DEPARTMENT OF THE INTERIOR
HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Water-Supply Paper 532

SURFACE WATER SUPPLY OF THE UNITED STATES

1921

PART XII. NORTH PACIFIC SLOPE DRAINAGE BASINS

A. PACIFIC BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

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

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

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
25 CENTS PER COPY

CONTENTS.

ILLUSTRATIONS.

SURFACE WATER SUPPLY OF PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN, 1921.

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, 1921.

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

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

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

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

Annual appropriations for the fiscal years ending June 30, 1895–1922.

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	180,000.00
1922	180,000.00

In this work many private and State organizations have cooperated, either by furnishing records or by assisting in their collection. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected; cooperation of the second kind is acknowledged on page 9.

Measurements of stream flow have been made at about 5,200 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1921, 1,350 gaging stations were being maintained by the Survey and the cooperating organizations. Many miscellaneous discharge measurements were made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the water-supply papers from time to time.

DEFINITION OF TERMS.

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

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

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

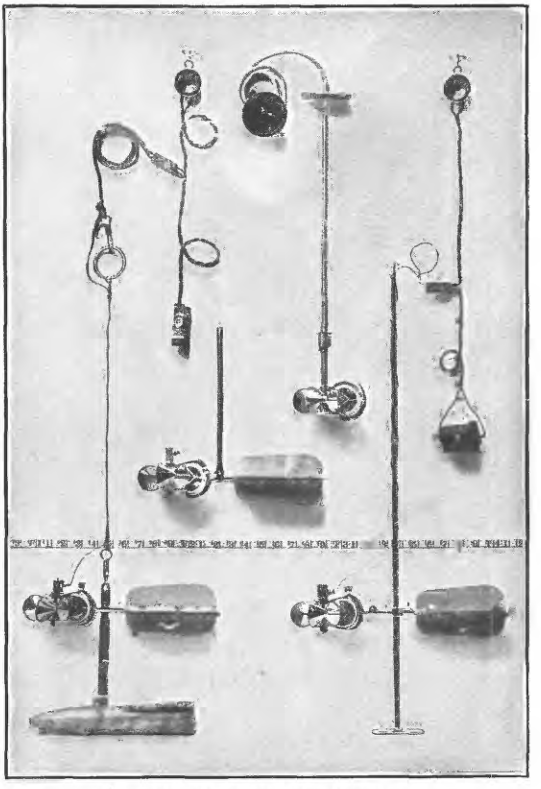
"Run-off in inches" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

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

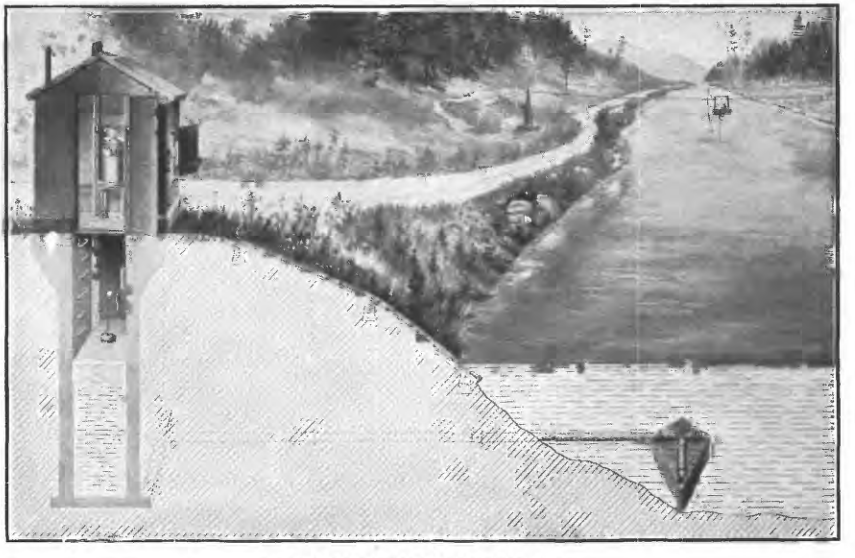
The following terms not in common use are here defined:

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

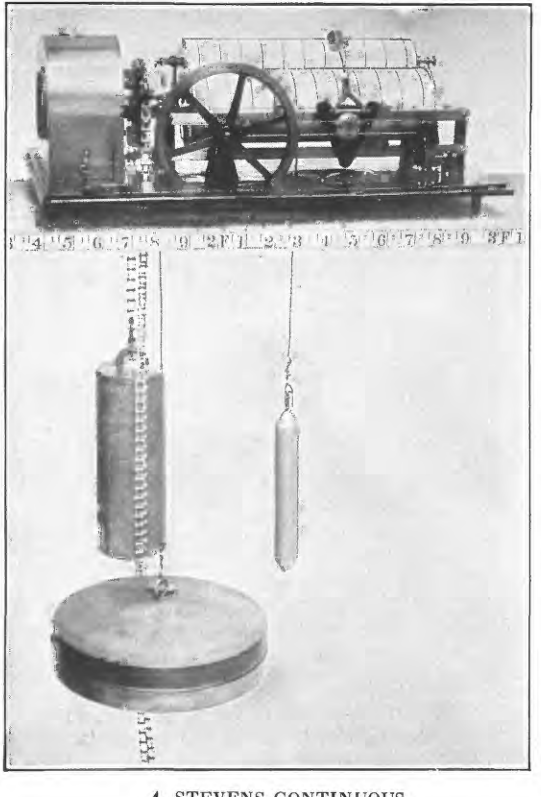
"Control," a term used to designate the section or sections of the stream below the gage which determine the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.



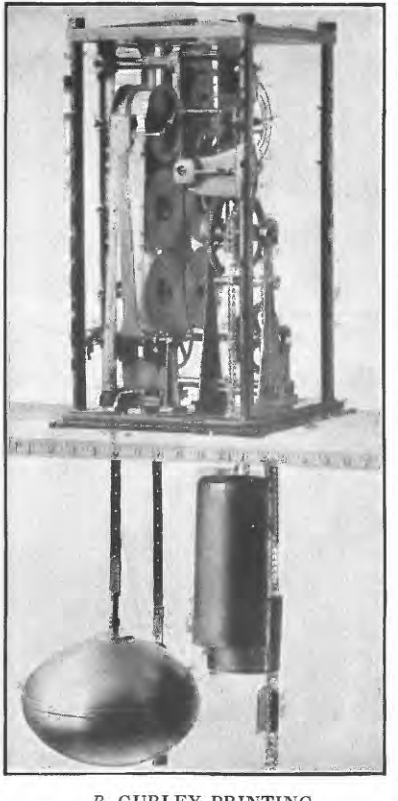
A. PRICE CURRENT METERS.



