
The year	18,100	315	2,040	1.67	22.75	1,480,000

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 of Spokane River drainage basin compiled from best available sources).

RECORDS AVAILABLE.—February 11, 1905, to September 30, 1922; April 25, 1903, to February 11, 1905, at St. Joe Boom Co.'s gage at mouth of St. Joe River.

GAGE.—Stevens continuous water-stage recorder at wharf; inspected by employees of Washington Water Power Co. Prior to March 24, 1921, gage was vertical staff at same site; read by Henry Kloppenburg. Gage datum, is 2,100 feet above mean sea level.

EXTREMES OF STAGE.—Maximum stage estimated at 31.9 feet on May 21–23, when recorder was not operating; minimum stage, from recorder, 21.52 feet on March 15 and 16.

1903–1922: 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.—Except for a very few days gage heights have been determined by inspection from gage-height graph. Records excellent.

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 year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	24.73	24.15	23.95	23.07	21.81	-------	23.15	28.20	30.08	26.42	26.16	25.50
2	24.68	24.13	24.33	22.94	21.80	-------	23.45	28.31	30.00	26.45	26.15	25.47
3	24.65	24.11	24.45	22.83	21.80	-------	23.91	28.57	30.00	26.46	26.13	25.42
4	24.60	24.09	24.40	22.73	21.81	21.61	24.61	28.83	29.96	26.48	26.12	25.41
5	24.58	24.08	24.27	22.61	21.81	21.60	25.22	29.06	29.93	26.50	26.08	25.40
6	24.54	24.08	24.11	22.51	21.82	21.59	25.63	29.40	29.91	26.48	26.06	25.36
7	24.50	24.06	23.96	22.40	21.81	21.57	25.80	29.73	29.87	26.45	26.03	25.35
8	24.47	24.03	23.79	22.32	21.81	21.57	25.38	29.91	29.73	26.44	26.01	25.33
9	24.46	24.02	23.60	22.25	21.78	21.57	26.86	30.01	29.53	26.45	26.00	25.30
10	24.42	24.00	23.48	22.15	21.80	21.56	27.10	29.99	29.27	26.47	26.00	25.30
11	24.38	23.97	23.39	22.07	21.81	21.56	27.16	29.88	29.03	26.49	25.99	25.29
12	24.33	23.95	23.58	21.98	21.87	21.56	27.07	29.73	28.82	26.40	26.00	25.27
13	24.30	23.90	24.42	21.91	21.88	21.55	27.93	29.58	28.56	26.38	26.00	25.26
14	24.27	23.92	25.28	21.88	21.88	21.55	26.76	29.52	28.32	26.36	25.99	25.22
15	24.23	23.91	25.72	21.87	21.90	21.54	26.57	29.53	28.07	26.40	25.99	25.19
16	24.21	23.89	25.85	21.85	21.90	21.54	26.37	29.76	27.83	26.40	25.98	25.17
17	24.20	23.88	25.78	21.81	21.90	21.55	26.12	30.09	27.54	26.38	25.94	25.13
18	24.18	23.87	25.61	21.81	21.90	21.61	25.94	30.55	27.26	26.37	25.92	25.09
19	24.16	23.83	25.40	21.81	21.90	21.70	25.76	-------	26.98	26.38	25.92	25.07
20	24.19	23.76	25.15	21.80	21.90	21.85	25.63	-------	26.73	26.37	25.90	25.03
21	24.18	23.74	24.88	21.80	21.90	21.96	25.66	-------	26.50	26.36	25.85	24.99
22	24.17	23.77	24.64	21.78	-------	22.09	25.98	-------	26.30	26.32	25.81	24.95
23	24.16	23.74	24.49	21.77	-------	22.32	26.45	-------	26.13	26.30	25.78	24.89
24	24.15	23.73	24.31	21.78	-------	22.62	27.02	-------	26.15	26.28	25.73	24.83
25	24.12	23.77	24.13	21.81	-------	22.77	27.46	31.46	26.28	26.27	25.68	24.81
26	24.14	23.72	23.96	21.82	-------	22.80	27.61	31.36	26.40	26.25	25.65	24.78
27	24.14	23.70	23.76	21.80	-------	22.82	27.64	31.31	26.41	26.24	25.62	24.77
28	24.17	23.67	23.61	21.83	-------	22.81	27.84	31.10	26.38	26.22	25.59	24.74
29	24.15	23.67	23.47	21.86	-------	22.81	28.03	30.80	26.36	26.22	25.54	24.70
30	24.16	23.72	23.29	21.86	-------	22.81	28.13	30.52	26.38	26.19	25.53	24.67
31	24.17	-------	23.22	21.84	-------	22.88	-------	30.27	-------	26.18	25.51	-------

NOTE.—No record Feb. 22 to Mar. 3 and May 19–24.

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 of a 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 (measured by engineers of Washington Water Power Co., on map of Spokane River drainage basin to scale of one-half inch to the mile, compiled from best sources available).

RECORDS AVAILABLE.—January 1, 1913, to September 30, 1922.

GAGE.—Stevens water-stage recorder on right bank since Nov. 22, 1920; inspected by employees of Washington Water Power Co. Previous gage vertical staff in three sections on left bank. Elevation of zero of gage, 2,000 feet above sea level.

DISCHARGE MEASUREMENTS.—Made from cable 600 feet above gage.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and boulders; shifts during floods. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 74.1 feet on May 22–23 (discharge, 24,900 second-feet); minimum stage, from recorder, 65.15 feet at 11 a. m. September 5 (discharge, 578 second-feet).

1911–1922: Maximum stage recorded, 79.20 feet at 7.30 a. m. May 18, 1917 (discharge, 39,800 second-feet); minimum stage recorded that of September 5, 1922.

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

DIVERSION.—Spokane Valley Land & Water Co.'s canal diverts water above gage for irrigation. Mean diversion during 1922, 60 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.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined; revised December 5. Operation of water-stage recorder satisfactory except as stated in footnote to table of daily discharge. Daily discharge for a few days in October, most of November, and the first 4 days of December ascertained by use of discharge integrator, otherwise by applying to rating table mean daily gage height determined by inspection from gage-height graph. Records good for October and November; excellent thereafter.

COOPERATION.—Gage-height record and some discharge measurements furnished by the Washington Water Power Co.

Discharge measurements of Spokane River at Post Falls, Idaho, during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 7	John McCombs	66.39	1,100	May 23	McCombs and Collins	74.06	24,300
Mar. 7	E. H. Collins	66.70	1,450	Sept. 23	Collins and Parker	66.24	1,030

Daily discharge, in second-feet, of Spokane River at Post Falls, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,050		5,280	4,550		1,380	4,550	14,100	18,800	1,440	980	1,010
2	1,050	1,100	6,360	4,320		1,380	5,140	14,500	18,300	1,780	955	980
3	1,060		6,590	4,100	1,200	1,440	5,860	14,900	18,300	1,540	955	955
4	1,050	1,170	6,510	3,890		1,380	6,970	15,700	18,300	1,540	980	955
5	1,060	1,120	6,220	3,790		1,380	8,000	16,100	18,300	1,780	980	930
6	1,120	1,120	5,980	3,590	1,190	1,380	8,820	17,400	18,300	1,920	955	955
7	1,150	1,120	5,740	3,590	1,110	1,380	9,410	18,300	18,300	1,780	930	955
8	1,160	1,120	5,380	3,490	1,190	1,440	10,400	18,300	17,400	1,150	908	930
9	1,150	1,110	5,140	3,330	1,110	1,380	14,100	18,800	17,400	1,040	930	930
10	1,160	1,320	5,020	3,120	1,110	1,380	11,800	18,800	16,500	1,400	980	930
11	1,140	1,290	4,780	2,940	1,150	1,440	12,200	18,300	16,100	4,080	1,010	930
12	1,140	1,220	5,020	2,520	1,190	1,440	11,800	18,300	15,700	2,180	1,010	908
13		1,250	6,220	1,490	1,080	1,380	11,800	17,800	14,900	1,240	1,010	908
14		1,210	7,480	1,240	1,110	1,440	11,400	17,400	14,100	1,080	1,010	955
15		1,240	8,540	1,280	1,240	1,380	10,700	17,400	13,700	1,040	980	955
16	1,150	1,280	8,820	1,330	1,190	1,380	10,400	17,800	12,900	980	1,010	955
17		1,250	8,820	1,330	1,240	1,380	10,000	18,800	12,500	1,040	980	980
18		1,320	8,540		1,380	1,380	9,720	20,200	11,800	980	980	1,010
19		1,410	8,270		1,440	1,600	9,110	22,300	11,100	1,010	1,010	1,010
20		1,290	7,740	1,400	1,440	2,200	9,110	23,800	10,700	980	1,010	1,010
21	1,220	1,350	7,480		1,280	2,940	9,110	24,300	10,000	1,040	1,010	1,040
22	1,220	1,460	6,970		1,330	3,030	9,410	24,900	8,270	955	1,010	1,010
23	1,220	1,350	6,970	1,490	1,380	3,490	10,400	24,300	4,760	1,010	1,010	1,010
24	1,180	1,280	6,720	1,440	1,440	3,790	11,100	23,800	1,990	955	1,010	980
25	1,050	1,800	6,220	1,330	1,540	4,000	12,200	23,300	1,330	980	1,080	1,010
26	990	2,960	5,980	1,330	1,540	4,000	12,500	22,800	2,710	1,040	1,010	1,010
27	1,020	2,950	5,740	1,240	1,440	4,100	12,900	22,300	3,590	980	1,010	1,010
28		2,710	5,500	1,190	1,380	4,100	13,700	21,800	3,080	930	1,040	1,010
29	1,050	3,020	5,260	1,240	-------	4,100	13,700	21,300	2,680	955	1,010	980
30		3,380	5,020	1,280	-------	4,100	14,100	20,200	1,720	980	1,010	980
31	1,020	-------	4,780	1,280	-------	4,210	-------	19,200	-------	980	980	-------

NOTE.—Water-stage recorder not operating Oct. 13–20, 28–30, Nov. 1–3, 6, 7, Jan. 18–22, and Feb. 1–5; discharge estimated from recorded range of stage and general information. Braced figures show mean discharge for periods indicated.

Monthly discharge of Spokane River and Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the year ending Sept. 30, 1922.

[Drainage area, 3,880 square miles.]

Month.	Discharge in second-feet.						Run-off (combined)	
	River.		River (mean).	Canal (mean).	Combined.			
	Maximum.	Minimum.			Mean.	Per square mile.	Inches.	Acre-feet.
October	-------	990	1,110	39.3	1,150	-------	-------	70,700
November	3,380	-------	1,550	20.2	1,570	-------	-------	93,400
December	8,820	4,780	6,420	13.2	6,430	-------	-------	395,000
January	4,550	1,190	2,220	.0	2,220	-------	-------	136,000
February	1,540	1,080	1,270	.0	1,270	-------	-------	70,500
March	4,210	1,380	2,280	.0	2,280	-------	-------	140,000
April	14,100	4,550	10,300	24.4	10,300	-------	-------	613,000
May	24,900	14,100	19,600	93.1	19,700	-------	-------	1,210,000
June	18,800	1,330	11,800	144	11,900	-------	-------	708,000
July	4,080	930	1,320	155	1,480	-------	-------	91,000
August	1,080	908	992	140	1,130	-------	-------	69,500
September	1,040	908	973	82.6	1,060	-------	-------	63,100
The year	24,900	908	5,010	59.7	5,060	1.30	17.65	3,660,000

NOTE.—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. 13, T. 25 N., R. 42 E., about opposite Cochrane Street, Spokane, Spokane County, one-fourth of a mile above high railroad viaduct, and 3 miles above Latah Creek.

DRAINAGE AREA.—4,350 square miles (revised; measured by engineers of Washington Water Power Co. on maps of Spokane River drainage basin, scale one-half inch to the mile, compiled from best available sources).

RECORDS AVAILABLE.—April 1, 1891, to September 30, 1922.

GAGE.—Stevens continuous water-stage recorder, on right bank set to mean sea-level datum, 1 mile below Monroe Street Bridge; installed May 9, 1921, and used since July 1, 1921. Approximate elevation of present gage datum 1,700 feet above sea level.

Gages previously used as follows: April 1, 1891, to October 24, 1896, vertical staff gage near head gates at Washington Water Power Co.'s dam above Spokane Falls, 1 mile above present site; zero of this gage at same elevation as crest of dam. October 25, 1896, to July 8, 1903, two wire gages at Oregon Railroad & Navigation Co.'s bridge, 2.9 miles above present site. July 9, 1903, to April 9, 1904, a wire gage on Olive Avenue Bridge, 2.7 miles above present site; set at different datum but to read same as previous gage. March 31, 1904, to March 1, 1907, a vertical staff at the Mission Street Bridge, 3.4 miles above present site. March 2, 1907, to July 23, 1911, combined inclined and vertical staff gage at Martha Street, 4 miles above present site. July 24, 1911, to July 30, 1915, several gages, set to mean sea-level datum, located 500 feet above Washington Water Power Co.'s steam plant, 3.8 miles above present site; Bristol water-stage recorder in operation for most of this period. July 31, 1915, to June 30, 1921, Stevens continuous water-stage recorder, set to mean sea-level datum, at same location near Washington Water Power Co.'s steam plant. At time of each relocation simultaneous readings were obtained between the old and new gages so that the relation of stage at the different sites was established.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. One channel at all stages. Control is well-defined riffle one-fourth of a mile below gage; should be permanent. Stage of zero flow estimated at gage height 14.5 feet on October 7, 1922.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 25.3 feet at 2.30 a. m. on May 22 (discharge, 26,300 second-feet); minimum stage from recorder, 17.37 feet at 12.45 p. m. August 13 (discharge, 1,060 second-feet).

1891–1922: Maximum stage recorded, 12.42 feet May 31, 1894 (discharge, 49,000 second-feet); minimum discharge, that of August 13, 1922.

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

DIVERSION.—Water is diverted above station for irrigation by Spokane Valley Land & Water Co.

REGULATION.—Flow partly regulated by storage in Coeur d'Alene Lake since July, 1906.

ACCURACY.—Stage-discharge relation at present site permanent. Rating curve well defined. Operation of water-stage recorder satisfactory. Daily discharge October 1 to June 21 ascertained by applying to rating table daily mean gage height determined from recorder graph by inspection; discharge integrator used June 22 to September 30. 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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 9	Collins and Ford	24.00	19,800	July 25	J. L. Ford	17.87	1,700
22	Collins and Godfrey	25.21	25,700	Aug. 25	Collins and Ford	17.78	1,540
June 29	McCombs and Collins	18.96	3,690	Sept. 27	James E. Stewart	17.72	1,580

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,680	1,640	4,330	5,020	1,920	1,870	4,580	14,700	20,500	2,640	1,700	1,540
2	1,700	1,740	6,100	4,800	2,000	1,800	5,020	15,000	20,100	2,700	1,600	1,590
3	1,700	1,740	6,480	4,690	2,000	1,880	5,490	15,400	20,100	2,680	1,520	1,500
4	1,700	1,860	6,480	4,470	2,000	1,900	6,610	16,200	20,100	2,460	1,550	1,520
5	1,720	1,880	6,350	4,360	1,920	1,920	7,730	16,500	19,600	2,660	1,620	1,530
6	1,770	1,810	6,220	4,160	1,780	1,820	8,610	17,800	19,600	2,840	1,520	1,570
7	1,770	1,750	5,980	4,160	1,740	2,080	9,230	18,700	19,600	2,780	1,570	1,520
8	1,720	1,750	5,730	4,050	1,750	1,930	10,200	19,100	19,100	2,440	1,480	1,530
9	1,770	1,740	5,370	3,850	1,840	1,900	11,200	19,600	18,700	2,090	1,470	1,570
10	1,710	1,860	5,260	3,750	1,710	1,930	12,200	19,600	18,200	1,760	1,520	1,450
11	1,780	2,000	5,140	3,650	1,710	1,930	12,200	19,600	17,400	3,580	1,590	1,510
12	1,930	1,860	5,140	3,460	1,700	1,930	12,200	19,100	16,900	3,700	1,570	1,460
13	1,930	1,820	5,980	3,570	1,740	1,920	12,200	18,700	16,200	2,170	1,620	1,440
14	1,930	1,780	7,440	2,240	1,670	1,930	11,900	18,700	15,800	2,020	1,580	1,510
15	1,930	1,820	8,610	2,160	1,750	1,930	11,600	18,700	15,000	1,960	1,520	1,520
16	1,930	1,840	8,920	2,160	1,800	1,930	11,200	18,700	14,700	1,880	1,570	1,520
17	1,930	1,860	8,610	2,160	1,770	1,840	10,500	19,600	14,000	1,870	1,540	1,500
18	1,870	1,880	8,920	2,160	1,860	1,920	10,200	21,000	13,300	1,840	1,520	1,550
19	1,810	2,000	8,610	2,240	1,930	1,930	9,870	23,000	12,600	1,860	1,520	1,560
20	1,930	2,000	8,020	2,240	1,930	2,400	9,550	24,600	11,900	1,740	1,540	1,600
21	1,900	1,920	7,730	2,160	1,880	2,820	9,550	25,200	11,200	1,850	1,510	1,620
22	1,930	2,000	7,440	2,160	1,810	3,180	9,870	25,700	10,100	1,740	1,550	1,600
23	1,930	2,000	7,160	2,160	1,880	3,460	10,900	25,700	7,640	1,740	1,600	1,650
24	1,860	1,930	7,020	2,160	1,880	3,850	11,600	25,200	4,090	1,740	1,580	1,570
25	1,720	1,810	6,610	2,080	2,080	4,050	12,600	24,600	3,250	1,710	1,630	1,530
26	1,770	3,000	6,350	2,000	1,740	4,160	12,900	24,100	3,300	1,780	1,610	1,520
27	1,860	3,180	6,100	1,930	2,000	4,160	13,300	23,600	4,660	1,680	1,590	1,560
28	1,870	3,090	5,850	1,900	1,870	4,260	14,000	23,600	4,500	1,670	1,550	1,540
29	1,780	3,270	5,610	1,930	------	4,160	14,300	22,500	3,760	1,620	1,540	1,520
30	1,670	3,460	5,490	2,000	------	4,160	14,700	21,500	3,220	1,600	1,570	1,500
31	1,670	------	5,260	2,000	------	4,360	------	21,000	------	1,700	1,560	------

Monthly discharge of Spokane River at Spokane, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 4,350 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1,930	1,670	1,810	------	------	111,000
November	3,460	1,640	2,080	------	------	124,000
December	8,920	4,330	6,590	------	------	405,000
January	5,020	1,900	2,930	------	------	180,000
February	2,080	1,670	1,840	------	------	102,000
March	4,360	1,800	2,620	------	------	161,000
April	14,700	4,580	10,500	------	------	625,000
May	25,700	14,700	20,500	------	------	1,260,000
June	20,500	3,220	13,300	------	------	791,000
July	3,700	1,600	2,150	------	------	132,000
August	1,700	1,470	1,560	------	------	95,900
September	1,650	1,440	1,540	------	------	91,600
The year	25,700	1,440	5,640	1.30	17.65	4,080,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not computed owing to regulation. The yearly figures represent the natural yield quite closely.

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, Lincoln County.

DRAINAGE AREA.—6,380 square miles (measured by engineers of Washington Water Power Co. on map of Spokane River drainage basin, to scale of one-half inch to the mile, compiled from best sources available).

RECORDS AVAILABLE.—November 5, 1912, to September 30, 1922.

GAGE.—Stevens continuous water-stage recorder on left bank; 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 recorded during year from water-stage recorder, 86.7 feet from 9 a. m. to 11 a. m. May 23 (discharge, 28,200 second-feet); minimum stage from water-stage recorder, 74.1 feet at 6.30 a. m. July 26 (discharge, 1,370 second-feet).

1912–1922: Maximum stage, from water-stage recorder, 90.32 feet at 8.30 p. m. May 18, 1917 (discharge, 41,300 second-feet). Minimum stage, that of July 26, 1922.

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

DIVERSIONS.—Water is diverted by the Spokane Valley Land & Water Co. for irrigation above 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 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, or by applying to rating table mean gage heights determined from graph by inspection or, during period of faulty record, by applying to rating table gage heights determined from curve of relation between station gage and tailrace gage at Little Falls power plant. Records excellent.

COOPERATION.—Gage-height record and part of discharge measurements furnished by Washington Water Power Co.

Discharge measurements of Spokane River below Little Falls, near Long Lake, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 26	E. H. Collins	75.72	2,520	June 28	McCombs and Collins	78.04	5,510
May 29	McCombs and Collins	85.77	24,400	Sept. 14	Parker and Collins	75.24	2,110

Daily discharge, in second-feet, of Spokane River below Little Falls, near Long Lake, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,440	2,440	6,160	4,710	2,830	2,450	10,400	17,400	21,300	3,500	2,430	2,150
2	2,080	2,440	6,840	6,690	2,440	2,390	8,350	17,700	20,600	3,060	2,320	2,230
3	2,400	2,570	7,640	6,240	2,730	2,270	10,500	17,100	20,000	3,620	2,250	1,860
4	2,500	2,460	7,160	4,660	2,100	3,130	13,200	18,800	20,900	3,080	2,200	2,000
5	2,520	2,400	7,180	4,640	2,180	3,030	12,200	20,000	21,600	3,880	2,190	2,720
6	2,560	2,020	7,190	4,770	2,630	2,860	12,600	19,700	21,300	3,060	1,920	2,180
7	2,540	2,400	6,260	4,590	2,380	2,460	12,600	22,900	20,600	3,310	2,060	2,120
8	2,560	2,500	6,360	3,990	2,270	2,640	12,600	21,600	21,300	3,710	2,210	2,170
9	2,190	2,600	5,610	4,440	2,460	2,640	14,900	22,900	20,300	2,340	2,230	2,160
10	2,530	2,360	5,220	4,680	2,660	2,770	17,000	21,900	18,800	3,010	2,220	1,980
11	2,440	2,280	4,950	4,110	2,410	2,730	16,100	21,600	18,800	2,740	2,140	2,420
12	2,630	2,440	6,000	3,700	1,980	2,530	17,600	21,600	18,700	4,950	2,200	2,290
13	2,260	2,100	6,250	2,900	2,480	2,880	15,100	20,900	17,200	2,860	1,900	2,160
14	2,530	2,700	7,580	2,960	2,400	2,400	14,900	20,000	16,700	2,650	2,290	2,170
15	2,260	2,460	9,790	2,330	2,310	2,650	14,300	20,900	14,900	2,660	2,590	2,120
16	1,940	2,720	11,200	2,980	2,240	2,900	14,400	20,000	15,200	2,240	2,140	2,320
17	2,530	2,540	9,380	2,860	2,350	3,290	13,800	20,900	15,300	2,440	2,630	2,000
18	2,460	2,670	9,030	2,670	2,210	2,920	13,000	22,900	13,200	2,460	2,190	2,140
19	2,480	2,610	9,450	2,540	2,280	3,460	12,400	23,800	14,200	2,570	2,330	2,180
20	2,610	2,040	8,040	2,540	2,560	5,820	11,500	26,200	13,000	2,430	1,980	2,200
21	2,470	2,670	7,540	2,530	2,680	4,880	11,800	26,200	12,000	2,360	2,420	2,280
22	2,560	2,350	7,970	2,170	2,470	9,380	12,000	26,900	10,700	2,520	2,350	2,200
23	2,000	2,550	8,510	2,500	2,590	8,060	13,000	27,900	8,960	2,110	2,350	2,430
24	2,560	2,240	8,570	2,610	2,690	6,940	14,200	26,900	5,820	2,090	2,290	1,950
25	2,570	3,160	8,050	2,500	2,390	6,520	14,500	25,900	2,900	2,510	2,340	2,160
26	2,650	3,780	7,070	2,490	2,030	6,140	15,100	25,900	1,890	2,180	2,370	2,220
27	2,530	3,280	6,990	2,550	2,530	5,960	15,400	25,200	2,710	2,400	2,040	2,390
28	2,440	4,170	7,000	2,760	2,480	6,330	15,800	24,200	5,310	2,190	2,330	2,270
29	2,400	4,120	5,330	2,290	-------	6,160	17,100	24,800	4,280	2,390	2,440	2,160
30	2,180	3,760	4,460	2,830	-------	5,710	16,200	23,500	4,480	2,120	2,230	2,460
31	2,440	-------	4,530	2,730	-------	7,220	-------	21,900	-------	2,330	2,340	-------

NOTE.—Gage-height record Oct. 10-17, lost in mail; recorder not operating Oct. 31 to Nov. 2. Discharge determined from curve of relation between station gage and tailrace gage at Little Falls power plant.