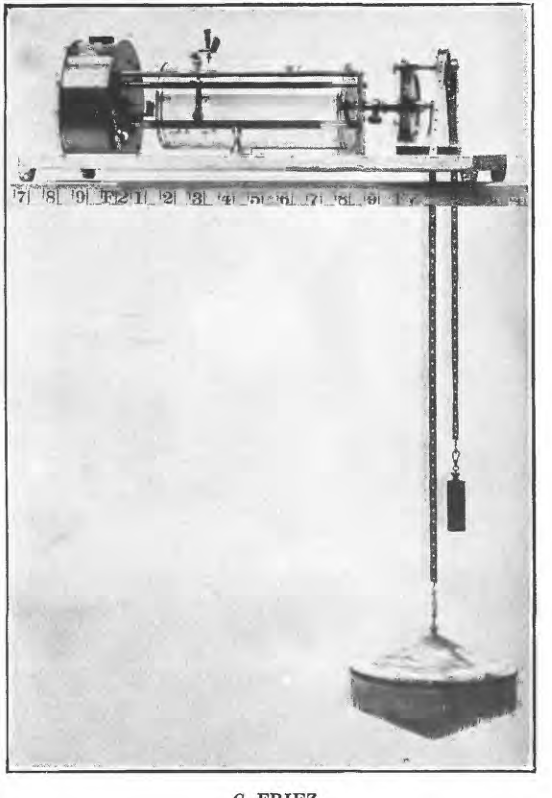
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

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

EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1920, and ending September 30, 1921. At the first of January, in most parts of the United States much of the precipitation in the preceding three months is stored as ground water, in the form of snow or ice, or in ponds, lakes, and swamps, and this stored water passes off in the streams during the spring break-up. At the end of September, on the other hand, the only stored water available for run-off is possibly a small quantity in the ground; therefore, the run-off for the year beginning October 1 is practically all derived from precipitation within that year.

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

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

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

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

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

The table of daily discharge gives the discharge in second-feet corresponding to the mean of the gage heights read each day. At stations on streams subject to sudden or rapid diurnal fluctuation

84390—24†—WSP 532——2

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

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than that given in the column. Likewise, in the column headed "Minimum," the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" gives the average flow in cubic feet for each second during the month. On this average flow computations recorded in the remaining columns, which are defined on pages 2 and 3, are based.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

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

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

For the rating curves "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

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

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

The table of monthly discharge gives only a general idea of the flow at the station and should not be used for other than preliminary estimates; the tables of daily discharge allow more detailed studies of the variation in flow. It should be borne in mind, however, that the observations in each succeeding year may be expected to throw new light on 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., State House.
Asheville, N. C., 6 Government Street.
Chattanooga, Tenn., 37 Municipal Building.
Columbus, Ohio, Brown Hall, Ohio State University.
Chicago, Ill., 1404 Kimball Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Ames, Iowa, State Highway Commission Building.
Rolla, Mo., Rolla Building, School of Mines and Metallurgy.
Topeka, Kans., 23 Federal Building.
Helena, Mont., 52 Montana National Bank Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Idaho Falls, Idaho, 228 Federal Building.
Boise, Idaho, 615 Idaho 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 5,200 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.

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 1921. 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, 1899–1921

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 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.		
												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] 37, 38	38, [e] 39	38, [f] 39	38	38	38
1900 [g]	47, [h] 48	48	48, [i] 49	49	49	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	332C
1913	351	352	353	354	355	356	357	358	359	360	361	362–A	362–B	362C
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

[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 precipition, 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 acts appropriating money.

During the first half of the climatic year the work in Washington was carried on in cooperation with the Board of Geological Survey, composed of Louis F. Hart, governor and chairman of board; W. W. Sherman, State treasurer and secretary of board; Henry Suzzallo, president of the University of Washington; and E. O. Holland, president of the State College. The board was represented in the cooperative investigations by Henry Landes, State geologist. A new administrative code became effective in Washington April 1, which transferred the functioning of the Board of Geological Survey to the Department of Conservation and Development, Dan A. Scott, director. During the last half of the climatic year cooperative relations with the new department 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 the efficient manner in which they represented their States in the cooperative investigations.

Acknowledgments are also due to the United States Bureau of Reclamation, the United States Forest Service, and the United States Office of Indian Affairs for assistance, suggestions, and the freest use of data gathered exclusively for them and paid for by them. The United States Weather Bureau furnished hydrographic and climatologic data used in discharge computation for a number of streams.

The Straits Power Co. cooperated in maintaining the stations on Soleduck River near Fairholm, Wash., and on Lyre River at Piedmont, Wash., the city of Tacoma cooperated in maintaining the stations on North Fork of Skokomish River near Hoodsport, Nisqually River near La Grande, East Creek near Elbe, Little Nisqually River near Alder, and Tacoma power conduit near La Grande, Wash., and the American Nitrogen Products Co. cooperated in maintaining the stations on Whitechuck River near Darrington and Suiattle River below Lime Creek, near Darrington, Wash.

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

DIVISION OF WORK.

Data for stations in Washington and Idaho were collected and prepared for publication under the direction of G. L. Parker, district engineer, assisted by Lasley Lee, J. E. Stewart, D. J. Calkins, R. B. Kilgore, John McCombs, A. C. Baldwin, C. C. Osborn, and A. P. Newberry.

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

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

The manuscript was assembled and reviewed by B. L. Bigwood.

GAGING-STATION RECORDS.

QUINAULT RIVER BASIN.

QUINAULT RIVER AT QUINAULT LAKE, WASH.

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

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

RECORDS AVAILABLE.—October 29, 1911, to September 30, 1921.

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, and not subject to overflow; right bank high, wooded, and subject to overflow above gage height about 20 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 10.9 feet at 11 p. m. February 11 (discharge, 20,100 second-feet); minimum stage, from recorder, 1.65 feet at 10.30 a. m. September 18 (discharge, 765 second-feet).