Monthly discharge of Spokane River below Little Falls, near Long Lake, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 6,380 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	2,650	1,940	2,430	----------	----------	149,000
November	4,170	2,020	2,690	----------	----------	160,000
December	11,200	4,460	7,200	----------	----------	443,000
January	6,690	2,170	3,450	----------	----------	212,000
February	2,830	1,980	2,420	----------	----------	134,000
March	9,380	2,270	4,240	----------	----------	261,000
April	17,600	8,350	13,800	----------	----------	821,000
May	27,900	17,100	22,500	----------	----------	1,380,000
June	21,600	1,890	14,100	----------	----------	839,000
July	4,950	2,090	2,770	----------	----------	170,000
August	2,630	1,900	2,260	----------	----------	139,000
September	2,720	1,860	2,200	----------	----------	131,000
The year	27,900	1,860	6,690	1.05	14.25	4,840,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not compnted, owing to regulation. The yearly figures represent the natural yield quite closely.

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, Shoshone County, 5 miles below Marble Creek, and 11 miles east of St. Joe.

DRAINAGE AREA.—1,080 square miles (measured by engineers of Washington Water Power Co. on map of Spokane River drainage basin compiled from all sources available).

RECORDS AVAILABLE.—July 13, 1920, to September 30, 1922; April 14, 1911, to September 30, 1912, at station about 2½ miles downstream.

GAGE.—Stevens continuous water-stage recorder on right bank at ferry landing at Calder; installed December 22, 1920; inspected by C. P. Latham. Gage at former station April, 1911, to September 30, 1912, was vertical staff on right bank 2½ miles below present site; July 13 to December 21, 1920, vertical staff gage at practically same site and datum as present gage. Present gage datum is about 2,100 feet above sea level.

DISCHARGE MEASUREMENTS.—Made from cable 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 year, from water-stage recorder, 87.8 feet at 7 a. m. May 18 (discharge, 17,600 second-feet); minimum stage recorded from recorder, 79.00 feet at 2 a. m. November 20 (discharge, 280 second-feet); discharge may have been lower during winter when stage-discharge relation was affected by ice.

1911–1912; 1920–1922: Maximum and minimum stages occurred during climatic year 1922.

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. Water released at regular intervals during driving season. Operation of dam causes diurnal fluctuation at gage of about 1 foot. Duration of effect about 4 hours.

ACCURACY.—Stage-discharge relation changed May 18; affected by ice December 21–25 and January 5 to March 20 and by logs August 11 to September 30. Rating curves fairly well defined below 800 second-feet; well defined above. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspection from gage-height graph corrected to agree with staff-gage readings. Records good above 800 second-feet; otherwise fair except for periods of ice and log effect.

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, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 2	E. H. Collins	81.78	2,500	May 19	McCombs and Ford	86.98	14,900
Jan. 11	do	[a] 80.02	663	June 9	John McCombs	84.62	7,660
Feb. 8	John McCombs	[a] 80.00	543	27	McCombs and Collins	81.81	2,260
Apr. 25	Collins and Godfrey	83.13	4,730	Aug. 2	J. L. Ford	80.04	724
May 5	E. H. Collins	85.39	10,400	Sept. 20	Parker and Collins	[b] 79.44	352
18	McCombs and Ford	87.42	16,400	26	Ford and Fisken	[b] 79.43	351

[a] Stage-discharge relation affected by ice. [b] Stage-discharge relation affected by logs.

Daily discharge, in second-feet, of St. Joe River at Calder, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	450	470	4,900	900			1,360	6,220	9,900	1,940	780	430
2	430	470	2,840	760			1,690	7,720	10,800	1,840	750	450
3	470	450	1,580	670			2,560	6,940	11,100	1,740	720	390
4	450	470	1,020	615			3,620	8,260	11,400	1,740	720	430
5	450	450	865		430	520	2,560	10,500	11,700	1,640	750	410
6	450	470	830				2,560	8,820	11,100	1,640	690	450
7	430	490	795				3,300	8,820	9,600	1,440	665	540
8	430	470	670				4,500	7,980	8,400	1,350	640	640
9	470	470	615	580			3,460	6,460	7,840	1,350	665	490
10	430	450	795				2,560	5,980	7,040	1,440	615	410
11	430	450	1,580				2,170	5,980	6,540	1,440	640	430
12	430	450	8,260				1,810	6,460	6,300	1,270	720	430
13	430	470	9,380				1,580	7,200	6,060	1,270	750	430
14	470	470	5,100		520		1,580	8,540	5,620	1,270	665	355
15	470	470	3,460			650	1,360	10,500	5,200	1,190	615	390
16	490	430	2,560				1,280	12,600	5,000	1,110	590	340
17	515	490	2,170				1,360	15,900	4,600	1,110	565	370
18	590	430	1,930	350			1,360	16,600	4,220	1,030	565	340
19	470	370	1,360				1,360	14,900	3,860	990	590	340
20	470	310	1,120				2,050	12,700	3,700	990	565	340
21	730	370				900	3,790	11,400	3,380	950	515	355
22	470	470				1,360	5,760	10,200	3,220	915	515	355
23	470	830	1,020			1,260	4,900	9,600	2,900	880	565	370
24	430	640			410	1,020	4,700	10,200	2,760	845	470	355
25	430	730				830	4,900	11,700	2,500	880	450	370
26	450	760	940			700	5,320	10,800	2,380	915	430	355
27	515	760	1,020	400		670	6,220	8,700	2,260	845	430	390
28	565	900	865			640	5,320	7,560	2,150	845	430	370
29	590	730	760		-------	640	4,700	7,040	2,040	845	450	370
30	470	1,580	730		-------	700	5,320	7,840	2,040	780	470	340
31	515	-------	730		-------	940	-------	8,700	--------	750	490	-------

NOTE.—Braced figures show mean discharge estimated for periods when stage-discharge relation was affected by ice.

Monthly discharge of St. Joe River at Calder, Idaho, for the year ending Sept. 30, 1922.

[Drainage area, 1,080 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum	Mean.	Per square mile.	Inches.	Acre-feet.
October	730	430	479	0.444	0.51	29,500
November	1,580	310	559	.518	.58	33,300
December	9,380	615	2,000	1.85	2.13	123,000
January	900	----------	481	.445	.51	29,600
February	----------	----------	456	.422	.44	25,300
March	1,360	----------	689	.638	.74	42,400
April	6,220	1,260	3,170	2.94	3.28	189,000
May	16,600	5,980	9,450	8.75	10.09	581,000
June	11,700	2,040	5,850	5.42	6.05	348,000
July	1,940	750	1,200	1.11	1.28	73,800
August	780	430	596	.552	.64	36,600
September	640	340	401	.371	.41	23,900
The year	16,600	----------	2,120	1.96	26.66	1,540,000

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.—420 square miles (measured by engineers Washington Water Power Co. on map of Spokane River drainage basin compiled from all available sources).

RECORDS AVAILABLE.—July 9, 1911, to October 31, 1912, and July 15, 1920, to September 30, 1922.

GAGE.—Vertical and inclined staffs 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 at railway station.

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 year, 62.6 feet on April 22 and May 5 (discharge, 2,780 second-feet); minimum discharge occurred during winter when stage-discharge relation was affected by ice and logs; certainly less than 40 second-feet.

1911–1912; 1920–1922: Maximum stage recorded, 66.5 feet at 6 a. m. March 18, 1921 (discharge, 8,660 second-feet); minimum discharge probably occurred during winter 1921–22.

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

ACCURACY.—Stage-discharge relation changed December 1; affected by ice and logs November 18, 19, 21–24, 26, 27, December 18 to April 2; affected by logs on control June 15 to September 30. Rating curve used prior to December 1, poorly defined; that used after December 1 fairly well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records fair October and November; good April to June; otherwise poor.

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, 1922.

Date.	Made by—	Gage height.	Discharge.	Date	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 3	E. H. Collins	2,160.42	596	May 20	McCombs and Ford	61.87	1,990
13	do	61.02	1,190	June 26	McCombs and Collins	[b] 60.20	175
Jan. 13	Collins and Dodson	[a] 60.88	72.0	Aug. 1	Collins and Ford	[b] 60.07	65.3
Feb. 11	John McCombs	[a] 62.15	51.7	1	Ford and Collins	[b] 60.07	70.5
Apr. 24	E. H. Collins	62.20	2,240	Sept. 19	Collins and Parker	[b] 59.95	43.6
May 4	do	62.52	2,780	28	Ford and Fisken	[b] 60.11	60.1
17	McCombs and Ford	62.12	2,350				

[a] Stage-discharge relation affected by ice and logs.
[b] Stage-discharge relation affected by logs.

Daily discharge, in second-feet, of St. Maries River at Lotus, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	212	324	2,120				1,720	2,330	1,120			
2	212	301	1,420				2,120	2,330	1,120			
3	208	292	645				2,330	2,330	1,120			
4	208	292	388				2,440	2,660	1,020			
5	212	301	265	150	50		2,120	2,780	1,020			
6	212	346	335				2,120	2,550	975			
7	208	301	265				2,120	2,330	885			
8	205	301	152			50	2,660	2,120	840	110	95	70
9	205	288	145				2,120	1,920	840			
10	212	275	202				1,520	1,720	800			
11	212	266	274				1,420	1,520	680			
12	212	266	840				1,220	1,420	610			
13	220	279	1,170				1,070	1,420	575			
14	224	301	840				975	1,520	540			
15	241	324	610	60	55		800	1,720				
16	283	346	415				760	1,920				
17	275	346	310				760	2,220				
18	283	290					840	2,330				
19	346	260					975	2,330				
20	324	266					1,520	2,020				
21	346						2,330	1,720				
22	369	420					2,780	1,520	275			
23	324						2,550	1,520				45
24	292					90	2,330	1,420		85	65	
25	275	590	170		55		2,120	1,420				
26	292	680		40			2,330	1,320				
27	346	780					2,330	1,220				
28	416	490					2,120	1,170				
29	465	346			-------		1,920	1,120				
30	392	620			-------		2,020	1,070				
31	346	-------			-------		-------	1,070	-------			-------

NOTE.—Braced figures show mean discharge for periods indicated.

Monthly discharge of St. Maries River at Lotus, Idaho, for the year ending Sept 30, 1922.

[Drainage area, 420 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	465	205	277	0.660	0.76	17,000
November	780	260	372	.886	.99	22,100
December	2,120	----------	412	.981	1.13	25,300
January	----------	----------	81.9	.195	.22	5,040
February	----------	----------	53.2	.127	.13	2,950
March	----------	----------	70.6	.168	.19	4,340
April	2,780	760	1,810	4.31	4.81	108,000
May	2,780	1,070	1,810	4.31	4.97	111,000
June	1,120	----------	552	1.31	1.46	32,800
July	----------	----------	97.1	.231	.27	5,970
August	----------	----------	79.5	.189	.22	4,890
September	----------	----------	57.5	.137	.15	3,420
The year	2,780	----------	474	1.13	15.30	343,000

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, 1920, to September 30, 1922.

GAGE.—Vertical staff in two sections fastened to rock and to rock-crib foundation of boathouse 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. Gage read by Sigurd Berven and C. Humphrey.

EXTREMES OF STAGE—Maximum stage recorded during year, 6.75 feet on May 27; minimum stage recorded, 1.32 feet September 30.

1920–1922: Maximum stage recorded, 10.06 feet from April 30 to May 18, 1921; minimum stage recorded, 0.40 foot November 13–15, 1920.

ICE.—No ice during period of record.

DIVERSION.—Water pumped from lake for irrigation and domestic purposes.

REGULATION.—None.

ACCURACY.—Gage read once daily to hundredths.

Daily gage height, in feet, of Hayden Lake at Hayden Lake, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	-------	2.75	2.48	2.78	2.74	1.92	2.08	5.25	6.60	5.37	3.60	2.18
2	3.35	2.72	2.50	2.78	2.72	1.90	2.14	5.30	6.57	5.34	3.55	2.14
3	3.35	2.70	2.52	2.79	2.60	1.90	2.24	5.45	6.53	5.30	3.51	2.10
4	3.32	2.68	2.54	2.79	2.58	1.88	2.34	5.60	6.49	5.24	3.46	2.06
5	3.28	2.66	2.56	2.79	2.58	1.88	2.42	5.70	6.45	5.18	3.40	2.02
6	3.24	2.64	2.58	2.80	2.56	1.86	2.58	5.80	6.43	5.12	3.35	2.00
7	3.20	2.62	2.60	2.80	2.56	1.86	2.82	5.90	6.41	5.05	3.30	1.96
8	3.17	2.60	2.64	2.80	2.54	1.84	3.08	6.05	6.39	5.00	3.28	1.92
9	3.17	2.58	2.68	2.80	2.52	1.84	3.25	6.10	6.37	4.95	3.18	1.88
10	3.16	2.56	2.70	2.80	2.52	1.82	3.40	6.20	6.35	4.90	3.12	1.84
11	3.14	2.54	2.70	2.80	2.50	1.82	3.55	6.20	6.33	4.85	3.08	1.82
12	3.12	2.52	2.70	2.80	-------	1.80	3.62	6.20	6.30	4.80	3.06	1.78
13	3.10	2.51	2.70	2.80	-------	1.80	3.73	6.23	6.25	4.74	3.04	1.76
14	3.08	2.49	2.72	2.80	1.92	1.78	3.76	6.27	6.20	4.65	3.00	1.74
15	3.06	2.48	2.72	2.80	1.92	1.78	3.80	6.30	6.15	4.60	2.96	1.72
16	3.04	2.46	2.72	2.80	1.92	1.76	3.82	6.35	6.10	4.55	2.92	1.68
17	3.02	2.47	2.73	2.80	1.92	1.76	3.84	6.40	6.05	4.49	2.88	1.64
18	3.00	2.45	2.73	2.80	1.92	1.74	3.86	6.45	6.00	4.44	2.84	1.62
19	2.99	2.44	2.73	2.80	1.92	1.74	3.88	6.50	5.95	4.39	2.80	1.60
20	2.98	2.44	2.74	2.80	1.92	1.76	3.91	6.55	5.90	4.33	2.74	1.56
21	2.96	2.44	2.74	2.80	1.92	1.78	3.94	6.57	5.86	4.27	2.70	1.54
22	2.95	2.44	2.75	2.80	1.92	1.82	4.10	6.59	5.82	4.20	2.65	1.50
23	2.93	2.43	2.75	2.80	1.92	1.86	4.25	6.61	5.78	4.14	2.58	1.48
24	2.91	2.43	2.76	2.80	1.92	1.90	4.45	6.63	5.75	4.02	2.52	1.46
25	2.89	2.43	2.76	2.80	1.92	1.94	4.60	6.65	5.70	3.96	2.46	1.42
26	2.87	2.42	2.76	2.80	1.92	1.96	4.75	6.68	5.65	3.91	2.40	1.40
27	2.85	2.42	2.77	2.80	1.92	1.98	4.85	6.70	5.55	3.86	2.35	1.38
28	2.83	2.42	2.77	2.80	1.92	2.00	4.98	6.72	5.50	3.80	2.30	1.37
29	2.81	2.44	2.77	2.78	-------	2.02	5.10	6.75	5.45	3.75	2.26	1.35
30	2.79	2.46	2.78	2.76	-------	2.02	5.20	6.70	5.40	3.70	2.24	1.32
31	2.77	-------	2.78	2.75	-------	2.04	-------	6.63	-------	3.65	2.20	-------

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 head gages 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, 1922.

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 cross ties on top of flume or from footbridge across flume one-fourth of a 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 head gates of diversion ditches below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.2 feet July 2–21 (discharge, 157 second-feet); no water in canal December 18 to April 14.

1911–1917 and 1919–1922: Maximum stage recorded, 3.2 feet June 18–22, 1911 (discharge, 170 second-feet); no water in canal during periods in 1911, 1912, 1916, 1917, 1919, 1920, 1921, and 1922.

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

ACCURACY.—Stage-discharge relation changed during period of no flow and gradually July 1 to September 23; affected by backwater from aquatic growth October 1 to December 17, and July 1 to September 30.

Rating curve developed from a series of measurements made during a two-day period in 1920 and well defined within limits of use; has been used as standard form of curve for this station and curves parallel to this have been assumed to result from changes at control indicated by discharge measurements. Gage read to hundredths once daily, which is considered adequate for determination of mean daily gage height since two submerged orifices and wasteway above canal head gate are instrumental in causing gage height in canal to remain constant, even though the stage of the river is subject to considerable daily fluctuation. Daily discharge October to June and September 23–30 ascertained by applying daily gage height, corrected for backwater, to rating table; shifting-control method used July 1 to September 22, 1922. 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 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, during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 4	E. H. Collins	1.94	62.8	June 17	John McCombs	3.07	150
May 31	do	2.82	133	Sept. 23	Parker and Collins	1.74	47.4

Daily discharge, in second-feet, of Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Apr.	May.	June.	July.	Aug.	Sept.
1	81	19.6	29	-------	63	136	150	150	122
2	81	19.6	29	-------	69	136	157	143	122
3	81	19.6	29	-------	69	136	157	143	122
4	69	19.6	29	-------	69	136	157	143	122
5	81	19.6	29	-------	72	136	157	143	115
6	81	19.6	27	-------	72	136	157	143	115
7	81	19.6	27	-------	72	136	157	143	115
8	81	19.6	27	-------	72	136	157	143	115
9	81	19.6	27	-------	75	136	157	143	115
10	27	19.6	19.6	-------	75	136	157	143	108
11	27	19.6	19.6	-------	75	136	157	143	108
12	25	19.6	19.6	-------	75	143	157	143	108
13	25	19.6	19.6	-------	75	143	157	143	108
14	25	19.6	19.6	-------	81	150	157	143	108
15	25	19.6	19.6	25	81	150	157	143	69
16	25	19.6	19.6	25	87	150	157	143	69
17	25	19.6	19.6	25	87	150	157	143	69
18	23	19.6	-------	25	94	150	157	143	63
19	23	19.6	-------	29	94	150	157	143	63
20	23	19.6	-------	29	94	150	157	143	60
21	23	19.6	-------	52	101	150	157	143	50
22	23	19.6	-------	52	101	150	150	143	50
23	23	19.6	-------	52	108	150	150	143	50
24	23	19.6	-------	52	115	150	150	143	50
25	19.6	19.6	-------	57	122	150	150	143	50
26	19.6	19.6	-------	57	129	150	150	136	50
27	19.6	19.6	-------	63	129	150	150	129	47
28	19.6	19.6	-------	63	129	150	150	129	47
29	19.6	29	-------	63	129	150	150	129	44
30	19.6	29	-------	63	136	150	150	122	44
31	19.6	-------	-------	-------	136	-------	150	122	-------

NOTE.—Canal dry Dec. 18 to Apr. 14.

Monthly discharge of Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	81	19.6	39.3	2,420
November	29	19.6	20.2	1,200
December	29	0	13.2	812
April	63	0	24.4	1,450
May	136	63	93.1	5,720
June	150	136	144	8,570
July	157	150	155	9,530
August	150	122	140	8,610
September	122	44	82.6	4,920
The year	157	0	59.7	43,200

NOTE.—Canal dry Dec. 18 to Apr. 14.

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, 1922.

GAGE.—Vertical staff on left bank at gaging bridge; installed October 19, 1916; read by J. L. Davis. For description of previous gages see Water-Supply Paper 512.

DISCHARGE MEASUREMENTS.—Made from gaging bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Concrete control. 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, 2.55 feet May 4 (discharge, 189 second-feet); minimum stage recorded, 0.75 foot September 25 and 26 (discharge, 3.7 second-feet).

1911–1922: Maximum stage recorded, 4.9 feet April 5, 1919, determined from leveling to high-water mark (discharge, 483 second-feet); minimum stage recorded, that of September 25 and 26, 1922.

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

DIVERSION.—Nespelem canal diverts water for irrigation from a point above gage. See records for Nespelem canal.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; affected by aquatic growth October 1–17 and June to September. Rating curve well defined. Gage read to hundredths once daily. 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 aquatic growth. Records below 10 second-feet good; otherwise excellent.

Discharge measurements of Nespelem River at Nespelem, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 18	R. B. Kilgore	0.83	9.7
May 13	John McCombs	2.08	135
15	----do	2.16	142

Daily discharge, in second-feet, of Nespelem River at Nespelem, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9.6	11	12	11	9.6	10	31	147	86	19	6.3	5.9
2	9.6	11	13	11	9.6	9.6	31	157	86	17	6.3	5.9
3	9.6	11	12	11	9.6	9.6	34	178	80	18	5.9	5.0
4	9.6	11	12	11	9.6	9.6	40	189	80	17	5.9	5.0
5	9.6	11	12	11	9.6	9.6	43	178	75	17	5.9	5.0
6	9.6	11	12	11	9.6	9.6	45	167	75	17	5.9	5.0
7	9.6	11	12	11	9.0	9.6	48	167	75	16	5.9	5.0
8	9.6	11	12	11	9.0	9.6	56	178	70	16	5.9	5.0
9	9.6	11	12	11	10	9.6	60	167	70	13	5.9	5.0
10	9.6	11	12	11	10	11	64	157	70	13	5.9	4.1
11	9.6	11	12	11	10	11	70	147	63	13	5.9	5.0
12	9.6	11	13	11	10	11	70	137	61	12	6.3	5.0
13	9.6	11	15	11	10	11	64	137	56	12	6.3	5.0
14	9.6	12	13	11	9.6	11	70	137	53	12	6.3	5.0
15	10	12	13	11	9.6	12	70	147	48	11	6.3	5.0
16	10	12	12	11	9.6	12	64	157	45	11	5.9	4.5
17	10	12	12	10	10	13	64	167	43	11	5.9	4.5
18	10	12	12	10	10	13	63	178	38	10	5.4	4.1
19	9.6	11	11	10	10	15	63	178	36	9.6	5.4	4.5
20	9.6	11	11	9.6	10	20	62	178	34	9.0	5.4	4.1
21	9.6	10	11	9.6	10	17	70	167	32	9.0	5.4	4.1
22	9.6	10	11	9.6	10	17	80	157	30	9.0	5.4	4.1
23	9.6	10	11	9.6	10	18	107	147	29	8.1	5.4	4.1
24	9.6	10	11	9.6	10	18	147	137	27	8.1	5.4	4.1
25	9.6	11	11	9.6	10	18	147	127	25	8.1	5.4	3.7
26	12	11	11	9.6	10	20	147	122	22	8.1	5.4	3.7
27	12	11	11	9.6	10	20	147	117	20	8.1	5.0	4.1
28	12	11	11	9.6	10	20	157	107	21	7.2	5.0	4.1
29	12	11	11	9.6	-------	21	157	102	20	6.7	5.0	4.1
30	12	12	11	9.6	-------	23	147	97	20	6.3	5.0	4.1
31	12	-------	11	9.6	-------	26	-------	97	-------	6.3	5.4	-------

NOTE.—Gage not read Dec. 25. Discharge estimated by interpolation.