1911–1921: Maximum stage recorded, 16.3 feet at 8 a. m. January 6, 1914 (discharge, 32,500 second-feet); 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. 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 daily mean gage height obtained by inspecting recorder graph or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent.

Discharge measurements of Quinault River at Quinault Lake, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 6	R. B. Kilgore	3.23	2,380
Sept. 3	John McCombs	2.49	1,500
12	do	1.93	974

Daily discharge, in second-feet, of Quinault River at Quinault Lake, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,340	2,160	3,870	7,570		4,200	1,620	2,550	3,400	4,820	1,910	1,180
2	6,150	2,030	3,790	9,360		4,030	1,620	2,550	3,560	4,280	1,910	1,510
3	8,340	1,910	3,870	9,130	2,800	3,790	1,560	2,620	3,790	3,790	1,850	1,510
4	14,600	1,850	5,390	7,570		3,560	1,510	2,550	4,110	3,480	1,680	1,460
5	12,100	1,680	5,010	8,000	2,690	3,180	1,460	2,350	4,200	3,330	1,620	1,410
6	10,300	1,560	4,460	6,750	2,480	2,830	1,360	2,220	4,370	3,040	1,510	1,310
7	9,840	1,460	4,280	5,580	2,480	2,620	1,310	2,090	5,010	2,970	1,510	1,260
8	7,780	1,360	3,950	5,200	2,480	2,350	1,270	2,030	4,640	3,040	1,560	1,200
9	8,220	1,310	3,790	4,640	2,550	2,160	1,240	1,910	4,280	2,970	1,560	1,160
10	5,010	1,250	4,110	3,870	6,130	2,090	1,260	2,090	4,110	2,830	1,510	1,080
11	7,360	1,180	5,390	3,330	15,000	1,970	1,360	2,480	4,200	2,830	1,460	1,010
12	6,950	1,130	5,200	3,110	17,000	1,850	1,560	2,550	4,200	2,900	1,410	966
13	5,580	1,160	5,200	3,260	10,600	1,730	1,970	2,480	4,110	2,900	1,360	918
14	5,200	1,100	4,370	6,780	7,150	1,680	1,970	2,550	4,550	2,900	1,310	863
15	4,820	1,260	3,630	11,600	5,200	1,620	1,910	2,760	5,010	2,900	1,300	835
16	5,010	1,910	3,040	8,440	4,030	2,220	1,730	3,110	4,550	2,760	1,260	793
17	5,580	4,810	2,900	6,350	3,260	3,500	1,620	3,330	4,030	2,620	1,510	779
18	5,580	6,750	2,970	5,200	2,830	4,460	1,560	3,400	3,630	2,550	2,420	779
19	4,820	8,440	3,180	4,550	2,550	4,110	1,730	3,400	3,710	2,480	2,280	863
20	4,110	8,900	2,970	3,870	2,420	3,630	2,030	3,330	4,200	2,420	1,970	1,430
21	3,630	6,950	2,690	3,330	2,160	3,110	2,420	3,260	5,770	2,280	1,730	4,550
22	3,330	5,390	2,420	2,900	2,220	2,830	3,040	3,260	5,390	2,280	1,510	3,870
23	3,180	4,370	2,350	2,620	2,760	2,620	3,110	3,260	4,820	2,280	1,410	3,480
24	3,260	3,710	2,900	2,480	3,110	2,420	2,970	3,560	4,640	2,350	1,410	2,970
25	3,400	4,110	3,110	2,350	3,180	2,280	2,760	4,030	4,640	2,280	1,460	2,900
26	3,260	4,820	2,970	2,350	3,110	2,090	2,620	4,030	4,640	2,220	1,360	7,070
27	3,110	6,350	3,570	2,620	3,110	1,970	2,480	3,630	5,010	2,160	1,270	7,780
28	3,110	5,770	7,360	2,760	3,710	1,850	2,350	3,110	4,820	2,030	1,180	7,570
29	2,900	5,010	7,780	2,690	-------	1,790	2,480	2,830	4,460	2,030	1,100	5,580
30	2,620	4,370	9,600	2,700	-------	1,680	2,550	2,830	4,820	1,970	1,060	4,110
31	2,350	-------	8,440	2,900	-------	1,620	-------	3,040	-------	1,970	1,040	-------

NOTE.—Water-stage recorder not operating Jan. 30 to Feb. 4; discharge estimated by comparison with records for near-by streams. Braced figure shows mean discharge for period included.

Monthly discharge of Quinault River at Quinault Lake, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 264 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	14,600	2,350	5,640	21.4	24.67	347,000
November	8,900	1,100	3,470	13.1	14.62	206,000
December	9,600	2,350	4,340	16.4	18.91	267,000
January	11,600	2,350	4,960	18.8	21.67	305,000
February	17,000	2,160	4,410	16.7	17.39	245,000
March	4,460	1,620	2,640	10.0	11.53	162,000
April	3,110	1,240	1,950	7.39	8.24	116,000
May	4,030	1,910	2,880	10.9	12.57	177,000
June	5,770	3,400	4,420	16.7	18.63	263,000
July	4,820	1,970	2,760	10.5	12.11	170,000
August	2,420	1,040	1,530	5.80	6.69	94,100
September	7,780	779	2,410	9.13	10.19	143,000
The year	17,000	779	3,450	13.1	177.22	2,500,000

QUILLAYUTE RIVER BASIN.

SOLEDUCK RIVER NEAR FAIRHOLM, WASH.

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

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

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1921, when station was discontinued.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 9.5 feet at 11.30 a. m. February 11 (discharge, 13,100 second-feet); minimum stage, from recorder, 0.88 foot September 17–18 (discharge, 140 second-feet).

1918–1921: Maximum stage, from recorder, 11.7 feet at 6 a. m. December 18, 1917 (discharge, 18,600 second-feet); minimum stage, from recorder, 0.48 foot September 29 and October 2 and 3, 1918 (discharge, 58 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 8,000 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 daily mean gage height determined by inspection of recorder graph or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records fair for periods of flat estimates; otherwise excellent.