Combined monthly discharge of Nespelem River and Nespelem canal at Nespelem, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.					Combined run-off (acre-feet.)
	River (mean).	Canal (mean).	Combined.			
			Maximum.	Minimum.	Mean.	
October	10.1	----------	12	9.6	10.1	621
November	11.1	----------	12	10	11.1	660
December	11.8	----------	15	11	11.8	726
January	10.4	----------	11	9.6	10.4	640
February	9.8	----------	10	9.0	9.8	544
March	14.3	----------	26	9.6	14.3	879
April	80.6	1.86	163	31	82.5	4,910
May	149	6.72	196	104	156	9,590
June	49.7	9.23	97	27	58.9	3,500
July	11.6	5.59	26	11	17.2	1,060
August	5.70	4.57	11	9.1	10.3	633
September	4.59	4.10	10	7.8	8.69	517
The year	30.8	2.68	196	7.8	33.5	24,300

NOTE.—No flow through canal Oct. 1 to Apr. 18.

NESPELEM CANAL AT NESPELEM, WASH.

LOCATION.—In sec. 24, T. 31 N., R. 30 E., three-quarters of a mile below canal intake and three-quarters of a mile northwest of Nespelem post office, Okanogan County.

RECORDS AVAILABLE.—April 1, 1921, to September 30, 1922.

GAGE.—Vertical staff on right side of canal; read by Claude Marble.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Canal section. Plant growth during summer usually affects stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.74 feet on June 1 and 2 (discharge, 11.2 second-feet). No flow through canal October 1 to April 18.

1921–22: Maximum stage recorded, that of June 1 and 2, 1922. No flow through canal during nonirrigating seasons.

ACCURACY.—Stage-discharge relation changed June 1. Rating curves fairly well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good.

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

Canal diverts water from right bank of Nespelem River about on line between sections 24 and 13, T. 31 N., R. 30 E.

The following discharge measurement was made by John McCombs:

May 14, 1922: Gage height, 1.45 feet; discharge, 6.3 second-feet.

Daily discharge, in second-feet, of Nespelem canal at Nespelem, Wash., for the year ending Sept. 30, 1922.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	------	6.5	11.2	7.0	4.7	4.1	16	------	6.5	9.3	5.6	5.0	4.1
2	------	6.6	11.2	6.8	4.6	4.1	17	------	6.5	9.3	5.5	5.0	4.1
3	------	6.6	11.0	6.7	4.5	4.1	18	------	6.5	9.2	5.5	5.0	4.1
4	------	6.6	10.6	6.4	4.5	4.1	19	2.3	6.5	8.9	5.3	5.0	4.1
5	------	6.7	10.6	6.3	4.5	4.1	20	2.5	6.5	8.9	5.3	4.9	4.1
6	------	6.7	10.5	6.2	4.5	4.1	21	2.5	6.5	8.3	5.3	4.7	4.1
7	------	6.6	10.3	6.2	4.5	4.1	22	2.6	6.6	8.1	5.3	4.7	4.1
8	------	6.6	10.3	6.1	4.5	4.1	23	4.3	7.0	8.0	5.2	4.5	4.1
9	------	6.6	10.2	6.0	4.5	4.1	24	5.6	7.2	8.0	5.0	4.3	4.1
10	------	6.5	10.2	5.8	4.6	4.1	25	5.6	7.2	8.0	4.8	4.1	4.1
11	------	6.5	10.1	5.8	4.7	4.1	26	5.6	7.2	7.6	4.8	4.1	4.1
12	------	6.5	9.7	5.7	4.7	4.1	27	6.0	7.1	7.5	4.8	4.1	4.1
13	------	6.5	9.3	5.7	5.0	4.1	28	6.0	7.1	7.4	4.8	4.1	4.1
14	------	6.5	9.3	5.6	5.0	4.1	29	6.1	7.2	7.3	4.8	4.1	4.1
15	------	6.5	9.3	5.6	5.0	4.1	30	6.6	7.2	7.3	4.8	4.1	4.1
							31	------	7.1	------	4.7	4.1	------

NOTE—No water in canal Oct. 1 to Apr. 18.

Monthly discharge of Nespelem canal at Nespelem, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
April	6.6	0.0	1.86	111
May	7.2	6.5	6.72	413
June	11.2	7.3	9.23	549
July	7.0	4.7	5.59	344
August	5.0	4.1	4.57	281
September	4.1	4.1	4.10	244
The period	11.2	0	5.35	1,940

NOTE.—No water in canal Oct. 1 to Apr. 18.

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, 1922.

GAGE.—Chain gage on highway bridge; installed June 10, 1920; read by W. A. Steiner. For description of previous gages see Water-Supply Paper 512.

DISCHARGE MEASUREMENTS.—Made from boat at gage, or 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, 12.4 feet June 7 (discharge, 20,400 second-feet); minimum stage recorded, 1.7 feet November 21 and September 23–29 (discharge, 720 second-feet).

1911–1922: Maximum stage recorded, 12.21 feet June 20, 1916 (discharge, 22,200 second-feet); minimum discharge recorded, discharge, 520 second-feet December 28, 1917.

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

DIVERSIONS.—Numerous small ditches divert water for irrigation above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed gradually May 21–31 and June 22–30; not affected by ice. Rating curves fairly well defined. Gage read once daily to hundredths, except as indicated in footnote to table of daily discharge. Daily discharge ascertained by applying daily gage height to rating table. Records good.

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

Discharge measurements of Okanogan River at Okanogan, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 15	2.05	916	June 20	7.16	8,460
17	2.00	908	21	6.99	8,010
Mar. 28	2.47	1,340	Sept. 30	1.76	736
June 12	9.45	13,900			

Daily discharge, in second-feet, of Okanogan River at Okanogan, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,650	2,880	1,430	1,800	1,140	1,140	1,430	2,240	13,500	5,430	1,230	900
2	1,490	2,360	1,330	1,730	1,230	1,140	1,380	2,360	14,600	5,090	1,140	840
3	1,330	2,240	1,230	1,650	1,330	1,190	1,330	3,020	15,800	4,750	1,140	860
4	1,330	2,000	1,180	1,650	1,330	1,240	1,430	3,160	16,400	4,500	1,050	880
5	1,230	1,880	1,140	1,650	1,380	1,280	1,430	3,310	18,500	4,250	1,050	900
6	1,140	1,820	1,140	1,650	1,430	1,330	1,430	3,610	20,100	4,090	1,010	840
7	1,140	1,760	1,140	1,650	1,540	1,230	1,430	3,690	20,400	3,770	970	840
8	1,050	1,760	1,140	1,650	1,540	1,330	1,430	3,770	19,000	3,460	970	840
9	1,050	2,000	1,140	1,650	1,650	1,330	1,480	3,930	17,000	3,310	900	840
10	1,050	2,120	1,140	1,760	1,540	1,430	1,540	3,770	15,100	3,160	900	870
11	970	2,000	1,140	1,760	1,430	1,430	1,540	3,610	14,200	3,020	840	900
12	970	1,880	1,140	1,760	1,330	1,430	1,540	3,610	13,700	2,740	900	900
13	970	1,880	1,230	1,700	1,230	1,430	1,430	3,460	13,500	2,610	900	900
14	970	1,880	4,750	1,650	1,230	1,430	1,430	3,700	13,000	2,480	900	900
15	900	1,760	4,250	1,600	1,230	1,430	1,430	3,930	12,500	2,360	900	840
16	900	1,650	3,560	1,540	1,230	1,540	1,380	5,260	12,100	2,240	935	840
17	900	1,650	2,880	1,540	1,230	2,000	1,330	7,710	11,200	2,120	970	840
18	780	1,540	2,160	1,430	1,230	1,330	1,330	11,410	10,200	2,000	970	840
19	900	1,430	1,430	1,430	1,230	1,440	1,330	13,200	9,210	1,880	970	780
20	970	1,080	1,760	1,430	1,230	1,540	1,330	13,900	8,550	1,760	970	780
21	1,050	720	3,310	1,430	1,230	1,430	1,330	12,800	8,130	1,650	970	780
22	1,050	900	3,310	1,430	1,230	1,430	1,430	11,800	8,340	1,650	970	750
23	1,190	1,050	3,020	1,430	1,230	1,430	1,600	10,500	7,920	1,600	1,230	720
24	1,330	1,110	2,680	1,540	1,230	1,330	1,760	9,650	7,300	1,540	1,140	720
25	1,230	1,170	2,340	1,760	1,140	1,330	1,880	9,650	6,900	1,430	1,050	720
26	1,230	1,230	1,990	1,650	1,140	1,330	1,880	9,650	6,500	1,430	970	720
27	1,230	1,330	1,650	1,650	1,140	1,330	1,880	8,990	6,310	1,330	935	720
28	1,140	1,430	1,540	1,650	1,140	1,330	2,000	9,100	6,130	1,330	900	720
29	1,140	1,330	1,760	1,600	-------	1,330	2,120	9,210	5,950	1,330	900	720
30	2,300	1,430	1,880	1,540	-------	1,330	2,180	10,800	5,600	1,330	840	780
31	3,460	-------	1,880	1,430	-------	1,430	-------	12,100	-------	1,330	900	-------

NOTE.—Gage not read Oct. 2, 9, 23, 30, Nov. 6, 11, 13, 20, 24, 25, 27, Dec. 2, 4, 9, 11, 16, 18, 24, 25, 26, Jan. 1, 2, 8, 13, 14, 15, 22, 29, Feb. 5, 12, 16–19, 22, 26, Mar. 3–5, 12, 19, 26, Apr. 2, 9, 16, 23, 30, May 7, 14, 21, 28, June 9, 18, 25, July 2, 4, 9, 16, 18, 23, 30, Aug. 6, 13, 16, 20, 27, Sept. 3, 4, 10, 17, and 24; discharge interpolated.

Monthly discharge of Okanogan River at Okanogan, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	3,460	780	1,230	75,600
November	2,880	720	1,640	97,600
December	4,750	1,140	1,990	122,000
January	1,800	1,430	1,610	99,000
February	1,650	1,140	1,290	71,600
March	2,000	1,140	1,380	84,800
April	2,180	1,330	1,550	92,200
May	13,900	2,240	7,000	430,000
June	20,400	5,600	11,900	708,000
July	5,430	1,330	2,610	160,000
August	1,230	840	981	60,300
September	900	720	816	48,600
The year	20,400	720	2,830	2,050,000

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, 1922.

GAGE.—Vertical staff on concrete foundation wall of power house on right bank; installed January 31, 1921; read by employees of Okanogan Valley Power Co. Prior to January 31, 1921, gage was a vertical staff in seven sections on left bank just above present site and at different datum.

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. Control for low and medium stage is riffle formed by bedrock and boulders; high-water control not well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 18.5 feet on June 5 (discharge, 21,400 second-feet); minimum stage recorded, 3.2 feet on September 21–24, and 26 (discharge, 405 second-feet).

1911–1922: Maximum stage recorded, that of June 5, 1922; river dry at 4 p. m. December 5, 1920, while filling pond behind dam.

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

DIVERSIONS.—Some water is diverted for irrigation from tributaries above station. Principal diversion made from river above gage by West Okanogan Irrigation district[7] and has increased from about 75 second-feet to about 140 second-feet since irrigation season of 1916.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Gage-height record furnished by the Okanogan Valley Power Co.

Discharge measurements of Similkameen River near Oroville, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 21	4.30	950	Apr. 5	3.57	553
22	4.68	1,180	June 7	16.8	18,600
Jan. 21	3.60	607	19	10.35	7,300
Mar. 29	3.40	477			

[7] The discharge of the West Okanogan Irrigation District canal at point where road to power house passes under flume near Oroville, was 138 second-feet on June 8, 1922, and the same amount on June 18, 1922, measured by current meter.

Daily discharge, in second-feet, of Similkameen River at Oroville, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,080	1,950	940	940	575	485	530	1,520	14,700	3,640	720	508
2	1,010	1,860	940	940	575	485	530	2,130	16,400	3,340	670	598
3	880	1,600	880	940	575	485	552	2,310	18,300	3,240	645	575
4	880	1,600	820	880	575	530	530	2,310	20,200	3,040	620	575
5	820	1,440	820	880	575	485	575	2,580	21,400	2,850	575	552
6	770	1,440	820	880	645	508	575	2,760	20,600	2,670	575	508
7	770	1,440	770	940	770	530	575	2,760	18,100	2,490	575	530
8	720	1,680	770	880	770	530	620	2,760	15,500	2,310	530	530
9	670	1,600	770	880	770	530	720	2,670	13,600	2,130	530	530
10	670	1,600	770	820	770	575	720	2,580	12,200	2,130	508	575
11	620	1,440	770	820	720	575	670	2,490	11,900	1,950	485	575
12	575	1,440	1,010	770	598	575	620	2,400	11,900	1,770	485	575
13	575	1,440	3,340	770	575	530	598	2,310	11,500	1,680	530	552
14	575	1,440	4,140	770	575	485	575	2,760	11,200	1,520	530	530
15	575	1,290	2,670	720	575	530	575	3,740	11,200	1,440	552	485
16	575	1,220	2,130	720	670	575	575	5,580	9,850	1,360	530	485
17	620	1,150	1,950	575	720	530	575	9,370	8,900	1,290	670	485
18	645	1,150	1,600	575	720	530	552	12,700	8,000	1,220	645	485
19	670	880	1,010	720	720	552	552	14,000	7,020	1,150	620	445
20	670	720	770	620	720	575	552	12,200	6,470	1,080	575	445
21	940	720	620	575	720	530	575	10,900	6,880	1,010	770	405
22	1,150	670	575	575	720	530	670	9,210	6,340	940	820	405
23	1,010	670	598	670	720	508	880	8,150	5,820	880	720	405
24	880	770	620	670	670	485	1,010	8,900	5,220	880	620	405
25	820	880	720	670	620	485	1,010	8,000	5,110	820	598	445
26	880	940	770	720	670	485	1,010	7,720	4,890	820	575	405
27	820	1,010	770	720	670	485	1,150	6,880	4,780	820	575	445
28	770	1,010	880	720	575	485	1,290	7,160	4,560	880	530	445
29	880	940	940	720	-------	485	1,290	8,900	4,240	820	485	508
30	3,240	940	940	645	-------	485	1,290	10,900	3,840	770	465	575
31	2,490	-------	940	575	-------	552	-------	12,900	--------	770	530	-------

Monthly discharge of Similkameen River and West Okanogan Irrigation District canal near Oroville, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 3,450 square miles.]

Month.	Discharge in second-feet.						Run-off (combined).	
	River (mean).	Canal (mean).	Combined.				Inches.	Acre-feet.
			Maximum.	Minimum.	Mean.	Per square mile.		
October	911	0	3,240	575	911	0.264	0.30	56,000
November	1,230	0	1,950	670	1,230	.357	.40	73,200
December	1,160	0	4,140	575	1,160	.336	.39	71,300
January	752	0	940	575	752	.218	.25	46,200
February	663	0	770	575	663	.192	.20	36,800
March	520	0	575	485	520	.151	.17	32,000
April	732	5	1,320	530	737	.214	.24	43,900
May	6,180	94	14,100	1,560	6,270	1.82	2.10	386,000
June	10,700	143	21,500	4,010	10,800	3.13	3.49	643,000
July	1,670	162	3,810	930	1,830	.530	.61	113,000
August	589	137	956	601	726	.210	.24	44,600
September	500	40	705	405	540	.157	.18	32,100
The year	2,130	49	21,500	405	2,180	.632	8.57	1,580,000

SINLAHEKIN CREEK AT TWIN BRIDGES, NEAR LOOMIS, WASH.

LOCATION.—In NE. ¼ sec. 3, T. 37 N., R. 25 E., 100 feet above lower bridge, half a mile below Sarsapkin Creek, 6 miles southwest of Loomis, in Okanogan County, and 3½ miles below former gaging station at Blue Lake.

DRAINAGE AREA.—75.5 square miles (measured on topographic maps).

RECORDS AVAILABLE.—May 1, 1921, to September 30, 1922, at site below Sarsapkin Creek; June 1 to October 31, 1920, at Blue Lake; and June 13, 1903, to March 30, 1905, at site 3 miles above Loomis.

GAGE.—Staff gage on right bank; read by N. R. Judson. June 1 to October 31, 1920, vertical staff on left bank 3½ miles upstream.

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

CHANNEL AND CONTROL.—Left bank high; right bank low but not subject to overflow. One channel at all stages. Control is well-defined riffle of small boulders and gravel a few feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.6 feet on May 18 (discharge, 363 second-feet); minimum stage recorded, 0.24 foot on August 7 and 8 (discharge, 1.6 second-feet); may have been lower during winter, during period gage was not read.

1921–1922: Maximum and minimum discharge same as given above.

ICE.—Stage-discharge relation seriously affected by ice; observations discontinued during winter.

REGULATION.—None.

DIVERSIONS.—Water diverted above gage for irrigation of few acres.

ACCURACY.—Stage-discharge relation changed gradually October 1–21 and during winter. Rating curves fairly well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table; shifting-control method used October 1–21. Except for extremely low water, records good.

COOPERATION.—Station maintained in cooperation with Whitestone Irrigation District.

Discharge measurements of Sinlahekin Creek at Twin Bridges, near Loomis, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 22	0.49	4.5	June 6	1.47	160
22	.49	4.7	10	1.12	101
Apr. 3	.54	11	17	.90	51
3	.56	12			

Daily discharge, in second-feet, of Sinlahekin Creek at Twin Bridges, near Loomis, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.0	4.5	-------	8.5	34	255	16	4.2	11
2	4.0	4.2	-------	7.0	49	255	15	2.1	7.0
3	4.6	4.0	-------	12	49	273	14	1.8	7.0
4	3.8	4.0	-------	13	46	210	13	2.0	6.6
5	3.8	3.8	-------	8.5	46	174	12	2.1	6.2
6	3.3	4.2	-------	7.0	46	165	12	2.1	6.2
7	4.2	3.8	-------	7.0	49	138	11	1.6	6.2
8	4.2	3.8	4.7	8.1	47	122	11	1.6	6.6
9	4.1	3.6	9.6	12	49	104	9.6	2.0	6.6
10	4.0	3.6	7.7	8.1	39	97	9.0	3.8	6.2
11	3.9	3.6	6.2	6.6	36	93	9.0	2.4	6.2
12	4.4	3.6	6.2	6.2	34	85	8.1	3.3	5.8
13	4.3	3.6	13	6.2	46	80	8.1	7.0	5.5
14	4.2	4.7	14	6.2	68	72	6.2	5.5	3.8
15	4.1	4.0	14	5.5	100	64	6.2	6.2	3.8
16	5.0	4.0	11	5.5	219	56	5.8	7.0	3.8
17	4.9	3.8	9.6	5.5	345	52	5.8	5.5	3.3
18	4.8	3.6	13	5.8	363	49	5.1	5.5	3.3
19	4.7	2.7	20	6.2	273	46	4.7	6.2	2.4
20	4.6	2.4	13	7.4	237	42	4.7	11	2.4
21	4.5	2.4	12	9.6	201	39	4.5	8.5	2.4
22	4.5	2.7	14	14	165	36	3.8	7.7	1.8
23	4.5	-------	7.7	18	147	34	3.1	7.0	1.8
24	4.7	-------	5.5	20	156	29	3.1	7.0	1.8
25	5.2	-------	5.5	20	165	29	3.1	5.5	1.8
26	7.5	-------	6.2	20	156	31	3.1	4.2	2.1
27	5.5	-------	7.0	26	138	24	4.5	4.2	9.6
28	6.5	-------	11	26	147	22	4.0	4.2	7.4
29	4.9	-------	12	31	156	21	3.8	3.3	6.2
30	4.9	-------	11	26	174	20	3.6	2.1	6.2
31	4.5	-------	14	-------	210	-------	2.4	11	-------

NOTE.—No record Nov. 23 to Mar. 7.

Monthly discharge of Sinlahekin Creek at Twin Bridges, near Loomis, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	7.5	3.3	4.58	282
November 1–22	4.7	2.4	3.66	160
March 8–31	20	4.7	10.3	490
April	31	5.5	12.1	720
May	363	34	129	7,930
June	273	20	90.6	5,390
July	16	2.4	7.27	447
August	11	1.6	4.76	293
September	11	1.8	5.03	299

NOTE.—No record Nov. 23 to Mar. 7.

TOATS COULEE CREEK NEAR LOOMIS, WASH.

LOCATION.—In SE. ¼ sec. 33, T. 39 N., R. 25 E., just below Deer Creek, 1,200 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, 1920, to September 30, 1922.

GAGE.—Stevens continuous water-stage recorder on left bank at head of falls, installed June 3, 1920; inspected by C. L. Jones. May 11 to June 2, 1920, temporary staff gage at same site but at different datum. All readings prior to installation of water-stage recorder reduced to datum of present gage. Discharge measurements have also been referred to a vertical staff gage near right bank at high water measuring section, a few feet above weir and intake of Whitestone Irrigation District flume. This gage was used by the irrigation district in obtaining records prior to the establishment of present station.

DISCHARGE MEASUREMENTS.—Made from footbridge just above irrigation flume intake or by wading.

CHANNEL AND CONTROL.—Bed composed of large boulders and gravel. One channel at all stages. Banks high and wooded. Control at head of 20-foot falls several feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 4.8 feet at 8 p. m. June 3 (discharge, 925 second-feet); minimum stage, from recorder, 0.84 foot at noon November 17 (discharge, 2.6 second-feet); stage may have been lower during winter when recorder was not operating.

1920–1922: Maximum stage recorded, that of June 3, 1922; minimum stage recorded that of November 17, 1921.

ICE.—Stage-discharge relation seriously affected by ice; record discontinued during winter.

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during winter while recorder was not in operation and gradually May 16 to June 17. Not affected by ice while recorder was operating. Rating curves fairly well defined. Operation of water-stage recorder fairly satisfactory, except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined graphically from recorder graph. Records fair.

COOPERATION.—Station maintained in cooperation with the Whitestone Irrigation District.

Discharge measurements of Toats Coulee Creek near Loomis, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 23	0.96	3.2	June 5	3.01	434
24	1.32	8.3	9	3.15	273
Apr. 2	1.18	7.4	16	2.89	161
3	1.15	6.6	17	2.85	150
June 4	3.25	478			

Daily discharge, in second-feet, of Toats Coulee Creek near Loomis, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6.8	16		7.0	33	580	51	9.5	22
2	6.8	15		7.0	38	537	48	8.6	16
3	6.8	12		7.8	38	595	46	7.8	13
4	6.8	12		7.5	38	494	44	7.4	11
5	6.8	12		8.3	39	450	38	7.1	9.7
6	6.6	12		8.6	39	379	37	7.1	9.5
7	6.6	13		11	40	337	36	6.9	9.5
8	6.6	12		11	36	305	33	6.2	9.5
9	6.6	8.6		9.8	33	271	31	5.1	10
10	6.6	14		9.1	30	271	30	5.8	9.5
11	6.4	11		8.3	28	268	30	8.0	8.2
12	6.4	9.4		7.9	29	248	27	11	7.8
13	6.6	10		7.3	41	240	24	18	6.9
14	7.4	9.6		7.6	61	227	22	14	6.3
15	8.6	6.0		7.6	142	207	20	18	5.8
16	12	9.2		7.6	276	172	18	20	5.8
17	12	3.4		7.6	351	149	16	14	5.4
18		4.0		7.8	365	126	15	11	5.0
19		4.6		8.8	337	117	14	13	4.8
20	8			12	321	113	13	20	4.6
21				18	297	111	12	18	4.4
22				22	268	105	12	16	4.3
23	4.8			24	261	96	12	13	4.6
24	9.6			23	307	84	12	11	4.8
25	11			22	326	75	11	9.7	4.4
26	12			23	294	70	12	8.6	4.2
27	10		6.5	28	305	66	19	7.4	9.0
28	10		6.3	23	379	62	15	7.1	15
29	12		6.1	21	421	59	14	6.3	12
30	18		6.5	24	479	57	11	6.0	11
31	17		7.8		522		11	16	

NOTE.—Water-stage recorder not operating Oct. 1, 2, 18–22, and Oct. 31 to Nov. 1; discharge determined from general information, recorded range of stage, and comparison with records of Sinlahekin Creek at Twin Bridges. Braced figures show mean discharge for period indicated. No record Nov. 20 to Mar. 26

Monthly discharge of Toats Coulee Creek near Loomis, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	18	4.8	8.7	535
November 1-19	16	3.4	10.2	384
March 27-31	7.8	6.1	6.6	65
April	28	7.0	13.3	791
May	522	28	199	12,200
June	595	57	229	13,600
July	51	11	23.7	1,460
August	20	5.1	10.9	670
September	22	4.2	8.47	504

NOTE.—No record Nov. 29 to Mar. 26.

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 Bureau of Reclamation, 2 miles south of Conconully, and about 14 miles above Okanogan, Okanogan County.

DRAINAGE AREA.—121 square miles; 164 square miles at former location at Jones's ranch (revised results measured on topographic maps).

RECORDS AVAILABLE.—July 6, 1910, to September 30, 1922, when station was discontinued. From April 12, 1903, to March 31, 1912, records were obtained at Jones's 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 C. M. Conger.

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, 1.26 feet on May 20 and 21 (discharge, 100 second-feet); minimum stage recorded, 0.05 foot November 6–26 and December 19–22 (discharge, 1.2 second-feet).

1903–1922: Maximum stage recorded, 3.63 feet 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, 1919, 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. Correction not made to 1919–1922 monthly summaries.

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 furnished by United States Bureau of Reclamation.

Discharge measurements of Salmon Creek near Conconully, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 24	0.14	3.6
June 10	.95	65.1

Daily discharge, in second-feet, of Salmon Creek near Conconully, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.5	8.5	1.5	1.5	1.5	1.5	1.9	1.9	79	83	78	2.2
2	1.5	8.5	1.5	1.5	1.5	1.5	1.9	1.9	85	82	73	1.9
3	1.5	4.0	1.5	1.5	1.5	1.5	5.5	1.9	86	76	66	1.7
4	1.5	1.5	1.5	1.5	1.5	1.5	11.9	1.9	83	72	63	1.7
5	1.5	1.5	1.5	1.5	1.5	1.5	15.2	2.2	77	69	61	1.7
6	1.5	1.2	1.5	1.5	1.5	1.5	15.2	2.2	61	69	60	1.7
7	1.5	1.2	1.5	1.5	1.5	1.5	13.5	6.6	64	71	62	1.7
8	1.5	1.2	1.5	1.5	1.5	1.5	12.8	10	66	70	79	1.7
9	1.5	1.2	1.5	1.5	1.5	1.7	12.8	17.8	66	68	82	1.7
10	1.5	1.2	1.5	1.5	1.5	1.7	12.8	28	63	68	80	1.7
11	1.5	1.2	1.5	1.5	1.5	1.7	12.8	34	61	80	78	8.7
12	1.5	1.2	1.7	1.5	1.5	1.7	12.4	34	61	86	76	29
13	1.7	1.2	1.7	1.5	1.5	1.7	11	34	74	80	76	48
14	1.7	1.2	1.5	1.5	1.5	1.7	11	36	44	78	72	64
15	1.7	1.2	1.5	1.5	1.5	1.7	10.5	41	34	78	64	63
16	1.7	1.2	1.5	1.5	1.5	1.7	9	58	36	66	58	62
17	1.7	1.2	1.5	1.5	1.5	1.7	9	72	48	86	56	61
18	1.7	1.2	1.5	1.5	1.5	1.7	6.6	88	92	88	55	59
19	1.7	1.2	1.2	1.5	1.5	1.7	1.9	98	94	86	48	58
20	1.7	1.2	1.2	1.5	1.5	1.7	1.9	99	88	83	48	46
21	5	1.2	1.2	1.5	1.5	1.7	1.9	100	86	79	51	37
22	10	1.2	1.2	1.5	1.5	1.7	1.9	97	86	76	71	26
23	6.4	1.2	1.5	1.5	1.5	1.7	1.9	84	86	73	79	19.1
24	3.8	1.2	1.5	1.5	1.5	1.7	1.9	74	88	73	79	11.6
25	3.8	1.2	1.5	1.5	1.5	1.7	1.9	79	79	81	81	10.5
26	3.8	1.2	1.5	1.5	1.5	1.7	1.9	81	79	85	80	10.5
27	3.8	1.5	1.5	1.5	1.5	1.7	2.2	73	89	87	80	9.5
28	3.8	1.5	1.5	1.5	1.5	1.7	2.2	72	91	87	77	8.5
29	3.8	1.5	1.5	1.5	-------	1.7	1.9	71	88	85	74	7
30	3.8	1.5	1.5	1.5	-------	1.7	1.9	80	86	85	74	4.9
31	6	-------	1.5	1.5	-------	1.9	-------	80	-------	81	34	-------

Monthly discharge of Salmon Creek near Conconully, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	10	1.5	2.76	170
November	8.5	1.2	1.84	109
December	1.7	1.2	1.47	90.4
January	1.5	1.5	1.50	92.2
February	1.5	1.5	1.50	83.3
March	1.9	1.5	1.65	101
April	15.2	1.9	6.97	415
May	100	1.9	50.3	3,090
June	94	34	74.0	4,400
July	88	66	78.4	4,820
August	82	34	68.2	4,190
September	64	1.7	22.0	1,310
This year	100	1.2	26.1	18,900

NOTE.—Complete information is not available for determining monthly storage regulation effected in Conconully and Salmon Lake reservoirs. Therefore correction for storage accumulation or release as published in earlier reports, is not possible.

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, 1922.

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 near by.

CHANNEL AND CONTROL.—One channel at all stages; straight for long distance above and below gage. Bed composed of boulders and gravel. Control is riffle of large boulders 300 feet below gage; may shift during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.0 feet at noon June 4 (discharge, 12,500 second-feet); minimum stage recorded, 1.8 feet on February 24 and March 12–29 (discharge, 249 second-feet).

1919–1922: Maximum stage recorded, 10.4 feet at 9 a. m. on June 5, 1921 (discharge, 13,400 second-feet); minimum discharge, estimated 144 second-feet December 13–15, 1919, when stage-discharge relation was affected by ice.

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

DIVERSIONS.—Numerous diversions above station for irrigation. Diversion through Risley ditch and Methow Valley Irrigation District canals added to mean monthly flow past gage.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined below 6,000 second-feet. Gage read to hundredths once daily; frequently twice daily during period of heavy flow when stage was changing rapidly. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Station maintained in cooperation with Methow Okanogan Irrigation District.

Discharge measurements of Methow River at Twisp, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 12	2.04	341	June 14	7.10	6,550
June 13	6.80	5,750	Sept. 27	1.89	270

Daily discharge, in second-feet, of Methow River at Twisp, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	365	815	476	500	285	276	304	1,310	8,420	2,620	524	453
2	365	815	453	500	430	285	304	1,800	10,500	2,490	500	430
3	365	815	430	453	324	267	304	1,900	11,600	2,490	476	430
4	365	748	430	453	344	267	344	1,900	12,300	2,360	476	386
5	365	715	430	453	365	285	344	1,900	11,600	2,240	476	386
6	365	715	408	453	386	267	408	1,800	10,100	2,010	453	365
7	365	715	408	453	344	267	453	1,808	8,210	1,900	453	386
8	344	685	408	453	324	267	500	1,700	7,010	1,700	430	386
9	365	685	408	430	324	267	500	1,700	6,250	1,500	408	386
10	344	655	408	430	304	267	524	1,600	5,870	1,500	408	386
11	324	642	430	453	304	267	524	1,500	5,870	1,310	408	365
12	324	628	549	453	285	249	500	1,500	5,690	1,220	408	365
13	324	628	1,900	453	267	249	500	1,500	5,870	1,140	453	344
14	324	600	1,310	409	267	249	500	1,900	6,250	1,140	453	324
15	324	574	1,140	365	285	249	500	2,900	6,250	1,060	524	324
16	344	574	850	386	304	249	524	4,990	5,330	920	549	324
17	344	549	832	408	304	249	500	8,840	4,650	850	524	324
18	344	524	815	344	285	249	524	9,470	4,320	815	476	304
19	344	476	722	344	267	249	549	7,610	3,840	748	476	304
20	365	453	628	365	285	249	600	6,440	4,320	715	549	304
21	574	453	715	386	267	249	780	5,330	4,160	685	549	285
22	549	453	685	365	285	249	1,060	4,650	4,160	655	574	285
23	549	453	600	365	267	249	1,310	4,160	3,520	628	549	285
24	500	500	574	408	249	249	1,310	4,480	3,360	600	476	285
25	476	524	600	408	386	249	1,310	4,320	3,680	600	453	285
26	500	524	524	408	267	249	1,310	3,840	3,520	600	430	267
27	500	524	574	365	267	249	1,400	3,680	3,520	628	423	285
28	524	476	574	365	267	249	1,400	4,160	3,360	600	415	324
29	687	476	574	344	------	249	1,310	4,650	3,360	574	408	324
30	850	476	574	324	------	267	1,400	5,870	3,050	549	408	324
31	850	------	500	285	------	304	------	7,410	------	549	430	------

Combined monthly discharge of Methow River, Risley ditch, and Methow Valley Irrigation District canals at Twisp, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.							Combined run-off (total in acre-feet).
	River.			Risley ditch (mean).	Methow Valley Irrigation District canals (mean).		Combined (mean).	
	Maximum.	Minimum.	Mean.		Twisp River diversion.[a]	Methow River diversion.		
October	850	324	436	2	20	------	458	28,200
November	815	453	596	------	------	------	596	35,500
December	1,900	408	643	------	------	------	643	39,500
January	500	285	406	------	------	------	406	25,000
February	430	249	305	------	------	------	305	16,900
March	304	249	259	------	------	------	259	15,900
April	1,400	304	727	5	10	------	742	44,200
May	9,470	1,310	3,760	8	40	5	3,810	234,000
June	12,300	3,050	6,000	10	51	15	6,080	362,000
July	2,620	549	1,210	10	50	32	1,300	79,900
August	574	408	469	10	48	36	563	34,600
September	453	267	341	10	39	26	416	24,800
The year	12,300	249	1,260	------	------	------	1,300	940,000

[a] Methow Valley Irrigation District canal in tables previously published.

NOTE.—Estimates of discharge for Risley ditch and the two Methow Valley Irrigation District canals based upon discharge measurements published under miscellaneous measurements near the end of this volume and actual gage-height records for Methow Valley Irrigation District canals over periods June 1 to Sept. 9 for Twisp River diversion, and July 1 to Aug. 5 and Sept. 1 to 30, for Methow River diversion, and upon general information and past records.

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; and December 5, 1910, to September 30, 1922.

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 1 mile west of Chelan; datum 1,070.18 feet above sea level. In 1905 gage was on a bend of upper bridge at Chelan; elevation not determined. Gage read by C. M. Farley and C. A. Bennett.

EXTREMES OF STAGE.—Maximum stage recorded during year, 6.05 feet on June 10; minimum stage recorded, 1.90 feet on March 27 and 31.

1898–99; 1911–1922: Maximum stage recorded, 8.2 feet on June 8, 1921; 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.—Records furnished in part by Chelan Electric Co.

Daily gage height, in feet, of Lake Chelan at Chelan, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.25							2.38		4.85	3.12	
2											3.14	3.11
3			3.76				1.91		5.45		3.15	
4					2.60	2.05					3.16	
5		4.23									3.18	
6						2.00						
7				3.56								
8	3.30						2.00	2.53		4.45		
9												2.92
10			3.67				1.95		6.05			
11	3.25				2.50							
12		4.00									3.20	
13						1.95		2.51				
14			4.70	3.30								
15	3.26									3.70		
16												2.79
17			4.57				1.95		5.88			
18					2.40							
19		3.85									3.20	
20						1.95		4.38				
21				2.96								
22	3.51									3.15		
23												2.55
24			4.11						5.15			
25					2.20		2.20			2.95		
26		3.70								2.95	3.09	
27						1.90		4.24		3.04		
28				2.75	2.07					3.04		
29	4.00									3.05		
30		3.74		2.73			2.33		4.86	3.07		2.40
31	4.21		3.78			1.90				3.08	3.15	

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, 1922.

GAGE.—Vertical staff on fourth bent of left approach to lower bridge; read by C. M. Farley and C. A. Bennett.

DISCHARGE MEASUREMENTS.—Made from upper bridge 1,000 feet above gage, from boat, 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, 10.6 feet June 7 and 8 (discharge, 8,420 second-feet); minimum stage recorded, 4.7 feet March 22 to April 2 (discharge, 512 second-feet).

1903–1922: Maximum stage recorded, 12.3 feet June 8, 1921 (discharge, 11,600 second-feet). Practically no flow for at least part of day on January 30, 1917, when 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.

DIVERSION.—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 permanent. Rating curve well defined below 10,000 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Gage-height record furnished by Chelan Electric Co.

Discharge measurements of Chelan River at Chelan, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.
	Feet	*Sec.-ft.*
Oct. 11	5.11	680
June 22	9.69	6,860
Sept. 25	5.77	1,140

Daily discharge, in second-feet, of Chelan River at Chelan, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	678	1,890	1,240	1,660	785	630	512	2,130	5,580	5,920	1,550	1,550
2	678	2,010	1,340	1,660	785	630	512	2,130	6,090	5,920	1,550	1,550
3	678	1,890	1,340	1,660	785	630	586	2,130	6,800	5,750	1,660	1,440
4	730	2,010	1,340	1,440	785	630	586	2,250	7,520	5,750	1,550	1,440
5	730	1,890	1,340	1,440	785	630	547	2,250	8,060	5,580	1,660	1,440
6	678	1,890	1,340	1,340	785	586	845	2,250	8,240	5,580	1,550	1,440
7	678	1,890	1,240	1,240	730	586	910	2,250	8,420	5,410	1,550	1,440
8	730	1,770	1,240	1,240	730	586	845	2,250	8,420	5,250	1,550	1,440
9	678	1,770	1,150	1,340	730	586	910	2,250	8,060	5,090	1,550	1,340
10	678	1,770	1,150	1,150	730	586	910	2,010	7,880	4,770	1,550	1,340
11	678	1,770	1,150	1,150	730	586	910	2,010	7,700	4,770	1,550	1,340
12	678	1,770	1,550	1,150	730	586	910	2,130	7,700	4,610	1,550	1,340
13	678	1,660	2,250	1,150	730	547	910	2,010	7,700	4,290	1,550	1,340
14	630	1,660	2,500	1,150	730	547	910	2,250	7,700	4,290	1,550	1,340
15	630	1,550	2,760	1,060	730	547	910	2,370	7,520	3,970	1,550	1,340
16	678	1,550	2,630	980	730	547	910	2,630	7,520	3,970	1,550	1,340
17	730	1,440	2,760	980	730	547	910	3,190	7,340	3,650	1,550	1,340
18	730	1,440	2,500	980	730	547	910	3,810	7,160	3,340	1,550	1,240
19	785	1,440	2,500	980	730	547	910	4,450	6,980	3,190	1,550	1,240
20	845	1,340	2,370	980	678	547	845	4,770	6,800	3,190	1,550	1,240
21	910	1,340	2,370	910	678	547	910	4,930	6,800	3,040	1,550	1,150
22	910	1,340	2,250	910	678	512	980	4,930	6,800	3,040	1,550	1,150
23	910	1,340	2,250	910	678	512	980	4,770	6,440	2,900	1,550	1,150
24	910	1,340	2,130	910	678	512	1,340	4,770	6,260	2,760	1,440	1,150
25	910	1,240	2,130	845	678	512	1,340	4,930	6,260	2,250	1,440	1,150
26	910	1,240	2,010	910	630	512	1,440	4,770	6,260	1,770	1,440	1,060
27	980	1,240	2,010	845	630	512	1,440	4,290	6,260	1,550	1,440	785
28	910	1,240	1,890	845	630	512	1,440	4,450	6,260	1,550	1,440	785
29	1,240	1,150	1,770	845	-------	512	2,130	4,610	6,090	1,550	1,440	730
30	1,340	1,240	1,770	845	-------	512	2,130	4,770	5,920	1,550	1,550	730
31	1,770	-------	1,660	845	-------	512	-------	4,930	-------	1,550	1,550	-------

Monthly discharge of Chelan River at Chelan, Wash., for the year ending Sept. 30, 1922.

[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.	
October	1,770	630	829	51,000	+31,300	82,300	1,340	1.41	1.63
November	2,010	1,150	1,570	93,400	−14,100	79,300	1,330	1.40	1.56
December	2,760	1,150	1,870	115,000	+1,200	116,000	1,890	1.99	2.29
January	1,660	845	1,110	68,200	−33,900	34,300	558	.587	.68
February	785	630	720	40,000	−19,400	20,600	371	.391	.41
March	630	512	558	34,300	−5,100	29,200	475	.500	.58
April	2,130	512	1,010	60,100	+13,000	73,100	1,230	1.29	1.44
May	4,930	2,010	3,340	205,000	+80,800	286,000	4,650	4.89	5.64
June	8,420	5,580	7,080	421,000	−2,100	419,000	7,040	7.41	8.27
July	5,920	1,550	3,800	234,000	−55,400	179,000	2,910	3.06	3.53
August	1,660	1,440	1,540	94,700	+2,100	96,800	1,570	1.65	1.90
September	1,550	730	1,250	74,400	−23,000	51,400	864	.909	1.01
The year	8,420	512	2,060	1,490,000	−24,600	1,470,000	2,030	2.14	28.94

ENTIAT RIVER BASIN.

ENTIAT RIVER AT ENTIAT, WASH.

LOCATION.—In sec. 18, T. 25 N., R. 21 E., one-eighth of a mile below power plant of Wenatchee Valley Gas & Electric Co., three-fourths of a 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, 1922.

GAGE.—Inclined staff on left bank one-eighth of a 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. Stage of zero flow, -0.5 ± 0.1 foot, determined September 24, 1922.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 4.26 feet June 5 (discharge, 3,640 second-feet); minimum discharge occurred during winter when stage-discharge relation was affected by ice; not determined.

1910–1922: Maximum stage recorded, 5.0 feet June 17, 1916 (discharge, 5,150 second-feet); minimum discharge estimated 50 second-feet December 14, 1919, when stage-discharge relation was affected by ice.

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; affected by ice November 21–25 and January 1 to March 3. 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 records furnished by Wenatchee Valley Gas & Electric Co.

Discharge measurements of Entiat River at Entiat, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 10	1.00	130	June 23	2.58	1,080
Jan. 20	*3.37	149	Sept. 24	.80	84

* Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Entiat River at Entiat, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	207	310	174				132	458	2,610	893	225	161
2	200	310	171			100	138	488	2,950	850	237	149
3	187	268	167				144	458	3,290	850	229	144
4	161	260	161			101	149	488	3,460	808	215	138
5	155	252	161	220	100	106	158	458	3,640	768	207	138
6	149	229	155			106	155	458	3,120	728	200	132
7	144	229	149			111	161	458	2,950	690	193	132
8	138	233	149			111	167	458	2,290	583	187	132
9	138	237	155			114	180	458	1,980	583	187	127
10	135	233	161			119	187	458	1,830	518	190	127
11	135	229	187			116	193	458	1,880	458	207	127
12	132	222	193			116	193	458	1,830	488	200	122
13	161	218	1,540			111	200	518	1,830	458	193	122
14	187	215	1,410		110	111	204	618	1,830	404	167	116
15	180	207	1,240	170		116	207	850	1,900	404	161	116
16	177	193	850			119	211	1,290	1,830	404	180	111
17	161	180	728			122	222	2,450	1,830	355	161	111
18	174	167	583			119	245	2,780	1,540	355	155	109
19	161	161	458			116	268	2,450	1,410	355	161	111
20	167	158	380			111	289	2,130	1,410	355	167	101
21	180		380			111	310	1,980	1,350	310	161	83
22	187		380			114	332	1,410	1,290	289	155	83
23	183	170	380			116	355	1,290	1,080	260	155	85
24	167		355		90	116	355	1,240	1,030	260	149	83
25	161		355			114	355	1,180	1,030	264	149	83
26	167	193	355	160		111	355	1,180	1,030	268	155	83
27	174	187	355			116	380	1,180	1,030	260	155	88
28	180	180	332			116	380	1,180	1,030	252	161	106
29	355	187	310			122	431	1,290	984	237	161	101
30	355	180	289			119	458	1,480	984	229	167	106
31	310		268			127		1,980		229	174	

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

Monthly discharge of Entiat River at Entiat, Wash., for the year ending Sept. 30, 1922

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	355	132	183	11,300
November	310	158	210	12,500
December	1,540	149	417	25,600
January			183	11,300
February			100	5,550
March	127		113	6,950
April	458	132	250	14,900
May	2,780	458	1,100	67,600
June	3,640	984	1,870	111,000
July	893	229	457	28,100
August	237	149	179	11,000
September	161	83	114	6,780
The year	3,640		432	313,000

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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, 1922.

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 of a 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, 11.8 feet December 13 (discharge, 20,800 second-feet); minimum stage recorded, 2.85 feet September 25–27 (discharge, 505 second-feet).

1910–1922: Maximum stage recorded, that of December 13, 1921; minimum discharge, 316 second-feet September 29, 30, 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.

DIVERSION.—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; affected by ice January 13 to February 8, February 14, 15, 20, and 21, and February 25 to March 2; affected by logs May 5–16. Rating curve well defined. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table. Records excellent except for periods represented by flat estimates of discharge.

COOPERATION.—Gage-height record furnished by Quincy Valley Irrigation District.

Discharge measurements of Wenatchee River near Leavenworth, Wash., during the year ending Sept. 30, 1922.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 9	3.12	710	June 2	8.04	9,960
Jan. 18	• 3.88	736	Sept. 23	2.90	524

• Stage-discharge relation affected by ice and logs.