Discharge measurements of Soleduck River near Fairholm, Wash., during the period Oct. 1, 1920, to Nov. 13, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-feet.*			*Feet.*	*Sec.-feet.*
June 8	R. B. Kilgore	2.65	835	Sept. 8	John McCombs	1.18	192
9	do	2.72	884	Nov. 13	Parker and Billingska	1.98	518
Sept. 7	John McCombs	1.21	206				

Daily discharge, in second-feet, of Soleduck River near Fairholm, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	938	405	820	1,610	593	1,260	401	588	968	742	334	524
2	1,570	414	767	3,040	645	1,070	427	593	906	645	317	502
3	4,830	458	956	1,760	645	1,110	392	588	1,110	598	309	293
4	3,320	396	1,280	1,420	574	936	371	541	1,260	588		293
5	1,860	358	876	1,770	518	820	350	509	1,110	565		244
6	1,520	334	876	1,220	472	742	342	476	1,260	532		218
7	1,300	309	820	968	652	669	317	476	1,260	546		209
8	968	278	717	936	669	621	309	450	906	569	260	206
9	794	263	693	794	699	593	313	436	876	509		189
10	883	240	819	693	3,880	579	371	666	848	495		179
11	1,600	233	906	645	8,700	536	476	693	936	509		165
12	1,070	230	868	693	3,790	499	598	621	820	522		161
13	906	255	876	762	1,730	481	612	645	876	532		157
14	1,070	274	693	4,530	1,180	450	518	794	876	536		150
15	968	321	607	2,940	936	472	454	876	767	504		146
16	1,070	862	593	1,440	794	717	423	1,040	669	445		144
17	1,070	1,370	616	1,110	717	1,110	401	1,000	645	436		142
18	876	1,530	612	968	669	968	423	1,040	669	445	250	148
19	742	1,860	583	848	645	794	565	1,000	767	450		193
20	669	1,440	532	767	574	693	518	876	1,000	436		1,060
21	742	968	504	669	527	621	772	820	1,070	405		992
22	669	767	468	621	645	574	767	820	820	418		468
23	717	693	513	583	1,110	536	645	820	767	427		468
24	848	621	742	569	1,140	490	574	1,000	820	440	224	371
25	767	1,150	717	527	1,070	481	555	1,070	820	423	227	602
26	669	1,180	669	565	1,000	445	560	876	794	379	193	3,630
27	612	1,580	1,680	645	1,110	427	532	717	876	358	177	
28	621	1,110	3,220	598	1,390	418	588	621	717	358	167	1,000
29	527	1,040	2,120	574	-------	410	669	616	717	354	163	
30	476	936	2,410	565	-------	396	607	717	820	350	159	
31	436	-------	1,480	574	-------	392	-------	906	-------	350	199	-------

NOTE.—Only total range of stage recorded Aug. 4-23; no record September 27-30; discharge estimated by comparison with flow of near-by streams. Braced figures show mean discharge for periods included.

Monthly discharge of Soleduck River near Fairholm, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 79 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,830	436	1,130	14.3	16.49	69,500
November	1,860	230	729	9.23	10.30	43,400
December	3,220	468	969	12.3	14.18	59,600
January	4,530	527	1,140	14.4	16.60	70,100
February	8,700	472	1,320	16.7	17.39	73,300
March	1,260	392	655	8.29	9.56	40,300
April	772	309	495	6.27	7.00	29,500
May	1,070	436	738	9.34	10.77	45,400
June	1,260	645	892	11.3	12.61	53,100
July	742	350	480	6.08	7.01	29,500
August	----------	159	244	3.09	3.56	15,000
September	3,630	142	528	6.68	7.45	31,400
The year	8,700	142	774	9.80	132.92	560,000

LYRE RIVER BASIN.

LAKE CRESCENT AT PIEDMONT, WASH.

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

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

RECORDS AVAILABLE.—April 1, 1919, to September 30, 1921.

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

EXTREMES OF STAGE.—Maximum stage recorded during year, 4.82 feet January 17; minimum stage recorded, 1.48 feet September 16–19.

1919–1921: Maximum stage recorded January 17, 1921; minimum stage recorded, 1.30 feet October 26–29, 1919.

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

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

Daily gage height, in feet, of Lake Crescent at Piedmont, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.42	2.92	3.34	3.92	4.04	3.72	2.56	2.30	2.48	2.46	1.82	1.66
2	2.54	2.90	3.32	4.00	4.08	3.70	2.54	2.30	2.48	2.44	1.82	1.66
3	2.66	2.88	3.34	4.14	4.10	3.60	2.50	2.30	2.50	2.42	1.80	1.66
4	3.00	2.84	3.40	4.16	4.04	3.56	2.50	2.30	2.58	2.42	1.80	1.65
5	3.12	2.80	3.40	4.30	3.94	3.50	2.48	2.32	2.60	2.38	1.78	1.65
6	3.20	2.76	3.40	4.40	3.90	3.48	2.46	2.28	2.64	2.36	1.78	1.64
7	3.22	2.74	3.40	4.42	3.90	3.45	2.42	2.28	2.66	2.34	1.76	1.61
8	3.20	2.72	3.38	4.50	3.88	3.40	2.36	2.26	*2.68	2.32	1.74	1.60
9	3.20	2.76	3.36	4.45	3.92	3.30	2.34	2.30	2.68	2.30	1.72	1.60
10	3.20	2.78	3.40	4.42	3.98	3.25	2.30	2.34	2.70	2.28	1.70	1.58
11	3.28	2.60	3.56	4.40	4.26	3.20	2.30	2.38	2.70	2.26	1.70	1.54
12	3.28	2.58	3.58	4.42	4.70	3.15	2.30	2.34	2.70	2.24	1.68	1.52
13	3.26	2.56	3.70	4.45	4.76	3.10	2.30	2.32	2.70	2.22	1.68	1.52
14	3.28	2.60	3.66	4.50	4.70	3.05	2.28	2.30	2.72	2.20	1.66	1.50
15	3.30	2.64	3.62	4.76	4.64	3.00	2.28	2.30	2.68	2.20	1.66	1.50
16	3.32	2.66	3.60	4.80	4.54	3.00	2.28	2.38	2.64	2.14	1.64	1.48
17	3.36	2.68	3.56	4.82	4.42	3.02	2.28	2.40	2.62	2.12	1.68	1.48
18	3.34	2.74	3.54	4.80	4.30	3.08	2.28	2.42	2.62	2.10	1.68	1.48
19	3.28	2.90	3.48	4.74	4.25	3.00	2.26	2.46	2.62	2.08	1.68	1.48
20	3.24	2.96	3.42	4.68	4.12	2.98	2.26	2.48	2.60	2.04	1.66	1.52
21	3.20	2.98	3.38	4.60	4.00	2.98	2.28	2.48	2.60	2.02	1.70	1.60
22	3.20	3.00	3.34	4.50	3.94	2.90	2.28	2.46	-------	2.02	1.70	1.60
23	3.20	3.04	3.30	4.46	3.90	2.88	2.30	2.48	2.58	2.00	1.68	1.65
24	3.18	3.06	3.30	4.44	3.88	2.84	2.34	2.50	2.58	1.96	1.65	1.65
25	3.18	3.10	3.30	4.40	3.84	2.82	2.30	2.50	2.58	1.94	1.66	1.68
26	3.12	3.18	3.30	4.24	3.82	2.78	2.30	2.48	2.56	1.92	1.66	1.78
27	3.08	3.40	3.30	4.22	3.80	2.74	2.32	2.48	2.56	1.90	1.65	1.78
28	3.04	3.40	3.34	4.16	3.75	2.70	2.32	2.48	2.54	1.88	1.64	1.85
29	3.02	3.36	3.70	4.10	-------	2.66	2.32	2.48	2.52	1.88	1.62	1.85
30	2.98	3.34	3.76	4.00	-------	2.62	2.30	2.48	2.50	1.86	1.62	1.85
31	2.94	-------	3.82	4.00	-------	2.60	-------	2.48	-------	1.84	1.60	-------