Daily discharge, in second-feet, of Wenatchee River near Leavenworth, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,340	4,490	2,180	1,240		649	745	2,760	8,760	4,110	1,140	790
2	1,140	3,230	2,180	1,220		654	790	3,070	9,840	3,560	1,080	745
3	930	2,320	1,790	1,190		660	880	3,070	11,000	3,740	1,030	700
4	930	2,050	1,660	1,190		660	1,030	3,230	12,100	3,390	980	700
5	880	2,050	1,540	1,190	760	660	980		12,100	3,230	980	700
6	835	2,050	1,420	1,190		660	1,140		11,000	3,070	930	700
7	790	2,460	1,300	1,140		660	1,540		9,570	3,070	880	700
8	745	2,180	1,190	1,080		660	1,540		7,710	2,760	880	700
9	700	1,920	1,190	1,080	790	660	1,480		7,200	2,460	880	620
10	700	1,790	2,320	1,080	790	660	1,420		6,950	2,320	880	620
11	700	1,600	3,740	1,080	790	660	1,420	3,600	6,710	2,180	930	620
12	700	1,420	11,500	980	790	620	1,300		6,710	2,180	980	620
13	700	1,420	20,800		745	620	1,300		6,950	2,050	880	700
14	620	1,420	14,300		745	620	1,300		7,450	1,920	790	660
15	1,030	1,420	9,300		745	620	1,300		7,200	1,790	790	660
16	1,080	1,300	5,550		745	660	1,190		6,710	1,660	790	620
17	1,030	1,190	4,490	800	745	620	1,190	10,400	6,000	1,540	790	620
18	930	1,190	3,920		745	620	1,190	13,200	5,550	1,540	790	620
19	1,080	1,080	3,070		700	620	1,190	11,500	5,330	1,540	790	620
20	1,420	980	2,760		687	660	1,920	9,570	4,900	1,540	790	580
21	1,360	930	2,610		673	660	2,460	7,450	5,110	1,420	790	580
22	1,190	880	2,460		660	660	2,460	6,000	5,110	1,300	745	540
23	1,140	980	2,320		660	660	2,320	4,900	4,900	1,300	745	540
24	1,080	980	2,050		620	620	2,320	4,690	4,690	1,190	745	540
25	1,080	980	1,920		626	620	2,460	4,490	4,490	1,140	745	505
26	1,080	980	1,790	750	631	620	2,760	4,110	4,490	1,080	745	505
27	1,140	1,080	1,660		637	620	2,610	4,110	4,900	1,080	745	505
28	1,420	1,080	1,540		643	620	2,610	4,490	4,900	1,080	745	540
29	4,490	1,080	1,540		-------	620	2,610	5,360	4,490	1,030	745	540
30	4,490	1,190	1,420		-------	620	2,610	6,230	4,300	1,030	835	540
31	4,490	-------	1,420		-------	700	-------	7,450	-------	1,080	790	-------

NOTE.—Gage not read Oct. 1, Nov. 5, 11, Jan. 2, and May 29; discharge determined by interpolation. Braced figures show mean discharge for periods indicated.

Monthly discharge of Wenatchee River near Leavenworth, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 591 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,490	620	1,330	2.25	2.59	81,800
November	4,490	880	1,590	2.69	3.00	94,600
December	20,800	1,190	3,770	6.38	7.36	232,000
January	1,240	-------	915	1.55	1.79	56,300
February	-------	620	723	1.22	1.27	40,200
March	700	620	643	1.09	1.26	39,500
April	2,760	745	1,670	2.83	3.16	99,400
May	13,200	2,760	5,140	8.70	10.03	316,000
June	12,100	4,300	6,900	11.7	13.05	411,000
July	4,110	1,030	2,010	3.40	3.92	124,000
August	1,140	745	850	1.44	1.66	52,300
September	790	505	621	1.05	1.17	37,000
The year	20,800	505	2,190	3.71	50.26	1,580,000

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, 1922.

GAGE.—Water-stage recorder installed March 20, 1919. Vertical staff attached to pier of bridge to gage house; read by 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 recorded during year, 2,515.50 feet at noon June 21 (storage, 153,960 acre-feet); minimum stage recorded, 2,429.45 feet at 6.30 p. m., September 30 (storage, 5,570 acre-feet).

1906–1922: Maximum and minimum stages recorded during climatic year 1922.

STORAGE.—Capacity of new reservoir at crest of spillway, 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.—Water-stage recorder not used. Staff gage read to hundredths twice daily. Records excellent.

COOPERATION.—Complete records furnished by United States Bureau of Reclamation.

Daily storage, in acre-feet, of Keechelus Lake near Martin, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	29,300	32,620	52,260	99,950	106,550	111,030	115,990	119,820	147,370	153,420	101,830	16,740
2	28,880	33,300	55,360	100,320	106,800	111,260	116,230	120,920	147,640	152,240	99,690	15,260
3	28,490	33,870	56,800	100,580	107,020	111,400	116,630	121,960	147,500	151,560	96,810	14,240
4	28,090	34,360	57,810	100,810	107,250	111,550	116,910	123,590	147,270	150,900	93,860	13,310
5	27,610	34,870	58,590	101,110	107,540	111,720	117,200	125,450	146,630	150,140	90,530	12,430
6	26,490	35,330	59,300	101,400	107,780	111,830	117,310	126,870	146,980	149,320	87,110	11,650
7	24,880	41,350	59,870	101,670	107,940	112,000	115,750	128,070	148,840	148,470	83,580	11,010
8	23,200	36,340	60,400	101,910	108,110	112,130	113,800	129,100	150,470	147,300	80,130	10,620
9	21,640	36,720	60,880	102,160	108,240	112,260	113,170	129,860	151,960	145,880	76,550	10,110
10	20,060	37,100	61,960	102,430	108,390	112,430	113,410	130,490	152,690	145,260	73,090	9,620
11	19,050	37,450	67,470	102,620	108,560	112,520	113,710	131,060	152,820	142,440	69,610	9,230
12	19,160	37,850	79,750	102,800	108,730	112,670	113,840	131,740	152,870	140,680	66,160	8,930
13	19,370	38,240	88,100	102,970	108,840	112,910	114,020	132,510	153,370	138,860	62,790	8,690
14	19,580	38,720	90,840	103,130	108,920	113,080	114,240	133,620	153,550	136,910	59,340	8,450
15	19,930	39,190	92,360	103,320	109,050	113,230	114,410	135,280	152,390	135,160	56,050	8,210
16	20,180	39,590	93,390	103,530	109,390	113,340	114,500	137,750	153,100	133,290	52,790	7,980
17	20,530	39,900	94,110	103,780	109,620	113,430	114,580	141,120	153,420	131,170	49,700	7,750
18	20,870	40,270	94,880	103,880	109,840	113,780	114,630	143,420	153,250	129,330	46,620	7,510
19	21,130	40,690	95,200	104,150	110,010	114,100	114,670	144,600	153,320	127,700	43,630	7,310
20	21,510	40,980	95,690	104,360	110,130	114,240	114,800	144,990	153,650	125,930	40,740	7,090
21	21,840	41,390	96,350	104,560	110,260	114,430	115,000	145,160	153,880	124,230	37,880	6,900
22	22,250	41,690	96,690	104,730	110,390	114,580	115,440	145,220	153,730	122,550	34,960	6,730
23	22,470	42,070	97,210	104,820	110,520	114,650	115,810	145,190	153,650	120,790	32,840	6,560
24	22,800	42,360	97,490	104,980	110,580	114,760	116,190	145,020	153,580	118,980	30,910	6,390
25	23,140	42,750	97,810	105,320	110,690	114,870	116,540	144,940	153,550	117,270	29,070	6,250
26	23,770	43,180	98,250	105,630	110,780	114,960	116,940	144,670	153,020	114,930	27,160	6,110
27	24,360	43,730	98,620	105,920	110,840	115,070	117,490	144,280	153,420	112,580	25,160	5,970
28	26,100	44,230	98,860	106,050	110,970	115,240	117,980	144,110	153,500	110,180	23,230	5,860
29	29,110	44,880	99,200	106,130	-------	115,420	118,560	144,530	153,650	107,940	21,260	5,760
30	30,650	46,620	99,420	106,320	-------	115,590	119,090	145,310	153,750	105,840	19,480	5,640
31	31,740	-------	99,560	106,430	-------	115,810	-------	146,360	-------	103,820	18,030	-------

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, Kittitas County, and 9½ miles northwest of Easton.

DRAINAGE AREA.—55 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 18 to November 14, 1903; January 28, 1904, to September 30, 1922.

GAGE.—Inclined staff gage in paved section on left side of outlet works; installed December 2, 1916; read by C. O. Shupe. For description of previous 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, 9.40 feet August 6–14 (discharge, 1,840 second-feet); minimum stage recorded, 0.91 foot November 4–16 (discharge, 2.7 second-feet).

1904–1922: 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 permanent. Rating curve well defined. Gage read twice daily to hundredths. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Complete records furnished by United States Bureau of Reclamation.

Discharge measurements of Yakima River near Martin, Wash., during the year ending Sept. 30, 1922.

[Made by R. O. Crawford.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 7	7.47	987	Aug. 8	9.40	1,940
June 21	3.95	183	Sept. 23	3.81	166
July 18	7.10	896			

Daily discharge, in second-feet, of Yakima River near Martin, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	391	3	3	3	3	3	3	12	1,100	838	1,070	716
2	340	3	3	3	3	3	3	12	1,520	550	1,240	637
3	340	3	3	3	3	3	3	12	1,740	550	1,650	497
4	340	3	3	3	3	3	3	12	1,740	550	1,650	497
5	430	3	3	3	3	3	3	12	1,420	550	1,740	497
6	700	3	3	3	3	3	568	12	400	550	1,840	440
7	1,020	3	3	3	3	3	1,430	12	42	622	1,840	382
8	988	3	3	3	3	3	1,180	12	41	812	1,840	332
9	924	3	3	3	3	3	86	12	92	926	1,840	317
10	860	3	3	3	3	3	74	12	570	960	1,840	302
11	195	3	4	3	3	3	74	12	624	980	1,840	257
12	4	3	5	3	3	3	74	12	724	1,030	1,840	236
13	3	3	4	3	3	3	74	12	359	1,030	1,840	229
14	3	3	3	3	3	3	74	12	1,100	1,030	1,840	243
15	3	3	3	3	3	3	74	12	752	1,030	1,760	222
16	3	3	3	3	3	3	74	12	200	1,070	1,700	195
17	3	3	3	3	3	3	74	329	682	1,100	1,700	165
18	3	3	3	3	3	3	74	536	614	995	1,620	154
19	3	3	3	3	3	3	74	622	390	926	1,560	189
20	3	3	3	3	3	3	74	622	561	926	1,560	171
21	3	3	3	3	3	3	74	622	533	926	1,600	183
22	3	3	3	3	3	3	74	622	435	926	1,520	177
23	3	3	3	3	3	3	74	607	618	926	1,030	177
24	3	3	3	3	3	3	74	562	490	926	1,030	165
25	3	3	3	3	3	3	74	607	738	995	1,030	143
26	3	3	3	3	3	3	74	637	413	1,180	1,030	135
27	3	3	3	3	3	3	57	637	279	1,260	1,030	126
28	3	3	3	3	3	3	12	637	387	1,260	1,030	120
29	3	3	3	3	------	3	12	637	316	1,140	995	114
30	3	3	3	3	------	3	12	741	296	1,070	893	120
31	3	------	3	3	------	3	------	893	------	1,070	828	------

Monthly discharge of Yakima River near Martin, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 55 square miles.]

Month.	Observed discharge (second-feet).			Run-off (acre-feet).			Discharge without storage (second-feet).		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	1,020	3	213	13,100	+1,980	15,100	246	4.47	5.15
November	3	3	3.00	179	+14,900	15,100	254	4.62	5.16
December	5	3	3.13	192	+52,900	53,100	864	15.7	18.10
January	3	3	3.00	184	+6,870	7,050	115	2.09	2.41
February	3	3	3.00	167	+4,540	4,710	84.8	1.54	1.60
March	3	3	3.00	184	+4,840	5,020	81.6	1.48	1.71
April	1,430	3	154	9,160	+3,280	12,400	208	3.78	4.22
May	893	12	308	18,900	+27,300	46,200	751	13.7	15.79
June	1,740	41	639	38,000	+7,390	45,400	763	13.9	15.51
July	1,260	550	926	56,900	−49,900	7,000	114	2.07	2.39
August	1,840	828	1,480	91,000	−85,800	5,200	84.6	1.54	1.78
September	716	114	271	16,100	−12,400	3,700	62.2	1.13	1.26
The year	1,840	3	337	244,000	−24,100	220,000	304	5.53	75.08

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, 1922.

GAGE.—Friez water-stage recorder on right bank under highway bridge; installed July 12, 1911; inspected by J. F. Huffman. A temporary low-water staff read January 30 to April 6, 1922. Since June 27, 1916, vertical staff on recorder wall. August 12, 1910, to June 27, 1916, vertical and inclined staff on right bank 30 feet below bridge at present datum; prior to August 12, 1910, chain gage on bridge, at datum varying from 0.14 foot higher to 0.12 foot lower than that of present gage.

DISCHARGE MEASUREMENT.—Made from highway bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and cobblestones. One channel at all stages. Control for low water formed by broad riffle about 1,200 feet below gage; riffle drowned out at high water. Control shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 10.80 feet at 2 a. m. December 13 (discharge, 19,500 second-feet); minimum stage recorded, 0.71 foot March 2, 4, and 5 (discharge, 178 second-feet).

1906–1922: Maximum stage measured from high-water marks, 12.5 feet November 14, 1906 (discharge, about 25,600 second-feet); minimum stage recorded, that of March 2, 4, and 5, 1922.

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

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 changed December 13; not affected by ice. Rating curves well defined below 10,000 second-feet. Water-stage recorder inspected 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 Bureau of Reclamation.

Discharge measurements of Yakima River at Cle Elum, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 8	R. O. Crawford	2.92	1,240	June 20	R. O. Crawford	3.60	2,560
20	Parker and Crawford	1.70	548	July 17	do	4.33	3,690
Dec. 8	D. E. Ball	2.56	1,120	Aug. 8	do	4.01	3,120
Feb. 10	do	.80	199	Sept. 22	do	2.68	1,400
May 15	R. O. Crawford	4.66	4,120				

Daily discharge, in second-feet, of Yakima River at Cle Elum, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,600	1,710	3,550	825	197	180	580	1,910	7,330	2,400	2,810	2,600
2	1,440	1,440	3,200	773	197	178	689	2,090	8,300	2,950	2,810	2,600
3	1,340	1,200	2,580	709	197	180	759	2,340	8,800	2,740	3,060	2,470
4	1,240	1,010	2,120	689	197	178	818	2,540	9,050	2,810	2,950	2,340
5	1,200	925	1,760	642	197	178	848	2,670	9,050	2,880	2,950	2,280
6	1,340	871	1,550	611	197	191	941	2,880	7,570	2,880	3,100	2,280
7	1,490	878	1,390	611	197	194	2,090	2,950	5,150	2,880	3,100	2,210
8	1,490	894	1,190	563	197	191	2,670	2,670	4,000	2,880	3,020	2,030
9	1,290	871	1,080	563	197	191	2,090	2,470	3,480	3,100	3,020	1,790
10	1,200	805	1,200	551	197	188	1,360	2,400	3,320	3,320	3,020	1,740
11	1,100	710	3,130	546	188	191	1,260	2,340	3,740	3,320	2,950	1,620
12	605	685	13,500	575	183	199	913	2,340	3,740	3,400	2,880	1,510
13	501	678	17,100	617	191	202	766	2,470	3,480	3,480	2,880	1,510
14	470	691	10,300	675	194	194	759	2,600	3,480	3,400	2,810	1,680
15	465	678	5,970	636	194	208	773	3,740	4,370	3,400	2,880	1,740
16	445	672	4,090	592	194	214	795	5,150	3,560	3,480	2,740	1,680
17	511	623	3,020	557	188	229	795	7,090	2,880	3,560	2,670	1,620
18	543	599	2,540	540	186	242	795	8,300	2,740	3,480	2,670	1,560
19	577	588	2,210	518	188	242	781	8,550	2,670	3,400	2,600	1,460
20	554	593	1,970	491	191	245	795	6,620	2,470	3,480	2,540	1,400
21	549	593	1,680	480	188	252	992	5,550	2,600	3,480	2,470	1,400
22	549	577	1,460	507	194	262	1,340	4,660	2,470	3,400	2,470	1,400
23	532	565	1,300	557	202	279	1,680	4,090	2,810	3,320	2,470	1,400
24	511	554	1,160	598	220	283	1,740	3,910	2,600	3,240	2,540	1,360
25	501	560	1,050	636	197	283	1,740	3,820	2,470	3,100	2,600	1,260
26	495	617	1,020	675	197	297	1,850	3,820	2,670	3,170	2,670	1,210
27	543	678	1,000	781	208	320	1,910	3,560	2,340	3,170	2,810	1,160
28	723	691	918	825	197	320	1,790	3,560	2,210	3,170	2,810	1,100
29	1,660	827	841	759	-------	324	1,680	4,180	2,210	3,100	2,740	1,090
30	2,190	1,440	803	675	-------	349	1,790	5,050	2,090	2,950	2,670	1,070
31	2,000	-------	818	197	-------	460	-------	6,620	-------	2,880	2,600	-------

Monthly discharge of Yakima River at Cle Elum, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 500 square miles.]

Month.	Observed discharge (second-feet).			Run-off (acre-feet).			Discharge without storage (second-feet).		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	2,190	445	957	58,800	+8,440	67,200	1,090	2.18	2.51
November	1,710	554	807	48,000	+24,800	72,800	1,220	2.44	2.72
December	17,100	803	3,080	189,000	+101,000	290,000	4,720	9.44	10.88
January	825	197	612	37,600	+3,400	41,000	667	1.33	1.53
February	220	183	195	10,800	+14,900	25,700	463	.926	.96
March	460	178	240	14,800	+13,000	27,800	452	.904	1.04
April	2,670	580	1,260	75,000	+18,400	93,400	1,570	3.14	3.50
May	8,550	1,910	3,970	244,000	+48,600	293,000	4,770	9.54	11.00
June	9,050	2,090	4,120	245,000	+20,800	266,000	4,470	8.94	9.97
July	3,560	2,400	3,170	195,000	−142,000	53,000	862	1.72	1.98
August	3,100	2,470	2,780	171,000	−144,000	27,000	439	.878	1.01
September	2,600	1,070	1,690	101,000	−76,200	24,800	417	.834	.93
The year	17,100	178	1,920	1,390,000	−109,000	1,280,000	1,770	3.54	48.03

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 Bureau of Reclamation).

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, 1922, when station was discontinued.

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 Mr. and Mrs. Otto Froelich.

DISCHARGE MEASUREMENTS.—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 recorded during year from water-stage recorder, 13.78 feet at 7 a. m. December 15 (discharge, 32,000 second-feet); minimum stage recorded, 2.13 feet September 25 and 27–29 (discharge, 906 second-feet).

1904–1906 and 1914–1922: 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.

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 October 30 to November 2 and March 30 to April 9; not affected by ice. Rating curves fairly well defined. Water-stage recorder inspected daily. Daily discharge ascertained by applying mean daily gage height to rating table. Shifting-control method used October 30 to November 2 and March 30 to April 9. Records good.

COOPERATION.—Complete records furnished by United States Bureau of Reclamation.

Discharge measurements of Yakima River near Prosser, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 15	Parker, Taylor, and Crawford	2.62	1,350	May 22	R. O. Crawford	7.63	9,650
Nov. 7	D. E. Ball	3.91	2,460	June 16	do	6.23	6,780
Dec. 5	do	5.72	5,200	July 14	do	2.86	1,530
Feb. 4	Ball and Mineah	3.24	1,600	Aug. 14	do	2.92	1,620
May 4	R. O. Crawford	5.22	4,630	Sept. 14	do	2.32	1,080
				25	do	2.19	960

Daily discharge, in second-feet, of Yakima River near Prosser, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,140	3,420	3,120	3,200	1,870	1,290	2,520	4,040	8,580	1,870	1,440	1,180
2	2,140	3,420	6,140	3,050	1,660	1,240	2,860	4,040	10,200	1,520	1,390	1,180
3	2,030	3,350	7,260	2,830	1,470	1,240	2,940	4,280	11,400	1,390	1,350	1,260
4	1,870	3,120	6,140	2,690	1,560	1,290	3,420	4,620	12,600	1,570	1,310	1,310
5	1,760	2,900	5,210	2,620	1,610	1,290	4,040	4,790	13,500	1,620	1,350	1,310
6	1,670	2,620	4,490	2,690	1,610	1,340	4,120	5,540	13,800	1,760	1,390	1,310
7	1,620	2,360	4,060	2,690	1,610	1,290	4,280	5,740	13,200	1,720	1,350	1,310
8	1,620	2,300	3,900	2,690	1,560	1,340	5,160	5,740	10,800	1,570	1,440	1,350
9	1,720	2,230	3,740	2,760	1,560	1,520	6,760	5,540	8,810	1,520	1,480	1,350
10	1,760	2,230	3,580	2,620	1,560	1,710	6,760	4,790	7,430	1,480	1,350	1,310
11	1,670	2,110	3,580	2,490	1,560	1,660	5,540	4,280	6,980	1,520	1,350	1,220
12	1,620	2,050	6,350	2,170	1,470	1,560	4,790	3,640	6,980	1,570	1,480	1,140
13	1,520	1,930	14,600	2,110	1,420	1,470	4,280	3,280	6,980	1,520	1,570	1,100
14	1,440	1,870	23,000	2,050	1,420	1,560	4,040	3,220	6,760	1,480	1,570	1,070
15	1,310	1,870	30,400	2,170	1,380	1,560	3,800	4,280	6,550	1,480	1,480	1,030
16	1,220	1,930	21,400	2,230	1,380	1,610	3,500	6,140	6,550	1,440	1,520	990
17	1,310	1,870	12,600	2,490	1,520	1,710	3,220	8,810	6,550	1,440	1,570	990
18	1,350	1,820	8,750	2,720	1,660	1,710	2,940	12,000	5,350	1,440	1,520	1,030
19	1,440	1,870	7,020	2,690	1,710	1,710	2,720	14,500	4,970	1,480	1,440	990
20	1,520	1,870	6,140	2,510	1,660	1,930	2,590	15,500	4,620	1,440	1,390	990
21	1,520	1,520	5,570	2,530	1,610	2,050	2,660	13,800	4,280	1,440	1,310	990
22	1,520	1,710	5,210	2,660	1,560	2,110	3,280	10,200	4,120	1,440	1,220	990
23	1,520	1,610	5,030	2,500	1,610	2,170	4,790	8,350	3,880	1,440	1,180	990
24	1,570	1,560	4,850	2,170	1,520	2,110	5,350	6,980	3,570	1,440	1,140	990
25	1,520	1,760	4,400	2,360	1,380	1,990	5,160	6,140	3,360	1,440	1,100	990
26	1,520	1,870	4,150	2,490	1,380	1,870	4,970	5,740	3,140	1,440	1,070	955
27	1,440	1,870	3,980	2,490	1,470	1,820	4,970	5,540	3,140	1,390	1,030	955
28	1,390	1,930	3,820	2,400	1,380	1,820	4,970	5,160	3,080	1,390	1,070	920
29	1,390	1,990	3,660	2,230	-------	1,820	4,620	4,970	2,590	1,440	1,140	955
30	1,760	2,170	3,500	2,230	-------	1,930	4,280	5,350	2,200	1,440	1,220	955
31	2,720	-------	3,350	2,060	-------	2,090	-------	6,550	-------	1,440	1,180	-------

Monthly discharge of Yakima River near Prosser, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	2,720	1,220	1,630	100,000
November	3,420	1,520	2,170	129,000
December	30,400	3,120	7,390	454,000
January	3,200	2,050	2,500	154,000
February	1,870	1,380	1,540	85,500
March	2,170	1,240	1,670	103,000
April	6,760	2,520	4,180	249,000
May	15,500	3,220	6,570	404,000
June	13,800	2,200	6,870	409,000
July	1,870	1,390	1,500	92,200
August	1,570	1,030	1,340	82,400
September	1,350	920	1,100	65,500
The year	30,400	920	3,210	2,330,000

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 30, 1905, to September 30, 1922.

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) as follows: Highest section installed October 6, 1914, is inclined

and is anchored to rock paving on upstream face of storage dam between outlet conduit and east end of dam; middle section installed October 31, 1914, is inclined and is anchored to rock paving on upstream face of back-fill dam at former outlet of lake; lowest section installed September 28, 1915, is set vertically in dredged channel about halfway between back-fill dam and open water in lake. Original gage, used until September 5, 1911, was a vertical staff on east side of lake at boat landing, 400 feet above temporary crib dam at outlet; zero at elevation 2,226.02 feet. September 6, 1911, until installation of present sections, a vertical staff on face of gate tower at outlet through new storage dam. Recorder inspected by Fred Diener.

EXTREMES OF STORAGE.—Maximum stage recorded during year, 2,261.06 feet at 5.30 p. m. June 30 (storage, 234,730 acre-feet); minimum stage recorded, 2,207.68 feet at 5.30 p. m. September 30 (storage, 41,500 acre-feet).

1906–1922: Maximum stage recorded, 2.261.14 feet at 4 p. m. July 21, 1920 (storage, 235,090 acre-feet); 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 2,258.00 feet. Record of storage or release each month used for determining discharge without storage at gaging station below dam.

ACCURACY.—Water-stage recorder in gage tower used when gates were closed; referred to staff gage once daily. When gates were open staff gage read to hundredths twice daily. Records excellent.

COOPERATION.—Record furnished by United States Bureau of Reclamation.

Daily storage, in acre-feet, of Kachess Lake near Easton, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept
1	106,470	112,160	127,840	172,110	178,800	183,150	187,970	201,250	218,780	234,320	157,020	100,980
2	105,940	112,700	130,610	172,530	178,960	183,240	188,140	202,200	218,600	232,880	154,480	98,100
3	105,330	113,100	131,620	172,650	179,170	183,370	188,520	203,460	218,560	231,530	152,300	95,060
4	104,730	113,430	132,380	172,900	179,630	183,410	188,820	204,930	218,650	229,740	149,400	92,250
5	104,090	113,900	133,200	173,100	179,840	183,490	189,200	206,320	218,470	227,940	147,030	89,430
6	103,560	114,260	133,800	173,310	180,220	183,660	189,420	207,320	218,290	225,930	144,430	86,850
7	103,490	114,660	134,260	173,680	180,340	183,960	189,710	207,280	218,960	223,970	142,080	84,420
8	102,960	114,990	134,780	174,220	180,470	184,040	190,050	206,930	220,240	221,620	140,510	82,330
9	103,100	115,310	135,310	174,800	180,600	184,250	190,480	206,890	221,660	219,400	138,980	80,170
10	103,240	115,560	136,530	175,050	180,680	184,420	191,120	206,670	223,130	216,620	138,210	78,190
11	103,340	115,890	140,740	175,130	180,800	184,590	191,720	206,320	224,600	214,020	137,180	76,430
12	103,450	116,110	150,970	175,220	181,020	184,800	192,140	206,110	225,840	211,250	135,960	74,850
13	103,450	116,470	158,660	175,300	181,140	184,970	192,570	206,020	227,140	208,630	134,900	73,100
14	103,520	116,830	161,710	175,340	181,270	185,100	193,000	206,240	228,480	205,850	133,740	71,060
15	103,660	117,240	163,160	175,420	181,350	185,220	193,470	206,890	229,380	203,200	132,600	68,620
16	103,700	117,490	164,380	175,550	181,480	185,350	193,680	208,590	229,110	200,130	131,590	66,360
17	103,950	117,780	165,310	175,800	181,560	185,480	193,900	210,950	230,000	197,460	130,720	64,360
18	104,050	118,070	166,010	175,840	181,690	185,860	194,150	213,230	230,900	194,750	129,670	62,250
19	104,160	118,470	166,580	176,010	181,770	186,150	194,410	214,810	231,760	191,800	128,660	60,170
20	104,370	118,880	167,150	176,170	181,940	186,360	194,620	215,600	232,660	188,820	127,730	68,150
21	104,690	119,420	167,600	176,340	182,020	186,490	194,920	216,090	233,600	185,730	126,770	56,340
22	104,870	119,750	168,210	176,550	182,190	186,710	195,440	216,570	234,100	182,530	125,770	54,410
23	104,900	120,010	168,740	176,710	182,360	186,740	196,040	216,710	233,560	179,630	124,210	52,600
24	105,150	120,260	169,280	176,960	182,480	186,830	196,640	216,930	233,290	176,800	121,990	50,880
25	105,400	120,700	169,640	177,380	182,610	186,870	197,280	217,240	233,290	174,220	119,500	49,160
26	105,800	121,220	170,010	177,880	182,780	187,040	197,840	217,410	233,290	171,620	117,340	47,520
27	106,220	121,700	170,340	178,210	182,860	187,120	198,490	217,460	233,380	169,240	114,590	45,910
28	107,470	122,180	170,670	178,380	182,990	187,250	199,220	217,370	233,960	166,780	111,910	44,730
29	109,680	122,730	171,040	178,500	-------	187,420	199,870	217,630	234,500	164,340	109,500	43,320
30	110,720	124,250	171,410	178,630	-------	187,590	200,560	218,340	234,680	161,830	106,680	41,830
31	111,510	-------	171,780	178,710	-------	187,800	-------	218,650	-------	159,300	103,980	-------

KACHESS RIVER NEAR EASTON, WASH.

LOCATION.—In sec. 3, T. 20 N., R. 13 E., three-fourths of a mile below Kachess storage dam, one-fourth of a 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, 1922.

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 recorded during year, 6.17 feet on July 20 (discharge, 1,610 second-feet). Practically no flow when gates in dam are closed.

1904–1922: Maximum discharge, 2,240 second-feet (computed from gate opening) August 27, 1920; practically no flow when gates in dam are closed.

ICE.—Stage-discharge relation affected by ice at times.

DIVERSION.—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 changed continuously during period gates were open; not affected by ice. Rating curve revised for 1922 has been used as standard form of curve for this station and changes in control indicated by discharge measurements are assumed to yield curves parallel to this. Water-stage recorder inspected daily except as noted in footnote to table of daily discharge and when gates are closed. Daily discharge for periods when gates were open ascertained by shifting-control method. When gates were closed leakage estimated from knowledge of governing conditions. Records good.

COOPERATION.—Complete records furnished by United States Bureau of Reclamation.

Discharge measurements of Kachess River near Easton, Wash., during the year ending Sept., 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 7	R. O. Crawford	4.00	204	July 18	R. O. Crawford	6.05	1,500
19	G. L. Parker	2.60	55.7	Aug. 8	do	5.23	869
May 16	R. O. Crawford	4.40	451	Sept. 23	do	5.05	918
June 21	do	2.21	*3.0				

* Estimated.

Daily discharge, in second-feet, of Kachess River near Easton, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	216	1	1	2	2	2	3	3	1,360	696	1,260	1,510
2	200	1	1	2	2	2	3	3	1,480	857	1,260	1,510
3	198	1	1	2	2	2	3	3	1,480	911	1,290	1,450
4	193	1	1	2	2	2	3	3	1,480	1,080	1,260	1,420
5	206	1	1	2	2	2	3	3	1,290	1,140	1,260	1,420
6	233	1	1	2	2	2	3	347	778	1,140	1,260	1,360
7	206	1	1	2	2	2	3	607	237	1,200	1,110	1,260
8	87	1	1	2	2	2	3	496	3	1,290	857	1,140
9	1	1	1	2	2	2	3	410	3	1,420	884	1,050
10	1	1	1	2	2	2	3	403	3	1,480	884	967
11	35	1	1	2	2	2	3	403	3	1,450	804	884
12	56	1	1	2	2	2	3	399	3	1,420	753	884
13	56	1	1	2	2	2	3	399	3	1,420	753	995
14	56	1	1	2	2	2	3	406	3	1,420	778	1,110
15	56	1	1	2	2	2	3	422	3	1,450	753	1,140
16	56	1	1	2	2	2	3	471	3	1,510	679	1,110
17	56	1	1	2	2	2	3	607	3	1,510	679	1,080
18	56	1	1	2	2	2	3	679	3	1,480	679	1,050
19	41	1	1	2	2	2	3	607	3	1,510	655	995
20	1	1	1	2	2	2	3	552	3	1,610	655	995
21	1	1	1	2	2	2	2	526	3	1,580	655	939
22	1	1	1	2	2	2	3	475	340	1,480	719	939
23	1	1	1	2	2	2	3	488	557	1,350	1,050	911
24	1	1	1	2	2	2	3	483	349	1,360	1,200	884
25	1	1	1	2	2	2	3	479	303	1,320	1,230	857
26	1	1	1	2	2	2	3	483	262	1,320	1,230	830
27	1	1	1	2	2	2	3	522	112	1,320	1,390	804
28	1	1	1	2	2	2	3	548	2	1,320	1,390	778
29	1	1	1	2	------	2	3	607	32	1,290	1,390	778
30	1	1	1	2	------	2	3	911	132	1,260	1,360	728
31	1	------	1	2	------	2	------	1,110	------	1,260	1,420	------

NOTE.—Gage not read Oct. 11-18; recorder not operating; discharge determined from gate opening and lake stage.

Monthly discharge of Kachess River near Easton, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 64 square miles.]

Month.	Observed discharge (second-feet).			Run-off (acre-feet).			Discharge without storage (second-feet).		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	233	1	65.2	4,010	+4,510	8,520	139	2.17	2.50
November	1	1	1	59.5	+12,700	12,900	215	3.36	3.75
December	1	1	1	61.5	+47,500	47,600	774	12.1	13.95
January	2	2	2	123	+6,930	7,050	115	1.80	2.08
February	2	2	2	111	+4,280	4,390	79.0	1.23	1.28
March	2	2	2	123	+4,810	4,930	80.2	1.25	1.44
April	3	3	3	179	+12,800	13,000	218	3.41	3.90
May	1,110	3	447	27,500	+18,100	45,600	742	11.6	13.37
June	1,480	3	341	20,300	+16,000	36,300	610	9.53	10.63
July	1,610	696	1,320	81,200	−75,400	5,800	94.3	1.47	1.70
August	1,420	655	1,020	62,700	−55,300	7,400	120	1.88	2.17
September	1,510	728	1,060	63,100	−62,200	900	15.1	.236	.26
The year	1,610	1	358	259,000	−65,300	194,000	268	4.19	56.23

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, 1922.

GAGE.—Since November 8, 1916, Stevens 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 storage 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 from water-stage recorder, 18.86 feet at 1.30 a. m. December 13 (storage, 42,560 acre-feet); minimum stage recorded, 2.90 feet September 29 and 30 (storage, 6,040 acre-feet).

1907–1922: 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, 24,100 acre-feet (gage height, 11.3 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. Records excellent.

COOPERATION.—Records furnished by United States Bureau of Reclamation.

Daily storage, in acre-feet, of Cle Elum Lake near Roslyn, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	25,530	27,260	26,240	25,300	15,180	21,120	24,420	26,870	30,380	27,050	10,600	7,660
2	25,350	26,750	27,290	25,210	15,590	21,300	24,490	27,190	31,000	26,870	10,450	7,660
3	25,170	26,310	27,050	25,140	15,820	21,450	24,560	27,380	31,370	26,710	10,490	7,680
4	24,990	26,080	26,730	25,080	16,120	21,620	24,810	27,560	31,600	26,640	10,870	7,700
5	24,870	25,850	26,310	25,100	16,450	21,710	24,870	27,800	31,440	26,640	11,210	7,740
6	24,740	25,740	26,040	25,100	16,730	21,870	24,990	27,870	30,910	26,570	11,590	7,760
7	24,690	25,760	25,810	25,030	16,960	22,040	25,370	27,750	30,240	26,400	11,890	7,780
8	24,620	25,880	25,690	24,990	17,290	22,180	25,780	27,610	29,450	26,270	11,890	7,830
9	24,580	25,780	25,510	24,990	17,500	22,290	25,940	27,220	29,070	26,080	11,700	7,890
10	24,510	25,620	25,690	24,990	17,700	22,440	25,900	26,980	28,900	25,650	11,510	7,930
11	24,440	25,370	28,410	24,920	17,960	22,530	25,780	26,820	29,000	25,210	11,300	7,950
12	24,400	25,330	37,580	24,670	18,200	22,600	25,710	26,800	28,900	24,620	11,100	7,870
13	24,380	25,280	39,610	23,810	18,410	22,840	25,620	27,050	28,850	23,970	10,890	7,760
14	24,400	25,300	33,830	22,820	18,630	22,980	25,510	27,870	28,830	23,270	10,680	7,610
15	24,470	25,280	30,640	21,840	18,780	23,090	25,400	28,900	28,880	22,270	10,530	7,490
16	24,580	25,170	29,000	20,680	19,040	23,200	25,330	30,160	28,640	21,340	10,300	7,320
17	24,760	25,100	27,980	19,650	19,260	23,290	25,210	32,020	28,290	20,330	10,020	7,210
18	24,830	25,030	27,380	18,930	19,480	23,560	25,100	32,700	28,030	19,130	9,700	7,090
19	24,990	25,030	26,980	17,890	19,700	23,720	25,120	31,730	27,820	17,910	9,490	6,940
20	25,010	25,030	26,400	17,440	19,890	23,810	25,210	30,350	27,750	16,900	9,280	6,820
21	25,010	25,080	26,340	17,960	20,050	23,970	25,490	29,350	27,800	16,230	9,090	6,670
22	25,030	24,960	26,310	17,910	20,200	24,060	26,100	28,740	27,680	15,590	8,860	6,500
23	25,010	24,920	26,150	16,880	20,380	24,130	26,570	28,200	27,450	14,940	8,690	6,400
24	24,920	24,870	25,990	16,510	20,550	24,150	26,710	28,050	27,240	14,300	8,520	6,270
25	24,900	24,870	25,830	16,190	20,640	24,170	26,780	28,080	27,190	13,660	8,350	6,210
26	24,920	24,990	25,740	15,670	20,810	24,200	26,870	27,910	27,190	13,060	8,230	6,160
27	25,060	25,010	25,600	14,960	20,970	24,220	26,960	27,730	27,420	12,490	8,040	6,120
28	25,510	25,010	25,530	14,340	21,010	24,260	26,910	27,730	27,560	12,040	7,870	6,060
29	27,330	24,900	25,420	14,260	-------	24,310	26,750	28,290	27,500	11,630	7,760	6,040
30	27,980	24,870	25,350	14,680	-------	24,330	26,710	29,190	27,290	11,250	7,720	6,040
31	27,660	-------	25,330	14,920	-------	24,350	-------	29,920	-------	10,890	7,680	-------

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, 1922.

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 recorded during year, from water-stage recorder, 12.50 feet at 1 a. m. December 13 (discharge, 13,300 second-feet); minimum stage, from recorder, 0.62 foot from 5 p. m. January 29 to 4.35 p. m. February 2 (discharge, 39 second-feet).

1904–1922: 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 gradually October 1–5, 31, and December 12. Rating curves used October 6–30 and December 12 to September 30 well defined; that used October 31 to December 11 fairly well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying mean daily gage height to rating table. Shifting-control method used October 1–5. Records good October to December; excellent thereafter.

COOPERATION.—Complete records furnished by United States Bureau of Reclamation.

Discharge measurements of Cle Elum River near Roslyn, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 6	R. O. Crawford	1.92	300	June 20	R. O. Crawford	4.32	1,630
20	G. L. Parker	2.20	402	July 18	do	3.18	890
Dec. 7	D. E. Ball	2.96	625	Aug. 7	do	.86	70.8
Feb. 9	do	.71	49.1	Sept. 22	do	1.58	209
May 15	R. O. Crawford	5.19	2,330				

Daily discharge, in second-feet, of Cle Elum River near Roslyn, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	607	1,250	1,090	392	39	63	172	1,060	3,740	1,260	418	245
2	503	1,030	1,280	371	39	65	179	1,220	4,100	1,190	399	245
3	465	833	1,150	354	42	66	217	1,200	4,360	1,120	216	245
4	392	689	967	345	43	68	273	1,390	4,620	1,090	73	245
5	351	603	808	345	47	68	302	1,570	4,360	1,060	59	248
6	323	582	712	335	47	69	326	1,610	3,860	997	69	248
7	293	603	624	338	48	69	422	1,530	3,380	936	152	245
8	270	624	542	311	49	69	588	1,390	2,760	877	332	245
9	256	603	502	311	49	72	612	1,260	2,610	877	332	245
10	245	542	562	302	50	72	612	1,160	2,560	848	332	242
11	232	502	2,100	293	52	72	574	1,060	2,560	848	326	242
12	229	464	8,700	453	52	75	524	1,060	2,460	877	332	242
13	227	434	11,000	603	55	75	499	1,190	2,360	848	332	282
14	232	438	6,000	661	55	76	465	1,530	2,410	877	332	282
15	224	431	3,500	661	56	78	433	2,220	2,460	877	332	273
16	276	409	2,270	686	57	78	392	3,380	2,220	877	332	267
17	323	372	1,720	661	57	80	364	5,020	2,010	877	332	251
18	364	353	1,390	636	59	81	345	5,580	1,840	877	332	245
19	392	365	1,120	607	60	88	338	4,620	1,680	877	326	240
20	392	359	966	503	60	91	358	3,500	1,610	877	311	229
21	403	334	848	92	60	98	441	2,660	1,640	877	302	224
22	410	343	792	212	63	107	661	2,220	1,570	877	293	217
23	392	331	738	477	63	112	907	1,920	1,420	877	282	200
24	374	316	661	469	63	120	936	1,840	1,320	820	276	190
25	364	322	603	445	63	123	936	1,880	1,290	712	296	186
26	374	353	547	433	63	125	1,030	1,800	1,360	636	329	186
27	414	346	520	445	63	125	1,060	1,680	1,420	529	308	184
28	636	365	486	433	63	135	1,060	1,760	1,460	516	290	179
29	1,600	522	445	177	-------	139	997	2,140	1,460	494	248	177
30	1,980	712	426	39	-------	147	936	2,610	1,360	469	245	174
31	1,460	-------	403	39	-------	159	-------	3,160	-------	441	245	-------

Monthly discharge of Cle Elum River near Roslyn, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 202 square miles.]

Month.	Observed discharge (second-feet).			Run-off (acre-feet).			Discharge without storage (second-feet).		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	1,980	224	484	29,800	+1,950	31,800	517	2.56	2.95
November	1,250	316	514	30,600	−2,790	27,800	467	2.31	2.58
December	11,000	403	1,720	106,000	+460	106,000	1,720	8.51	9.81
January	686	39	401	24,700	−10,400	14,300	233	1.15	1.33
February	63	39	54.2	3,010	+6,090	9,100	164	.812	.85
March	159	63	92.4	5,680	+3,340	9,020	147	.728	.84
April	1,060	172	565	33,600	+2,360	36,000	605	3.00	3.35
May	5,580	1,060	2,140	132,000	+3,210	135,000	2,200	10.9	12.57
June	4,620	1,290	2,410	143,000	−2,630	140,000	2,360	11.6	12.94
July	1,260	441	846	52,000	−16,400	35,600	579	2.87	3.31
August	418	59	283	17,400	−3,210	14,200	231	1.14	1.31
September	282	174	231	13,700	−1,640	12,100	203	1.00	1.12
The year	11,000	39	817	591,000	−19,700	571,000	789	3.91	52.96

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; revised (measured on topographic maps and Pl. 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, 1922.

GAGE.—Stevens continuous water-stage recorder on left bank; installed December 7, 1916; inspected by 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 recorded during year, from water-stage recorder, 10.00 feet at 2 a. m. December 13 (discharge, 14,500 second-feet); minimum stage, from recorder, 1.73 feet at 1 p. m. September 24 (discharge, 225 second-feet).

1905; 1909–1922: Maximum discharge, 18,800 second-feet at 8 a. m. November 24, 1909; minimum discharge, 202 second-feet at 5 p. m. November 20, 1917, and September 23, 1918.

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

DIVERSIONS.—Above all important diversions except Selah Valley and Tieton canals. Diversion through canals added to mean monthly flow to determine natural flow past gage.

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 December 12; slightly affected by ice for very few days in January and February. Possibly affected during periods of low stage by backwater from wing dam at intake of Wapatox canal until after December 12. Effect of backwater probably slight. Rating curves well defined. Water-stage recorder inspected daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good October to February; excellent thereafter.

COOPERATION.—Maintained by United States Bureau of Reclamation in cooperation with Pacific Power & Light Co. United States Bureau of Reclamation made discharge measurements and computed discharge.

Discharge measurements of Naches River below Tieton River, near Naches, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 13	Parker and Crawford	2.23	449	May 19	R. O. Crawford	7.06	7,100
Dec. 12	R. O. Crawford	8.15	9,970	June 17	do	5.45	3,910
Jan. 20	D. E. Ball	3.14	1,090	July 10	do	2.99	1,010
Feb. 3	do	[a] 2.60	646	Aug. 10	do	2.36	544
Apr. 27	R. O. Crawford	4.11	2,030	Sept. 15	do	2.12	404
May 10	do	4.26	2,210				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Naches River below Tieton River, near Naches, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	576	1,100	2,200	1,460	729	539	681	2,140	6,130	1,650	520	473
2	563	1,140	1,800	1,460	694	545	681	2,320	6,800	1,260	551	485
3	551	1,020	1,600	1,460	694	508	800	2,260	7,260	1,500	502	456
4	526	955	1,420	1,420	634	490	978	2,640	7,490	1,650	508	456
5	608	786	1,300	1,460	621	485	932	3,130	7,720	1,600	473	490
6	614	807	1,220	1,460	601	456	1,100	3,060	6,570	1,380	514	479
7	595	793	1,340	1,460	595	473	1,460	2,980	6,130	1,300	508	502
8	576	771	1,300	1,460	608	461	1,600	2,700	5,910	1,140	502	514
9	551	743	1,220	1,420	576	467	1,340	2,380	5,490	1,020	496	479
10	520	722	1,340	1,340	589	461	1,260	2,140	5,280	962	514	456
11	473	708	3,020	1,300	557	433	1,140	2,080	5,080	918	569	444
12	450	681	9,660	1,300	563	461	1,060	2,020	4,880	873	634	461
13	456	667	12,200	1,300	563	456	985	2,200	4,780	793	551	439
14	496	674	7,030	1,300	433	456	962	3,060	4,980	640	532	428
15	557	674	4,490	1,300	601	473	910	4,030	4,580	621	539	395
16	582	654	3,280	1,340	701	473	873	5,700	4,120	589	557	360
17	681	640	2,700	1,340	750	450	851	7,960	3,770	526	526	312
18	757	634	2,500	1,340	729	485	836	8,680	3,520	514	502	281
19	701	520	2,140	1,300	708	502	895	7,260	3,360	557	496	256
20	687	422	1,860	1,060	647	496	1,060	5,910	3,360	563	473	256
21	674	360	1,920	1,060	694	502	1,700	4,580	3,360	563	479	256
22	660	365	1,860	1,060	722	508	2,260	3,860	2,980	563	473	252
23	614	496	1,700	925	701	514	2,080	3,440	2,640	551	485	244
24	582	563	1,650	910	674	502	1,970	3,360	2,440	569	485	225
25	569	563	1,600	962	660	490	2,020	3,280	2,500	569	479	233
26	601	551	1,550	970	627	496	2,080	2,980	2,700	563	485	248
27	595	569	1,460	940	614	514	1,970	2,770	2,700	545	508	294
28	667	634	1,460	873	539	545	1,860	2,770	2,570	520	508	303
29	970	582	1,420	800	-------	551	1,860	3,280	2,380	532	456	290
30	903	1,100	1,420	814	-------	563	1,860	3,940	1,970	532	444	256
31	829	-------	1,420	778	-------	627	-------	5,080	-------	520	456	-------

Estimated monthly natural discharge of Naches River below Tieton River, near Naches, Wash., for the year ending September 30, 1922.

[Drainage area, 942 square miles.]