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 Lake Crescent and half a mile west of Piedmont, Clallam County.

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

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1921.

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; practically permanent. Stage of zero flow, as determined September 4, 1919, gage height −0.4 foot ±0.25 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 7.12 feet at 1 p. m. February 14 (discharge, 718 second-feet); minimum stage, from recorder, 2.22 feet at 1 p. m. September 17 (discharge, 48 second-feet).

1918–1921: 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.

DIVERSIONS.—None.

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

ACCURACY.—Stage-discharge relation changed February 14. Two rating curves 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.

Discharge measurements of Lyre River at Piedmont, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 8	R. B. Kilgore	4.31	267
10	do	4.30	266
Sept. 8	John McCombs	2.57	78.4

Daily discharge, in second-feet, of Lyre River at Piedmont, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	128	201	285	379	410	511	268	222	242	248	125	83
2	138	189	278	402	402	495	268	222	242	242	120	86
3	166	189	278	426	402	495	254	222	248	235	117	84
4	220	189	292	442	394	479	254	216	254	228	112	82
5	239	183	292	476	379	463	242	209	261	228	108	80
6	252	183	292	476	372	463	242	209	268	222	106	80
7	258	183	292	476	372	448	235	203	275	216	105	78
8	258	177	292	493	364	433	228	197	275	216	101	76
9	252	177	292	493	364	418	228	197	275	209	99	73
10	252	177	299	476	386	418	222	209	275	209	98	69
11	258	172	320	476	459	403	222	216	282	197	96	60
12	258	172	327	476	544	388	222	209	275	197	95	59
13	258	172	349	476	580	373	222	209	282	191	93	56
14	258	172	342	544	661	373	222	209	282	191	91	55
15	258	172	334	580	696	359	216	209	282	185	87	52
16	258	177	327	580	661	359	216	222	275	179	86	52
17	258	183	327	580	644	359	216	228	268	173	94	49
18	258	189	320	562	627	359	209	235	268	173	95	52
19	252	201	313	562	610	359	216	235	261	168	92	57
20	246	213	306	544	593	352	216	242	261	162	90	65
21	246	213	306	527	576	345	222	242	261	156	89	76
22	239	213	299	510	559	338	222	242	261	156	86	77
23	239	213	292	510	559	331	228	242	254	151	86	76
24	232	207	306	493	543	324	228	242	248	146	86	75
25	232	220	299	476	543	317	222	254	248	146	86	82
26	226	246	299	459	527	310	222	254	248	139	86	106
27	220	292	290	459	527	296	216	254	248	136	82	112
28	220	285	327	442	511	296	216	248	248	134	79	116
29	207	285	334	426	-------	282	222	248	248	132	77	116
30	207	285	356	410	-------	275	222	242	248	128	76	117
31	207	-------	364	410	-------	268	-------	242	-------	127	78	-------

Monthly discharge of Lyre River at Piedmont, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 49.5 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	258	128	232	4.69	5.41	14,300
November	292	172	204	4.12	4.60	12,100
December	364	278	311	6.28	7.24	19,100
January	580	379	485	9.80	11.30	29,800
February	696	364	509	10.3	10.73	28,300
March	511	268	377	7.62	8.78	23,200
April	268	209	228	4.61	5.14	13,600
May	254	197	227	4.59	5.29	14,000
June	282	242	262	5.29	5.90	15,600
July	248	127	181	3.66	4.22	11,100
August	125	76	94.2	1.90	2.19	5,790
September	117	49	76.7	1.55	1.73	4,560
The year	696	49	264	5.33	72.53	191,000

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 Prof. Paper 7).

RECORDS AVAILABLE.—October 8, 1897, to December 31, 1901; October 1, 1918, to September 30, 1921.

GAGE.—Since October 17, 1918, Stevens water-stage recorder on left bank; inspected by A. L. Lofstrand and A. C. Wingo. Gage datum 206.29 feet above mean sea level. A wire gage on bridge at same site, but at 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 during year, from water-stage recorder, 6.9 feet at 2.30 p. m. February 11 (discharge, 10,100 second-feet); minimum stage, from recorder, 0.70 foot at 6 p. m. September 11 (discharge, 641 second-feet).