Month.	Discharge of river in second-feet.			Run-off in acre-feet.					Natural discharge in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	River observed.	Diversions. Selah Valley canal.	Diversions. Tieton canal.	Storage in Bumping Lake reservoir.	Without Storage.	Mean.	Mean per square mile.	
October	970	450	619	38,100	1,990	3,650	−3,060	40,700	662	0.703	0.81
November	1,140	360	696	41,400	-------	-------	+120	41,500	697	.740	.83
December	12,200	1,220	2,620	161,000	-------	-------	+16,700	178,000	2,890	3.07	3.54
January	1,460	778	1,210	74,400	-------	-------	−16,000	58,400	950	1.01	1.16
February	750	433	637	35,400	-------	-------	−6,350	29,000	522	.554	.58
March	627	433	496	30,500	-------	-------	−780	29,700	483	.513	.59
April	2,260	681	1,340	79,700	1,100	738	+1,030	82,600	1,390	1.48	1.65
May	8,680	2,020	3,680	226,000	6,510	16,800	+18,900	268,000	4,360	4.63	5.34
June	7,720	1,970	4,450	265,000	7,060	18,400	+15,400	306,000	5,140	5.46	6.09
July	1,650	514	841	51,700	7,250	19,700	−3,680	75,000	1,220	1.30	1.50
August	634	444	507	31,200	7,710	19,800	−18,500	40,200	654	.694	.80
September	514	225	367	21,800	7,070	15,900	−13,100	31,700	533	.566	.63
The year	12,200	225	1,460	1,060,000	-------	-------	−9,320	1,180,000	1,630	1.73	23.52

NOTE.—The run-off without storage and estimated natural discharge shown in the foregoing table represent natural yield as nearly as may be computed from stream-flow records. They do not take into account depletion due to irrigation above the gaging station amounting to perhaps 6,000 acre-feet a year and unmeasured waste above the gaging station on Selah Valley canal which reaches the river below the river gaging station. Accordingly the actual natural yield is larger than shown.

BUMPING LAKE NEAR NILE, WASH.

LOCATION.—At storage dam in 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, 1922.

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 of a mile above outlet, at different datum.

EXTREMES OF STORAGE.—Maximum stage recorded during year, 3,430.08 feet on July 5 (storage, 39,190 acre-feet); minimum stage recorded, 3,392.50 feet from March 12 to 18 (storage, 2,260 acre-feet).

1911–1922: Maximum stage recorded, 3,430.40 feet from 7.30 a. m. July 11 to 5.30 p. m. July 12, 1921 (storage, 39,630 acre-feet); 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 with storage for gaging station below dam.

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

COOPERATION.—Complete records furnished by United States Bureau of Reclamation Service.

Daily storage, in acre-feet, of Bumping Lake near Nile, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	11,390	8,190	10,800	25,130	9,100	2,990	2,390	3,460	24,240	38,100	33,600	14,830
2	10,990	7,680	12,520	24,600	9,100	2,860	2,480	3,530	26,360	38,520	33,090	14,190
3	10,600	7,150	13,230	24,080	9,110	2,760	2,570	3,670	28,780	38,940	32,510	13,520
4	10,310	6,840	13,940	23,520	9,100	2,670	2,670	4,030	31,850	39,150	31,960	12,850
5	9,990	6,840	14,560	22,950	9,080	2,560	2,720	4,520	34,610	39,190	31,460	12,290
6	9,690	6,820	15,020	22,370	9,070	2,490	2,720	4,810	36,500	39,180	30,830	11,630
7	9,440	6,800	14,930	21,760	9,070	2,430	2,760	4,960	37,700	39,120	30,090	11,020
8	9,120	6,780	14,830	21,220	9,070	2,370	2,820	5,060	37,840	39,120	29,440	10,390
9	8,840	6,740	14,780	20,690	9,030	2,310	2,840	5,020	37,880	39,060	28,850	9,760
10	8,560	6,700	14,780	20,170	9,030	2,290	2,850	4,960	37,840	38,990	28,250	9,140
11	8,340	6,660	16,350	19,600	8,990	2,270	2,880	4,860	37,840	38,880	27,690	8,460
12	8,100	6,570	21,280	19,080	8,950	2,260	2,880	4,930	37,810	38,850	27,160	7,780
13	7,900	6,410	26,740	18,730	8,950	2,260	2,880	5,740	37,850	38,860	26,640	7,130
14	7,720	6,210	28,960	18,400	8,880	2,260	2,850	6,530	37,940	39,010	26,110	6,530
15	7,590	6,000	29,900	18,040	8,430	2,260	2,850	7,530	37,900	39,120	25,590	5,910
16	7,480	5,880	30,320	17,630	7,990	2,260	2,850	8,900	37,780	39,120	25,050	5,310
17	7,380	5,750	30,470	17,310	7,600	2,260	2,840	10,720	37,700	39,120	24,480	4,790
18	7,230	5,790	30,420	16,730	7,230	2,270	2,820	12,690	37,640	39,120	23,880	4,320
19	7,060	5,960	30,230	16,300	6,750	2,310	2,820	14,300	37,630	38,960	23,280	4,060
20	6,940	6,120	29,970	15,810	6,280	2,360	2,850	15,310	37,630	38,660	22,800	3,620
21	6,820	6,280	29,660	15,300	5,810	2,390	2,850	16,140	37,620	38,300	22,250	3,220
22	6,690	6,450	29,400	14,760	5,270	2,420	2,860	16,760	37,490	37,940	21,580	2,990
23	6,580	6,600	29,200	14,200	4,790	2,440	2,960	17,170	37,430	37,520	20,920	2,850
24	6,480	6,830	28,920	13,580	4,210	2,460	3,060	17,640	37,360	37,130	20,240	2,740
25	6,530	7,220	28,500	13,080	3,880	2,450	3,160	18,200	37,360	36,710	19,580	2,600
26	6,570	7,490	28,010	12,500	3,540	2,420	3,220	18,630	37,360	36,320	18,950	2,500
27	6,640	7,690	27,490	11,950	3,280	2,400	3,280	19,020	37,360	35,900	18,200	2,460
28	7,130	7,960	27,030	11,380	3,150	2,380	3,350	19,460	37,360	35,420	17,390	2,430
29	7,980	8,280	26,570	10,820	-------	2,370	3,400	20,070	37,400	34,930	16,730	2,420
30	8,430	8,810	26,100	10,130	-------	2,380	3,400	20,960	37,700	34,470	16,080	2,390
31	8,690	-------	25,540	9,500	-------	2,370	-------	22,340	--------	34,020	15,490	-------

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, 1922.

GAGE.—Stevens water-stage recorder installed June 17, 1913; inspected by J. H. Nelson daily. Since June 17, 1913, vertical staff on left bank, one-fourth mile below spillway of storage dam; reconstructed at same site and datum April 27, 1915. 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, gage height about 0.3 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 4.43 feet at 7 a. m. June 9 (discharge, 1,270 second-feet); minimum stage from recorder, 1.43 feet at 3.35 p. m. May 13 (discharge, 22 second-feet).

1906 and 1909–1922: 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 permanent; not affected by ice. Rating curve fairly well defined. Water-stage recorder inspected daily. Daily discharge ascertained by applying mean daily gage height to rating table or, for a few days when range in stage was considerable, by averaging results obtained by applying mean gage height for shorter intervals. Records fair.

COOPERATION.—Complete records furnished by United States Bureau of Reclamation.

Discharge measurements of Bumping River near Nile, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 4	R. O. Crawford	2.69	249	July 13	Paul Taylor	1.82	56.6
5	do	2.69	259	Aug. 24	do	3.15	408
12	G. L. Parker	2.51	182	Sept. 26	R. O. Crawford	1.96	74.8
June 22	Paul Taylor	3.78	781				

Daily discharge, in second-feet, of Bumping River near Nile, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	272	499	38	451	182	108	62	165	320	200	333	416
2	276	477	151	451	90	96	62	179	333	200	342	421
3	230	412	125	446	89	89	68	195	337	237	369	407
4	230	248	44	441	89	86	70	227	346	316	364	416
5	227	190	44	441	90	81	70	280	355	333	387	426
6	224	190	164	431	89	76	72	303	555	312	416	407
7	221	190	280	431	89	75	75	325	1,160	291	412	426
8	218	187	284	426	89	72	79	325	1,230	257	402	421
9	218	184	284	421	89	70	81	320	1,230	233	387	412
10	197	184	287	412	89	68	84	320	1,160	221	383	397
11	190	182	456	407	87	68	86	307	1,120	209	374	407
12	182	182	606	337	87	66	84	137	1,120	195	364	407
13	174	182	606	276	87	65	84	23	1,120	104	364	383
14	174	182	560	276	136	65	82	25	1,160	90	360	369
15	174	179	510	276	291	63	82	27	1,120	114	378	337
16	174	179	510	276	295	62	81	31	1,040	126	378	303
17	174	151	510	268	291	62	79	206	968	128	374	250
18	172	45	504	268	284	61	79	329	902	166	364	221
19	169	26	493	329	280	62	79	342	867	230	364	190
20	169	27	499	451	284	62	79	342	867	284	360	165
21	165	27	520	441	287	62	82	346	840	291	369	138
22	143	27	368	436	280	62	92	346	754	291	387	116
23	116	27	431	426	261	63	105	346	685	291	426	103
24	90	27	446	421	237	63	112	333	666	291	416	90
25	70	27	472	416	192	63	122	329	691	329	416	78
26	75	27	472	402	158	62	130	329	722	325	446	70
27	75	28	457	383	138	62	140	329	709	320	472	70
28	79	28	451	374	120	62	149	333	678	320	431	68
29	84	28	446	364	------	62	153	337	467	316	412	66
30	87	36	441	360	------	63	156	346	203	312	412	63
31	340	------	446	346	------	61	------	333	------	312	402	------

Monthly discharge of Bumping River near Nile, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 68 square miles.]

Month.	Observed discharge (second-feet).			Run-off (acre-feet).			Discharge without storage (second-feet).		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	340	70	174	10,700	−3,060	7,640	124	1.82	2.10
November	499	26	146	8,690	+120	8,810	148	2.18	2.43
December	606	38	384	23,600	+16,700	40,300	655	9.63	11.10
January	451	268	383	23,600	−16,000	7,600	124	1.82	2.10
February	295	87	171	9,480	−6,350	3,130	56.4	.829	.86
March	108	61	69.1	4,250	−780	3,470	58.1	.854	.98
April	156	62	92.6	5,510	+1,030	6,540	110	1.62	1.81
May	346	23	262	16,100	+18,900	35,000	569	8.37	9.65
June	1,230	203	791	47,100	+15,400	62,500	1,050	15.4	17.18
July	333	90	247	15,200	−3,680	11,500	187	2.75	3.17
August	472	333	389	23,900	−18,500	5,400	87.8	1.29	1.49
September	426	63	268	15,900	−13,100	2,800	47.1	.693	.77
The year	1,230	26	282	204,000	−9,320	195,000	269	3.96	53.64

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, 1922.

GAGE.—Stevens continuous water-stage recorder on right bank about 1,000 feet below intake of Tieton canal; inspected by G. G. Willis. Friez water-stage recorder at same site used July 8, 1911, to October 13, 1918. For description of previous gages see Water-Supply Paper 442.

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 recorded during year from water-stage recorder, 8.15 feet at 1.20 a. m. December 13 (discharge, 6,150 second-feet); minimum stage from recorder, 1.77 feet at 9.20 p. m. August 6 (discharge, 12.5 second-feet).

1907–1922: Maximum stage recorded, that of December 13, 1921; minimum stage from water-stage recorder, 1.55 feet at 6.30 p. m. August 26, 1920 (discharge, 5 second-feet).

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

DIVERSION.—Tieton canal has diverted water above 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 seasons.

ACCURACY.—Stage-discharge relation permanent; slightly affected by ice for very few days in January and February. Rating curve well defined. Operation of water-stage recorder satisfactory, except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair January and February; otherwise good.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Discharge measurements of Tieton River at headworks of Tieton canal, near Naches, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 14	Crawford and Taylor	2.33	183	June 12	R. O. Crawford	4.40	1,170
Dec. 10	R. O. Crawford	3.74	662	July 8	do	3.34	428
Feb. 1	D. E. Ball	*2.88	186	25	D. E. Ball	2.54	110
Apr. 14	R. O. Crawford	3.12	300	Aug. 21	R. O. Crawford	2.22	51.0
May 9	do	3.35	404	Sept. 8	Crawford and VanHorn	1.93	21.8
18	do	4.54	1,290				

* Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Tieton River at headworks of Tieton canal, near Naches, Wash., for the year ending Sept. 30, 1922

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	187	343	777	555	218	194	259	527	1,560	623	139	50
2	187	330	539	540	292	211	263	533	1,780	275	128	52
3	178	317	598	526	275	197	317	504	1,940	574	94	38
4	162	309	717	497	240	194	352	586	2,180	662	69	59
5	168	309	710	496	225	190	357	636	2,240	610	58	54
6	165	304	675	482	221	184	404	568	1,940	527	39	29
7	156	288	649	467	221	187	488	544	1,670	477	53	54
8	153	284	610	453	221	184	504	482	1,460	409	44	39
9	165	271	586	424	221	184	439	424	1,360	371	62	28
10	162	267	630	404	221	184	419	384	1,360	330	78	37
11	156	259	1,260	394	218	181	404	380	1,260	317	148	43
12	153	263	2,660	389	218	190	375	380	1,220	309	134	48
13	153	259	3,790	389	218	187	334	439	1,260	267	46	62
14	187	263	2,180	394	197	187	309	623	1,360	251	38	60
15	267	259	1,460	419	214	187	309	745	1,260	240	31	40
16	326	259	1,170	434	214	187	317	1,050	1,120	194	45	37
17	334	255	961	527	211	178	309	1,310	1,120	172	56	32
18	361	280	1,050	522	207	184	313	1,410	1,050	181	62	26
19	330	263	899	466	190	187	348	1,510	944	194	60	43
20	330	259	781	419	184	184	399	1,310	986	150	33	59
21	334	259	806	375	194	187	527	1,050	986	123	52	69
22	326	259	781	317	204	201	592	876	884	109	34	85
23	317	300	714	304	194	211	544	769	724	96	33	76
24	313	271	693	300	190	218	550	761	662	79	43	104
25	313	263	672	296	218	221	533	761	689	98	42	136
26	326	263	651	288	218	229	466	710	842	96	42	184
27	313	292	613	275	214	204	414	689	876	78	38	225
28	366	304	613	267	187	211	384	675	834	83	46	229
29	414	300	582	263	-------	218	493	817	761	94	39	218
30	375	598	568	263	-------	229	93	1,050	785	98	52	197
31	352	-------	554	248	-------	255	-------	1,360	-------	116	54	-------

NOTE.—Water-stage recorder not operating Dec. 18 to Jan. 8; discharge determined from comparison with records of Naches River below Tieton River.

Combined monthly discharge of Tieton River and canal at headworks of Tieton canal, near Naches, Wash., for the year ending Sept. 30, 1922.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.						Combined run-off.	
	Combined.		River (mean).	Canal (mean).	Combined.		Inches.	Acre-feet.
	Maximum.	Minimum.			Mean.	Per square mile.		
October	414	274	259	59	318	1.32	1.52	19,600
November	598	255	292	----------	292	1.22	1.36	17,400
December	3,790	539	966	----------	966	4.02	4.64	59,300
January	555	248	400	----------	400	1.67	1.92	24,600
February	292	184	216	----------	216	.900	.94	12,000
March	255	178	198	----------	198	.825	.95	12,200
April	592	259	407	12	419	1.75	1.95	24,900
May	1,820	635	770	273	1,040	4.33	4.99	64,000
June	2,550	972	1,240	310	1,550	6.46	7.21	92,200
July	982	401	265	321	586	2.44	2.81	36,000
August	470	353	61.0	322	383	1.60	1.84	23,600
September	415	302	80.4	267	347	1.45	1.62	20,600
The year	3,790	178	430	----------	561	2.34	31.75	406,000

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, 1922.

GAGE.—Float gage installed in a stilling well about 500 feet below canal intake; read by 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, 5.35 feet on July 17 (discharge, 325 second-feet). No flow October 16 to April 22.

1910–1922: Maximum stage recorded 5.53 feet for few hours September 9, 1921 (discharge, 344 second-feet); no flow when head gates are closed.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 14	G. L. Parker	2.51	114	July 11	H. L. Morisette	5.28	310
May 6	H. L. Morisette	3.49	193	24	D. E. Ball	5.29	310
8	do	4.48	261	Aug. 21	R. O. Crawford	5.32	324
12	do	5.11	310	21	do	5.31	313
25	do	5.10	302	Sept. 8	Van Horn and Crawford	5.02	299
June 9	do	5.12	302				
23	do	5.09	300	8	Crawford and Van Horn.	5.05	309
July 11	do	5.27	322				

Daily discharge, in second-feet, of Tieton canal near Naches, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1	122		108	310	319	322	321
2	123		129	309	319	321	322
3	123		153	310	320	323	320
4	123		153	309	320	322	320
5	123		171	310	319	323	315
6	122		205	310	320	322	313
7	123		222	309	320	322	309
8	123		250	310	320	322	303
9	123		279	310	319	322	299
10	123		296	311	320	322	295
11	123		299	309	320	322	293
12	123		310	310	320	323	290
13	121		311	310	320	322	286
14	122		310	310	320	323	280
15	123		310	310	320	322	276
16			310	310	322	322	276
17			310	310	325	322	275
18			309	310	324	322	276
19			311	306	324	320	278
20			309	302	322	321	269
21			309	310	322	322	265
22		0	309	308	323	321	253
23		29	310	309	322	320	240
24		29	310	310	323	322	234
25		29	310	311	322	321	219
26		29	310	313	322	322	203
27		54	310	314	323	321	190
28		54	310	315	323	321	177
29		67	310	317	322	322	167
30		82	310	319	322	323	154
31			310		323	322	

NOTE.—Canal dry during periods for which discharge is not shown.

Monthly discharge of Tieton canal near Naches, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	123	0	59.4	3,650
April	82	0	12.4	738
May	311	108	273	16,800
June	319	302	310	18,400
July	325	319	321	19,700
August	323	320	322	19,800
September	322	154	267	15,900

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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, 1922.

GAGE.—Stevens continuous water-stage recorder on left bank, about 300 feet southeast of ranch house; installed April 6, 1919; inspected by G. A. Hill, Roy Nicklas, and R. S. Skillin. 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 eight-day water-stage recorder at same site and datum.

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 50 feet below gage installed in November, 1915. Stage of zero flow at time of construction of control, gage height 1.45 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 3.75 feet at midnight May 17 (discharge, 456 second-feet); probably higher during winter while station was not in operation. Minimum stage from recorder, 1.61 feet on November 21 (discharge, 7.6 second-feet); actual minimum probably occurred in the winter while station was not in operation.

1907–1922: Maximum stage recorded, 4.60 feet at 9 a. m. June 18, 1916 (discharge, 728 second-feet); minimum stage recorded, 1.55 feet from 5 to 9 p. m. November 8, 1920 (discharge, 6.8 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 while records were discontinued. Rating curves well defined below 400 second-feet. Operation of water-stage recorder fairly satisfactory except as noted 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. Records excellent for April to July, otherwise good.

Discharge measurements of North Fork of Ahtanum Creek near Tampico, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 15	John McCombs	1.89	24.2	May 21	R. S. Skillin	3.12	245
15	do	1.88	21.6	June 18	do	2.76	156
Apr. 17	Kilgore and Skillin	2.08	45	July 7	do	2.17	59.4
17	do	2.08	45	29	do	1.94	33.3

Daily discharge, in second-feet, of North Fork of Ahtanum Creek near Tampico, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	20	20	-------	106	318	77	30	19
2	20	20	-------	119	345	74	30	19
3	19	19	-------	117	351	68	29	17
4	19	19	-------	136	379	64	29	17
5	19	19	-------	153	379	61	28	18
6	19	19	-------	149	318	57	28	19
7	19	19	-------	145	281	55	27	20
8	19	18	-------	134	258	54	26	18
9	19	18	-------	121	244	51	26	17
10	19	18	-------	113	238	50	25	17
11	19	18	-------	110	233	49	25	16
12	19	18	-------	117	217	47	24	15
13	19	18	-------	145	212	45	24	15
14	21	18	-------	187	212	44	23	15
15	23	17	-------	228	196	41	23	15
16	23	17	-------	290	182	40	22	14
17	23	14	48	396	171	40	22	14
18	22	18	48	411	160	39	21	14
19	21	12	56	351	149	37	21	11
20	20	8.7	71	290	145	36	23	
21	20	7.6	108	247	139	35	24	
22	20	16	136	214	130	35	24	
23	20	27	122	204	121	35	22	
24	20	26	115	202	115	34	20	
25	20	21	115	189	110	33	19	18
26	22	17	119	180	108	33	19	
27	20	-------	115	175	101	32	19	
28	25	-------	108	178	94	32	18	
29	25	-------	100	206	88	32	17	
30	22	-------	93	241	81	31	17	25
31	21	-------	-------	290	-------	31	18	-------

NOTE.—Water-stage recorder not operating July 30 to Aug. 17 and Sept. 20–29; discharge determined by interpolation. Braced figures show mean discharge for periods indicated. No record Nov. 27 to Apr. 16.

Monthly discharge of North Fork of Ahtanum Creek near Tampico, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	25	19	20.5	1,260
November 1–26	27	7.6	17.8	918
April 17–30	136	48	96.7	2,690
May	411	106	198	12,200
June	379	81	202	12,000
July	77	31	44.9	2,760
August	30	17	23.3	1,430
September	----------	----------	17.2	1,020

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 mouth of North Fork and 2¾ miles southwest of Tampico, Yakima County.

DRAINAGE AREA.—26 square miles (measured on topographic maps and Pl. I, Water-Supply Paper 369).

RECORDS AVAILABLE.—March 15, 1915, to September 30, 1922.

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 MEASUREMENTS.—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 run July 20, 1919, gage height +0.05 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.75 feet on June 4 (discharge, 144 second-feet); minimum stage probably occurred during winter when record was discontinued.

1915–1922: Maximum stage recorded, 3.1 feet June 19, 1916 (discharge, 216 second-feet); minimum discharge, 4.3 second-feet September 25–26, 1915, and August 22 and 23, 1920.

ICE.—Stage-discharge relation seriously affected by ice; record discontinued during winter.

DIVERSIONS.—Small ditch diverting above gage supplies water to Conrad's hop fields.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed October 17. Rating curves fairly well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table; records good.

Discharge measurements of South Fork of Ahtanum Creek near Tampico, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 16	John McCombs	0.51	8.33	June 18	R. S. Skillin	0.89	36.2
16	do	.51	7.82	July 7	do	.64	15.6
Apr. 17	Kilgore and Skillin	.68	17.8	29	do	.56	10.4

Daily discharge, in second-feet, of South Fork of Ahtanum Creek near Tampico, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1	8.2	21	28	110	18	9.7	6.6
2	7.7	21	30	117	17	9.7	6.2
3	7.7	25	31	131	15	9.2	6.2
4	7.3	28	35	144	15	9.2	6.6
5	7.3	30	41	138	14	8.7	6.2
6	7.3	33	40	124	14	8.7	6.6
7	7.3	47	37	110	14	8.7	7.0
8	7.3	47	32	110	14	8.7	6.2
9	7.3	38	31	97	14	8.2	6.2
10	7.3	35	28	84	14	8.7	6.2
11	7.3	31	28	78	13	9.2	6.2
12	7.3	28	28	71	13	8.7	6.2
13	7.3	26	33	70	13	8.2	5.8
14	8.2	23	38	64	13	8.7	5.8
15	8.2	21	47	51	12	8.2	5.4
16	7.7	18	70	52	12	8.2	5.4
17	8.2	18	104	45	12	7.8	5.8
18	7.8	17	131	36	12	8.2	5.8
19	8.2	19	124	33	12	7.8	5.8
20	8.2	25	97	32	11	7.8	5.8
21	7.8	34	81	29	11	8.2	5.4
22	8.2	37	59	29	12	7.8	5.8
23	8.2	35	60	28	12	7.8	5.4
24	7.8	34	54	26	11	7.8	5.8
25	8.2	33	55	26	11	7.0	5.4
26	9.2	34	50	25	12	7.0	5.8
27	8.7	32	51	25	11	6.6	6.2
28	8.7	31	55	22	10	6.6	6.2
29	8.2	29	60	21	10	6.2	6.2
30	8.2	29	70	21	10	6.2	6.2
31	8.2	-------	84	-------	9.7	6.2	-------

NOTE.—No record Nov. 1 to Mar. 31.

Monthly discharge of South Fork of Ahtanum Creek near Tampico, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	9.2	7.3	7.89	485
April	47	17	29.3	1,740
May	131	28	55.2	3,390
June	144	21	65.0	3,870
July	18	9.7	12.6	775
August	9.7	6.2	8.06	496
September	7.0	5.4	6.01	358

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, Yakima County, and 5 miles southwest of White Swan.

DRAINAGE AREA.—124 square miles (measured on Pl. I, Water-Supply Paper 369).

RECORDS AVAILABLE.—February 27, 1909, to September 30, 1922.

GAGE.—Stevens continuous water-stage recorder on left bank half a mile east of ranch house; installed August 19, 1915; inspected by A. B. Morrison. 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. Banks covered with brush; subject to overflow at extremely high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 3.70 feet at 6 a. m. May 18 (discharge, 532 second-feet); minimum stage from recorder, 0.96 foot at 9 p. m. August 25 (discharge, 2.6 second-feet).

1909–1922: Maximum discharge recorded, 1,650 second-feet at noon May 4, 1916; minimum stage recorded, that of August 25, 1922.

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

DIVERSIONS.—Toppenish feeder canal was in operation during entire year. Mean daily diversion ranged from 0.4 second-foot to 22 second-feet. In addition to new acreage, this canal fulfills irrigation requirements formerly taken care of by Nicol and Abe Lincoln ditches, which have been abandoned. Diversion through canal added to mean monthly flow to determine natural monthly flow past gage. Diversion of spring run-off into reservoir on Simcoe Creek for use in irrigating Indian lands in proposed.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent for year; affected by ice November 18–25, January 2–31, February 1–6, and February 28 to March 4. Rating curve well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspection from recorder graph. Records excellent except for extremely low water and for periods during which stage-discharge relation was affected by ice.

COOPERATION.—Gage-height record and some discharge measurements furnished by United States Indian Service.

Discharge measurements of Toppenish Creek near Fort Simcoe, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 19	John McCombs	1.52	15.5	May 5	R. S. Skillin	3.32	374
Apr. 15	Kilgore and Skillin	2.38	125	June 13	do	1.79	39.2
19	do	2.35	116	July 26	do	1.18	5.7
27	R. S. Skillin	2.99	290				

Daily discharge, in second-feet, of Toppenish Creek near Fort Simcoe, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	11	18	313	39			146	237	76	6.0	4.0	4.8
2	11	18	205			30	150	268	70	5.0	3.6	5.5
3	11	18	129				196	277	68	4.0	4.2	4.4
4	11	17	92		20		237	307	66	3.5	4.8	4.0
5	11	17	67			30	212	379	60	3.1	4.6	5.5
6	11	18	59			31	223	362	56	3.4	4.0	6.0
7	11	18	55		26	33	266	339	53	4.8	4.0	6.0
8	11	18	53		30	38	332	295	55	5.0	4.6	6.0
9	11	19	50	30	32	51	263	257	58	5.5	3.9	6.0
10	11	19	50		33	48	223	226	56	5.5	4.6	4.8
11	12	19	96		34	47	194	212	50	5.5	7.5	4.2
12	12	20	202		36	44	170	210	44	4.6	8.0	3.9
13	14	20	221		35	47	150	237	40	3.6	7.0	3.5
14	16	21	155		35	48	135	301	35	3.2	6.5	3.6
15	20	24	115		36	50	123	352	31	5.5	6.0	3.6
16	18	23	84		37	52	113	401	28	5.5	6.0	3.5
17	18	22	62		38	53	95	476	26	5.0	5.0	3.5
18	17		56		39	55	87	461	26	5.0	3.9	3.4
19	16		51		40	117	115	383	23	4.4	3.7	3.6
20	15		50		40	121	170	298	20	4.0	4.4	3.5
21	15	20	49		39	119	251	251	19	5.0	4.8	3.7
22	15		51		38	148	335	218	17	5.0	5.0	4.2
23	16		50	20	36	123	310	196	16	6.0	4.0	5.0
24	15		52		34	95	280	183	14	6.0	3.6	5.0
25	16		51		32	71	268	167	12	4.6	3.1	4.8
26	25	43	50		31	68	280	155	10	5.5	3.6	4.4
27	23	65	49		30	70	283	144	10	5.5	4.4	6.0
28	20	56	48		30	74	263	131	9	5.0	3.8	7.0
29	20	49	46		-------	82	240	121	8	4.8	3.7	7.0
30	19	176	43		-------	86	210	107	7	4.0	4.8	7.0
31	18	-------	41		-------	125	-------	90	-------	4.4	5.0	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated. See paragraph on ice and accuracy.

Monthly discharge of Toppenish Creek and Toppenish feeder canal near Fort Simcoe, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Creek.			Canal (mean).	Combined (mean).	
	Maximum.	Minimum.	Mean.			
October	25	11	15.2	7.3	22.5	1,380
November	176	----------	29.3	5.7	35.0	2,080
December	313	41	86.9	1.6	88.5	5,440
January	----------	----------	25.1	1.7	26.8	1,650
February	40	----------	31.5	2.1	33.6	1,870
March	148	----------	66.0	2.3	68.3	4,200
April	335	87	211	2.3	213	12,700
May	476	90	259	12.7	272	16,700
June	76	7	35.4	22.0	57.4	3,420
July	6	3.1	4.77	14.7	19.5	1,200
August	8	3.1	4.71	10.1	14.8	910
September	7	3.4	4.78	9.7	14.5	863
The year	476	3.1	64.7	7.7	72.4	52,400

NOTE.—Canal discharge determined from complete gage-height record and fairly well defined rating curve.

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 Pl. I, Water Supply Paper 369).

RECORDS AVAILABLE.—November 20, 1915, to September 30, 1922. 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 A. B. Morrison. Previous gages as follow: 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. Right bank high; left bank is overflowed at medium stage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 4.13 feet at 5.15 p. m. December 1 (discharge, 357 second-feet); minimum discharge probably less than 0.1 second-foot sometime September 10–13 and 18–30.

1916–1922: Maximum stage recorded, 6.14 feet at 5 p. m. February 10, 1916, (discharge, 731 second-feet); minimum discharge probably occurred in September, 1922.

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

DIVERSION.—Considerable water is diverted above station for irrigation. Since about April, 1920, Simcoe Creek flume has diverted from 0.1 second-foot to about 6 second-feet from a point just above Spring Creek. Monthly discharge has been corrected for estimated diversion through flume.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 1 and April 18. Rating curve used prior to first change fairly well defined between 10 and 150 second-feet; later curves poorly defined. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean gage height determined from recorder graph by inspection. Records fair.

COOPERATION.—Gage-height record and some discharge measurements furnished by United States Indian Service.

Discharge measurements of Simcoe Creek below Spring Creek, at Fort Simcoe, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 14	Kilgore and Skillin	0.92	[a] 48.3	May 5	R. S. Skillin	1.48	[b] 73
14	do	.92	[a] 46.6	June 13	do	.50	[b] 8.2

[a] Includes measured overflow of 3.1 sec.-ft.
[b] No overflow.

Daily discharge, in second-feet, of Simcoe Creek below Spring Creek, near Fort Simcoe, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.7	0.4	162	14	11	15	41	52	27	4.7	2.0	0.3
2	.9	.4	82	13	11	15	43	54	22	4.7	1.8	.3
3	.7	.4	33	12	11	17	46	57	20	4.3	1.5	.3
4	.7	.4	23	13	11	17	55	59	18	4.0	1.5	.2
5	.7	.4	19	13	11	15	57	72	16	4.3	1.5	.3
6	.7	.4	14	13	10	14	60	75	14	4.3	1.7	.3
7	.7	.5	14	13	11	15	76	72	13	4.0	1.7	.2
8	.9	.5	13	13	11	19	94	70	12	4.0	1.7	.2
9	.9	.4	14	12	11	20	85	60	11	3.8	1.7	.2
10	.9	.5	14	11	11	20	75	54	10	3.8	1.5	.1
11	1.0	.5	20	13	11	20	67	49	8.5	3.8	1.5	.1
12	1.2	.5	70	8.8	11	21	59	48	8	3.6	1.4	.1
13	1.0	.6	116	10	11	22	54	49	8	2.8	1.3	.1
14	.9	.6	85	13	11	24	48	52	8	2.6	1.2	.2
15	.9	.6	64	13	13	25	45	60	7.5	2.8	1.3	.2
16	.7	.6	45	14	14	28	43	70	6	2.8	1.2	.2
17	.6	.6	38	14	14	29	40	94	6	2.8	1.0	.2
18	.6	.6	29	14	18	32	33	120	5	2.8	1.2	.1
19	.7	.6	33	14	18	39	33	115	5	2.6	1.0	.1
20	.6	.5	24	15	16	39	37	101	4.7	2.6	1.0	.1
21	.6	.6	25	14	15	39	46	84	4.7	2.6	1.0	.1
22	.6	1.0	21	14	16	39	60	70	4.7	2.3	1.0	.1
23	.4	2.0	20	14	15	39	68	63	4.7	2.3	1.0	.1
24	.4	2.0	20	14	14	37	65	60	4.7	2.3	.4	.1
25	.4	2.9	19	15	17	34	65	54	4.3	2.3	.3	.1
26	.4	2.6	20	15	16	33	63	49	3.8	2.3	.2	.1
27	.4	2.9	20	14	15	31	62	45	3.8	2.0	.3	.1
28	.4	3.2	20	14	15	33	60	42	4.0	2.0	.3	.1
29	.4	3.5	19	13	-------	33	58	37	4.3	2.0	.3	.1
30	.4	16	16	12	-------	34	54	32	4.7	2.0	.3	.1
31	.4	-------	15	12	-------	40	-------	31	-------	2.0	.3	-------

NOTE.—Water-stage recorder not operating Dec. 18 and 19; discharge determined by interpolation.

Combined monthly discharge of Simcoe Creek below Spring Creek and Simcoe Creek flume, near Fort Simcoe, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Creek.			Flume (mean).[a]	Combined (mean).	
	Maximum.	Minimum.	Mean.			
October	1.2	0.4	0.67	0.1	0.77	47.3
November	16	.4	1.56	.3	1.86	111
December	162	13	36.4	----------	36.4	2,240
January	15	8.8	13.1	----------	13.1	806
February	18	10	13.2	----------	13.2	733
March	40	14	27.0	----------	27.0	1,660
April	94	33	56.4	.2	56.6	3,370
May	120	31	62.9	5	67.9	4,180
June	27	3.8	9.11	6	15.1	898
July	4.7	2.0	3.07	1.5	4.57	281
August	2.0	.2	1.10	.7	1.80	111
September	.3	.1	.16	.5	.66	39.3
The year	162	.1	18.8	----------	20.0	14,500

NOTE.—Probably no flow in canal from Nov. 23 to Apr. 17. Mean discharge for remainder of year estimated from three discharge measurements during 1921–22, and from three to six gage height readings a month.

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, 1922; miscellaneous measurements 1911 and 1912.

GAGE.—Vertical staff on right bank under highway bridge; read by Mrs. M. Gelhart and H. Croon.

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, 4.6 feet on August 2, 3, and 12–18 (discharge, 556 second-feet); minimum stage recorded, 2.58 feet March 18 (discharge, 131 second-feet).

1913–1922: Maximum stage recorded, 8.2 feet on January 2, 1918, from high-water mark (discharge estimated at 1,500 second-feet); minimum discharge recorded, that of March 18, 1922.

ICE.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined. Gage read once daily to quarter-tenths prior to April 12; to hundredths thereafter. Daily discharge ascertained by applying daily gage height to rating table. Records good.

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 year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 14	John McCombs	3.78	361
Apr. 13	Kilgore and Skillin	3.00	203
20	do	2.90	186

Daily discharge, in second-feet, of Reservation drain at Alfalfa, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	420	329	352	243	213	223	184	223	374	420	544	510
2	420	307	374	243	213	213		223	374	465	556	510
3	397	307	352	243	213	213		233	374	465	556	510
4	397	307	329	243	213	213		233	374	488	533	510
5	397	307	329	243	213	213		243	374	510	510	510
6	374	307	329	233	213	213	194	243	374	465	522	510
7	374	285	307	233	213	203		243	397	442	533	510
8	374	285	307	233	213	203		264	420	465	510	488
9	374	285	307	233	223	203		264	420	465	510	488
10	374	285	285	233	223	203		264	442	465	510	488
11	374	285	285	233	223	203		285	465	465	533	488
12	374	285	285	223	223	203	203	285	510	465	556	510
13	374	285	285	223	223	203	203	264	533	465	556	488
14	374	285	329	223	223	203	203	264	533	442	556	488
15	374	285	352	223	223	203	203	254	510	442	556	465
16	374	264	329	223	233	203	203	254	510	465	556	465
17	374	264	285	223	233	167	203	264	510	465	556	465
18	374	264	285	223	243	131	203	285	510	465	556	465
19	374	264	264	223	243		203	285	510	465	533	465
20	374	264	264	223	243		184	285	510	465	522	465
21	374	254	264	223	233		184	329	510	465	510	465
22	374	254	264	223	223		184	329	533	465	510	465
23	352	254	264	223	223		203	329	510	465	510	442
24	352	254	264	223	223		223	329	510	465	510	442
25	329	254	264	223	223	158	223	329	488	465	510	442
26	352	264	264	223	223		223	329	465	488	510	442
27	352	264	254	223	223		223	329	465	510	510	442
28	329	264	254	223	223		223	338	420	510	510	442
29	329	285	254	223	-------		233	347	420	510	510	442
30	329	285	243	223	-------		233	356	420	510	510	442
31	329	-------	243	223	-------		-------	365	-------	533	510	-------

NOTE.—No gage-height record Mar. 17, 19–31, Apr. 2–11, May 28–31, July 29, Aug. 1, 6, 13, 20, 23, 24, 27, Sept. 3, 10, 16, 21, 24, and 29; discharge determined by interpolation.

Monthly discharge of Reservation drain at Alfalfa, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	420	329	369	22,700
November	329	254	279	16,600
December	374	243	292	18,000
January	243	223	228	14,000
February	243	213	223	12,400
March	223	131	183	11,300
April	233	----------	203	12,100
May	365	223	286	17,600
June	533	374	459	27,300
July	533	420	472	29,000
August	556	510	528	32,500
September	510	442	475	28,300
The year	556	131	334	242,000

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, 1922.

GAGE.—Stevens continuous water-stage recorder on left bank; inspected by H. E. and F. L. Larimore and R. S. Skillin.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel; shifting.

EXTREMES OF DISCHARGE.—Maximum discharge during year occurred on December 1, when water-stage recorder was not operating; stage and discharge not determined. Minimum stage from water-stage recorder, 1.25 feet on September 14–22 (discharge, 9 second-feet).

1913–1922: 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, 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 in summer show run-off of Lazy and Dry creeks and seepage return from upper Satus.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 1; affected by drift on control October 1–24; by ice November 20–24 and January 1 to February 10. Rating curve used prior to change fairly well defined; latest curve well defined up to 750 second-feet. Operation of water-stage recorder unsatisfactory through several periods, as indicated 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 a few days when variation in stage was considerable, by averaging results obtained by applying mean gage heights for shorter intervals. Shifting-control method used October 1–24. Records good except during breaks in gage-height record and periods of ice effect.

COOPERATION.—Some measurements and a portion of gage-height record furnished by United States Indian Service.

Discharge measurements of Satus Creek below Dry Creek, near Toppenish, Wash., during the year ending Sept. 30, 1922.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 28	John McCombs	1.55	20.6	June 21	R. S. Skillin	1.77	63.5
28	do	1.55	21.3	28	do	1.60	39.3
Apr. 13	Kilgore and Skillin	2.85	310	28	do	1.60	41.5
18	do	2.48	203	Aug. 5	Albertson and Skillin	1.30	11.2
June 12	R. S. Skillin	2.10	118				

Daily discharge, in second-feet, of Satus Creek below Dry Creek, near Toppenish, Wash., for the year ending Sept. 30, 1922.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	16	24	1,000			57		242	191	30	13	12
2	16	24	654			64	550	239	191	28	13	12
3	16	24	336			64		234	189	26	12	12
4	15	24	237			67	728	239	184	23	12	11
5	15	24	186			64		253	184	21	11	12
					50							
6	15	24	157			62	400	256	172	21	11	12
7	15	24	135			64		245	159	19	11	12
8	15	24	125	50		78	512	234	150	19	11	12
9	15	24	115			107		216	141	19	10	12
10	16	25	112			114	350	201	141	19	10	11
11	16	25	164		64	105		189	127	20	12	10
12	16	25	333		64	98	306	179	115	19	13	10
13	16	25	339		64	119	301	224	108	17	13	9.5
14	16	25	267		61	121	281	177	101	16	12	9
15	16	25	218		65	133	261	184	96	16	12	9
16	17	25	172		67	170	248	196	91	16	12	9
17	18	24	148		85	172	229	221	84	16	11	9
18	17	24	133		105	152	203	245	81	16	10	9
19	18	24	115		92	387	203	261	74	16	10	9
20	18		105		84	433	292	250	68	16	11	9
21	18	20	101		84	403	339	239	64	16	11	9
22	18		99		78	600	360	221	62	16	13	9
23	18		101	40	73		348	206	61	16	13	10
24	18		101		67		327	198	57	16	12	10
25	19	35	99		70		309	196	53	16	11	10
26	24	46	96		67	350	295	184	47	16	11	10
27	27	59	94		64		283	170	43	16	12	11
28	21	134	87		57		269	166	39	16	12	12
29	25	96	86		-------		269	170	36	16	12	12
30	26	582	81		-------		256	175	34	15	11	12
31	24	-------	76		-------		-------	189	-------	14	11	-------

NOTE.—Water-stage recorder not operating Oct. 8–12, 25–28, Dec. 1, Jan. 8–13. Some period or periods not determined Jan. 15 to Feb. 10, Mar. 23 to Apr. 3 and Apr. 5–11; discharge determined by interpolation Oct. 8–12, from daily staff readings Oct. 25–28 and Apr. 8, from comparison with weather records Jan. 1 to Feb. 10. Otherwise missing data supplied from a comparison with records of Toppenish Creek. Braced figures show mean discharge for periods indicated.

Monthly discharge of Satus Creek below Dry Creek, near Toppenish, Wash., for the year ending Sept. 30, 1922.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	27	15	18.1	1,110
November	582	-------	50.5	3,000
December	1,000	76	196	12,100
January	-------	-------	44.8	2,750
February	105	-------	64.7	3,590
March	-------	57	219	13,500
April	728	203	351	20,900
May	261	166	213	13,100
June	191	34	105	6,250
July	30	14	18.3	1,130
August	13	10	11.6	713
September	12	9	10.5	625
The year	1,000	9	109	78,800

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 tables:

Miscellaneous discharge measurements in drainage basins in Washington during the year ending Sept. 30, 1922

Quillayute River basin.

Date.	Stream.	Tributary to or diverting from—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Aug. 10	Soleduck River	Quillayute River	Former gaging station near Fairholm, Wash.	0.70	159
Sept. 14	do	do	do	.34	87
Aug. 9	do	do	Snider ranger station, Wash.	1.68	127
Sept. 14	do	do	do	1.46	78

Dungeness River basin.

Sept. 12	Dungeness River	Strait of Juan de Fuca	500 feet above canyon or gorge; ¼ mile above fish hatchery near Sequim, Wash.	0.80	177
15	Highland Irrigation district canal.	Diverts from right side of Dungeness River just below fish hatchery near Sequim.	On hill above road crossing of river near Sequim, Wash.		6.8

Finch Creek drainage basin.

May 20	Finch Creek	Hood canal	Mouth, Hoodsport, Wash.		21

Skokomish River basin.

Nov. 1	Skokomish River	Hood canal	Olympic Highway bridge near Union, Wash.		4,670
May 20	Big Creek	North Fork of Skokomish River.	Road crossing at mouth, near Lake Cushman, Wash.		32
20	Dow Creek	do	Road crossing near Hoodsport, Wash.		3.1

Snohomish River basin.

Sept. 27	Olney Creek	Wallace River	SE. ¼ sec. 12, T. 28 N., R. 8 E., near Startup, Wash.		36
25	Sultan River	Skykomish River	1½ miles above city of Everett's diversion dam, near Sultan, Wash.		131

Skagit River basin.

Sept. 5	South Fork of Sauk River.	Sauk River	Former gaging station near Barlow Pass, Wash.	4.20	251
3	Whitechuck River	do	Former gaging station near Darrington, Wash.	.80	440

Sanpoil River basin.

Oct. 19	Lost Creek	West Fork of Sanpoil River.	Former gaging station near Aeneas, Wash.	0.56	3.9

Miscellaneous discharge measurements in drainage basins in Washington during the year ending Sept. 30, 1922—Continued.

Methow River basin.

Date.	Stream.	Tributary to or diverting from—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Oct. 13	Chewack Creek	Methow River	Former gaging station below Boulder Creek near Winthrop, Wash.	4.80	72
June 14	Methow Valley Irrigation District canal.	do	1,200 feet above highway bridge at Twisp, Wash.	4.20	8.8
Sept. 28	do	do	do	3.95	12
28	do	do	do	3.80	7.0
28	do	do	do	3.70	2.5
28	do	do	do	4.32	22
28	do	do	do	4.58	21
Oct. 14	do	Right side of Twisp River.	3 miles below headworks at Twisp, Wash.	1.14	18.9
June 15	do	do	do	2.68	50
Sept. 28	do	do	do	1.66	29
Oct. 14	Risley ditch	Right side of Twisp River one-half mile above mouth.	One-half mile below intake	3.81	2.0
June 14	do	do	do	4.56	11.1
Sept. 22	do	do	do	4.75	9.7

Yakima River basin.

Oct. 21	Yakima River	Columbia River	Former gaging station at Umtanum, Wash.	3.71	691
11	do	do	Former gaging station near Parker, Wash.	3.09	923
22	do	do	do	3.06	840
Dec. 9	do	do	do	4.88	3,120
Oct. 7	New Reservation canal	Diverts from Yakima River.	Former gaging station at Parker, Wash.	3.52	339
11	do	do	do	3.53	334
7	Sunnyside canal	do	Former gaging station near Parker, Wash.	3.94	645
17	do	do	do	3.39	512
24	do	do	do	2.77	336
Oct. 18	Toppenish feeder canal	Diverts from left side of Toppenish Creek, 1 mile above gage near Fort Simcoe, Wash.	250 feet below head gates	1.94	7.4
Apr. 15	do	do	do	1.59	2.5
15	do	do	do	2.23	11.7
15	do	do	do	2.70	23
19	do	do	do	1.32	.7
Sept. 14	do	do	do	2.13	11.0
May 5	Simcoe Creek flume	Diverts from left side of Simcoe Creek a short distance above gage near Fort Simcoe, Wash.	Gaging station near headworks.	1.18	2.4
Sept. 14	do	do	do	.33	.6

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