1897–1901; 1918–1921: Maximum stage recorded, 10.6 feet (wire-gage datum) November 27, 1901 (discharge, 23,800 second-feet); minimum stage recorded, 0.80 foot October 18, 1897 (discharge, 170 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed October 3 and February 11, and gradually over the periods November 4 to February 6 and June 1 to July 27. Standard rating curve well defined between 500 and 5,000 second-feet; used October 1–3, February 7–11, and July 28 to September 30. Parallel curves used October 4 to November 3 and February 12 to May 31. Shifting-control method used November 4 to February 6 and June 1 to July 27. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table daily mean gage height obtained by inspecting recorder graph or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 3	A. L. Lofstrand	1.40	1,250	May 11	Lofstrand and Wingo	1.28	1,240
Feb. 7	do	1.46	1,200	June 7	Kilgore and Wingo	3.98	5,250
Mar. 6	do	1.90	1,690	10	do	3.29	3,720
21	do	1.42	1,280	Sept. 6	John McCombs	1.04	848
Apr. 19	do	1.32	1,240	9	do	.93	758

Daily discharge, in second-feet, of Elwha River at McDonald Bridge, near Port Angeles, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,900	1,350	2,000	2,760	1,260	2,550	1,040	1,040	3,250	3,290	1,760	1,120
2	2,480	1,350		3,840	1,300	2,280	1,030	1,040	3,750	2,840	1,760	1,040
3	4,630	1,260		3,290	1,260	2,280	960	1,010	3,840	2,620	1,600	857
4	6,550	1,200	2,480	2,920	1,120	2,160	922	960	4,180	2,550	1,400	843
5	5,660	1,140	2,160	3,140	1,080	1,980	885	952	4,430	2,480	1,300	822
6	4,940	1,090	2,160	2,620	1,020	1,820	864	968	5,210	2,410	1,450	836
7	4,260	1,030	1,930	2,280	1,120	1,710	836	1,020	5,480	2,550	1,600	857
8	3,440	993	1,760	2,280	1,120	1,600	829	1,040	4,430	2,620	1,600	836
9	2,840	955	1,710	2,040	1,170	1,500	871	1,040	3,920	2,410	1,500	777
10	2,770	918	1,930	1,820	4,040	1,500	976	1,300	3,750	2,340	1,350	751
11	4,070	880	2,100	1,660	7,580	1,400	1,260	1,260	3,670	2,410	1,300	705
12	3,060	843	1,880	1,760	6,220	1,300	1,450	1,210	3,590	2,480	1,260	688
13	2,690	915	1,820	1,710	4,260	1,260	1,450	1,300	3,590	2,480	1,260	667
14	2,620	871	1,500	3,740	3,360	1,160	1,300	1,710	3,520	2,550	1,300	657
15	2,410	900	1,400	4,300	2,760	1,210	1,160	2,160	3,140	2,480	1,260	651
16	2,340	1,800	1,350	3,140	2,340	1,500	1,120	2,620	2,840	2,220	1,210	646
17	2,340	3,040	1,350	2,550	2,100	1,820	1,080	2,760	2,690	2,100	1,790	646
18	2,160	3,940	1,350	2,220	1,880	1,820	1,120	2,990	2,690	2,160	1,660	683
19	1,930	4,000	1,300	1,980	1,760	1,600	1,210	3,290	2,920	2,160		777
20	1,820	3,500	1,210	1,760	1,600	1,450	1,210	3,140	3,540	2,160		1,440
21	1,930	2,990	1,120	1,600	1,500	1,350	1,400		4,140	2,040		2,060
22	1,760	2,480	1,080	1,500	1,550	1,300	1,500		3,520	2,040	1,260	1,080
23	2,100	1,980	1,120	1,450	2,040	1,210	1,350		3,360	2,220		1,040
24	2,410	1,930	1,400	1,350	2,220	1,120	1,210		3,520	2,220		915
25	2,220		1,300	1,300	2,280	1,120	1,160	2,700	3,670	2,100		1,230
26	1,980		1,210	1,350	2,160	1,040	1,080		3,590	1,980	857	3,450
27	1,980	2,500	1,750	1,450	2,280	1,020	1,040		3,670	1,820	836	2,550
28	1,980		3,590	1,300	2,690	1,010	1,080		3,360	1,820	829	2,050
29	1,710		3,140	1,300		1,010	1,120		3,290	1,820	836	1,450
30	1,550		3,590	1,300		992	1,040	2,480	3,520	1,760	836	1,210
31	1,450		2,990	1,350		1,000		2,690		1,880	885	

NOTE.—Recorder not operating Nov. 3–11, 20–22, 25–30, Dec. 1–3, May 21–29, July 4–5, and Aug. 19–25; discharge Nov. 3–11, 20–22, and July 4–5 determined by interpolation; for other periods, estimated by comparison with flow of near-by streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Elwha River at McDonald Bridge, near Port Angeles, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 262 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	6,550	1,450	2,770	10.6	12.22	170,000
November	4,000	843	1,880	7.18	8.01	112,000
December	3,590	1,080	1,860	7.10	8.19	114,000
January	4,300	1,300	2,160	8.24	9.50	133,000
February	7,580	1,020	2,320	8.85	9.22	129,000
March	2,550	992	1,490	5.69	6.56	91,600
April	1,500	829	1,120	4.27	4.76	66,600
May		952	2,010	7.67	8.84	124,000
June	5,480	2,690	3,670	14.0	15.62	218,000
July	3,290	1,760	2,290	8.74	10.08	141,000
August	1,790	829	1,300	4.96	5.72	79,900
September	3,450	646	1,110	4.24	4.73	66,000
The year	7,580	646	2,000	7.63	103.45	1,450,000

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, 1921.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from slightly damaged record of water-stage recorder, 11.0 feet, probably on February 11 (discharge, 5,680 second-feet); minimum stage, from recorder, 1.23 feet September 17–18 (discharge, 176 second-feet).

1913–1921: Maximum stage estimated at 23.5 feet January 6, 1914, during part of day when recorder was not operating (discharge, estimated 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 February 11–12. Two rating curves well defined. Operation of water-stage recorder excellent 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 of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent.

Discharge measurements of North Fork of Skokomish River near Hoodsport, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Dec. 31	McCombs and Taylor	5.83	1,820
Sept. 5	John McCombs	1.65	259
10	----do	1.44	218

Daily discharge, in second-feet, of North Fork of Skokomish River near Hoodsport, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	997	646	1,240	1,620	854	1,150	598	628	1,320	1,240	524	283
2	1,870	614	1,420	2,160	836	1,070	583	676	1,320	1,030	510	311
3	2,750	598		2,040	818	1,030	538	708	1,360	940	469	294
4	4,440	568		1,670	747	996	493	660	1,460	884	442	271
5	3,500	524		1,670	662	902	448	628	1,410	866	416	254
6	2,800	495		1,420	614	812	403	613	1,460	830	403	245
7	2,800	481	1,550	1,160	630	742	403	613	1,590	848	416	239
8	1,990	453		1,080	662	692	390	628	1,360	884	416	232
9	1,520	439		1,000	696	660	390	628	1,190	812	416	226
10	1,340	412		908	1,340	644	442	812	1,240	777	390	214
11	2,460	399		818	3,930	613	553	902	1,320	812	378	206
12	1,910	386	1,160	782	4,050	583	725	830	1,320	812	365	201
13	1,470	426	1,120	765	2,070	553	704	777	1,190	830	352	192
14	1,370	439	964	1,580	1,460	524	742	884	1,360	812	340	188
15	1,240	453	818	3,080	1,150	538	655	1,070	1,460	794	340	185
16	1,320	1,230	765	1,910	958	742	568	1,190	1,190	725	328	180
17	1,670	2,900	818	1,420	848	1,160	553	1,240	1,070	676	383	176
18	1,820	3,340	1,080	1,240	760	1,410	568	1,190	996	676	613	185
19	1,420	3,810	1,280	1,120	725	1,190	708	1,240	1,070	676	496	214
20	1,160	3,120	1,080	1,000	676	958	812	1,190	1,260	644	403	349
21	1,080	1,990	946	890	628	884	830	1,110	1,740	613	352	1,330
22	1,000	1,720	836	800	613	884	902	1,150	1,460	613	311	754
23	964	1,470	818	730	692	812	830	1,190	1,280	628	287	644
24	1,040	1,240	927	713	848	760	725	1,320	1,320	644	314	538
25	1,160	1,640	872	679	958	725	660	1,500	1,280	628	365	613
26	1,120	1,920	800	730	958	692	613	1,360	1,280	598	328	1,600
27	1,040	2,280	854	872	996	676	583	1,110	1,360	568	297	1,360
28	1,040	1,770	1,910	908	1,150	661	568	940	1,190	538	276	1,110
29	908	1,470	1,920	854	-------	645	613	884	1,150	524	265	777
30	782	1,370	2,520	890	-------	630	613	958	1,320	524	258	628
31	713	-------	1,980	946	-------	614	-------	1,150	-------	524	254	-------

NOTE.—Recorder not operating Dec. 3–11, Mar. 27 to Apr. 5, and Apr. 15; discharge Dec. 3–11 estimated by hydrographic comparison with Quinault River; interpolated for other periods. Braced figure shows mean discharge for period indicated.

Monthly discharge of North Fork of Skokomish River near Hoodsport, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 91 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,440	713	1,640	18.0	20.75	101,000
November	3,810	386	1,290	14.2	15.84	76,800
December	2,520	765	1,290	14.2	16.37	79,300
January	3,080	679	1,210	13.3	15.33	74,400
February	4,050	613	1,120	12.3	12.81	62,200
March	1,410	524	805	8.85	10.20	49,490
April	902	390	610	6.70	7.48	36,300
May	1,500	613	961	10.6	12.22	59,100
June	1,740	996	1,310	14.4	16.07	78,000
July	1,240	524	741	8.14	9.38	45,600
August	613	254	378	4.15	4.78	23,200
September	1,600	176	467	5.13	5.72	27,800
The year	4,440	176	984	10.8	146.95	713,000

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's municipal power plant and 2½ miles southeast of La Grande, Pierce County.

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

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1921; September 5, 1906, to October 31, 1911, fragmentary records showing total flow.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 12.8 feet December 30 (discharge, 11,800 second-feet). Probably no flow at gage for parts of several days in September when entire flow was diverted into power conduit.

1920–21: Maximum stage recorded on December 30, 1920. Probably no flow at gage for parts of days when entire flow is diverted into power conduit.

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

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

ACCURACY.—Stage-discharge relation permanent except as affected by silt, flushed from conduit settling basin and from behind dam, July 21 to September 30. Rating curve for normal control conditions well defined. Rating curves parallel to normal curve used for short periods July 21 to September 20. Shifting-control method used September 21–30. Operation of water-stage recorder satisfactory. Daily discharge ascertained by use of discharge integrator except for extremely high water, when discharge was determined by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent except those for August and September, which are subject to error owing to uncertain backwater effect of silt deposits.

Discharge measurements of Nisqually River near La Grande, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 4	Evans and Lanning	10.04	6,280	Jan. 5	McCombs and Raiter	10.06	6,150
Dec. 30	McCombs and Evans	12.65	11,400	Aug. 26	John McCombs	1.80	51.2
Jan. 4	do	9.14	4,880	30	do	2.48	165

Daily discharge, in second-feet, of Nisqually River near La Grande, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,100	350	940	4,160	1,220	2,780	751	1,270	1,800	1,420		304
2	1,770	356	976	7,400	1,580	2,580	781	1,190	1,830	1,080		191
3	2,920	328	930	7,160	2,280	2,280	860	952	1,870	836	380	
4	5,620	281	1,370	5,370	2,630	2,050	1,020	952	2,040	778		
5	3,940	215	1,130	7,200	2,030	1,800	776	983	2,200	618		
												60
6	2,720	185	904	3,980	1,840	1,580	622	911	2,260	722		
7	2,230	196	690	2,740	1,570	1,300	528	934	2,640	802		
8	2,060	124	575	2,060	1,670	1,020	501	967	2,110	1,010	460	
9	1,420	112	820	1,590	2,240	869	512	905	1,740	857		
10	1,130	71	1,040	1,240	4,680	786	554	1,340	1,640	850		
11	1,780	49	1,850	1,010	7,900	748	965	1,310	1,580	753		35
12	1,980	44	1,420	1,120	8,680	622	1,120	1,180	1,620	738		
13	1,600	34	1,540	1,000	6,320	691	1,400	1,270	1,520	754	400	
14	1,860	64	1,050	1,710	3,810	890	1,080	1,640	1,380	737		
15	2,110	66	752	2,760	2,200	687	872	2,030	1,120	690		
16	1,820	452	660	2,070	1,700	2,100	752	2,330	988	599		
17	1,680	1,990	592	1,670	1,420	8,060	676	2,200	885	708		40
18	1,320	3,360	652	1,490	1,200	7,590	964	1,930	846	641	370	
19	1,030	3,320	775	1,310	1,110	4,250	1,120	1,820	1,180	764		
20	834	2,820	652	1,050	1,140	3,020	1,280	1,760	1,100	717		
21	1,180	2,260	534	867	960	2,650	1,780	1,780	1,320	488		390
22	882	2,080	501	710	1,240	2,240	3,860	1,710	1,360	505		189
23	772	2,190	462	738	2,250	1,930	3,310	1,720	1,330	531	180	96
24	815	1,750	1,540	725	2,400	1,860	2,540	1,870	1,380	686		50
25	800	1,720	1,400	581	2,400	1,960	1,940	2,230	1,350	624		106
26	759	1,760	1,130	560	2,180	1,920	1,750	2,100	1,270	505	114	124
27	646	2,000	1,600	566	2,180	1,320	1,550	1,670	1,070	506	121	162
28	757	1,630	3,340	586	2,510	968	1,480	1,400	928	468	298	357
29	655	1,270	3,950	486	-------	938	1,600	1,260	980	476	256	173
30	528	1,060	10,300	486	-------	892	1,460	1,180	1,300	494	281	122
31	522	-------	6,360	596	-------	806	-------	1,560	-------	588	252	-------

NOTE.—Gage-height record not satisfactory on days for which daily discharge is not shown. Braced figures show mean discharge for periods included as determined from study of gage-height graph and record of flushing operations furnished by city of Tacoma.

Monthly discharge of Nisqually River and Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 287 square miles.]

Month.	Discharge in second-feet.						Combined run-off.	
	Combined.		River (mean.)	Conduit (mean.)	Combined.		Inches.	Acre-feet.
	Maximum.	Minimum.			Mean.	Per square mile.		
October	6,260	1,020	1,590	574	2,160	7.53	8.68	133,000
November	3,870	526	1,070	539	1,610	5.61	6.26	95,800
December	10,900	1,070	1,630	589	2,220	7.74	8.92	136,000
January	7,860	902	2,100	552	2,650	9.23	10.64	163,000
February	9,170	1,430	2,620	480	3,100	10.8	11.25	172,000
March	8,530	----------	2,040	459	2,500	8.71	10.04	154,000
April	4,320	885	1,280	424	1,700	5.92	6.60	101,000
May	2,690	1,320	1,500	385	1,880	6.55	7.55	116,000
June	2,990	1,200	1,490	336	1,830	6.38	7.12	109,000
July	1,790	800	708	315	1,020	3.55	4.09	62,700
August	----------	----------	331	319	650	2.26	2.61	40,000
September	----------	----------	102	354	456	1.59	1.77	27,200
The year	10,900	----------	1,360	444	1,810	6.31	85.53	1,310,000

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 For record of the power conduit see p. 26.

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, 1921.

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 be overflowed at extremely high stages. Artificial wooden control. Stage of zero flow, as determined September 9, 1919, gage height 0.01 foot; August 7, 1920, gage height 0.17 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.7 feet at 4 p. m. March 17 (discharge, 778 second-feet); minimum stage recorded, 0.42 foot August 16 and September 15–17 (discharge, 2.6 second-feet).

1918–1921: 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.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined below 550 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent except for extreme low water.

Discharge measurements of East Creek near Elbe, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 1	1.49	44.8	May 18	1.72	68.5
1	1.49	45.0	29	.45	3.0

Daily discharge, in second-feet, of East Creek near Elbe, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	65	30	76	205	55	172	45	64	35	15	3.9	3.4
2	103	28	82	431	66	147	47	54	34	15	3.9	4.6
3	340	25	75	327	105	127	43	48	38	14	3.8	5.4
4	540	25	138	366	79	105	39	44	42	13	3.6	5.3
5	272	24	107	340	67	86	36	43	41	12	3.6	5.0
6	138	24	83	197	58	76	33	42	38	11	3.4	4.8
7	114	22	67	138	55	64	31	45	37	11	3.4	4.8
8	100	22	70	120	74	54	29	43	29	10	3.4	4.8
9	85	21	93	107	114	47	28	39	27	9.4	3.2	4.5
10	62	20	110	82	272	44	34	90	26	8.7	3.1	4.2
11	164	19	164	69	431	45	35	80	33	8.2	3.1	3.9
12	164	18	138	86	327	39	69	62	30	7.9	3.0	3.4
13	120	18	138	79	197	40	108	59	26	7.6	2.9	3.2
14	138	18	121	213	138	44	66	66	24	7.4	2.9	3.0
15	147	17	82	258	120	156	50	71	24	6.9	2.9	2.8
16	121	20	72	147	89	314	43	107	25	6.7	2.8	2.6
17	110	90	69	156	74	722	38	88	22	6.7	6.2	2.8
18	98	300	71	120	64	457	55	69	26	6.2	11	4.2
19	82	243	70	110	62	258	90	60	25	5.9	7.4	15
20	69	189	70	79	59	156	90	59	24	5.7	5.8	12
21	66	140	65	69	57	123	109	57	26	5.7	4.6	31
22	60	156	75	56	66	90	197	60	22	5.7	4.4	18
23	55	118	107	55	129	87	138	53	20	5.6	4.0	8.4
24	50	107	116	55	164	95	98	54	22	5.3	3.8	8.1
25	55	105	102	51	172	90	85	53	25	5.0	3.5	14
26	49	107	116	52	147	79	83	46	22	4.8	3.4	13
27	43	147	121	48	164	67	74	38	18	4.6	3.2	11
28	41	123	286	45	164	54	75	32	15	4.5	8.2	12
29	39	107	379	43	-------	51	80	33	15	4.4	3.1	10
30	38	89	582	43	-------	50	65	35	16	4.2	3.1	8.2
31	35	-------	243	53	-------	47	-------	36	-------	4.0	3.1	-------

NOTE.—Gage not read Nov. 21 and May 17, and record for June 26-27 and July 3-5 destroyed by fire discharge ascertained by comparison with flow of Little Nisqually River or by interpolation.

Monthly discharge of East Creek near Elbe, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	540	35	115	7,070
November	300	17	79.1	4,710
December	582	65	132	8,120
January	431	43	135	8,300
February	431	55	127	7,050
March	722	39	129	7,930
April	197	28	67.1	3,990
May	107	32	55.8	3,430
June	42	15	26.9	1,600
July	15	4.0	7.81	480
August	11	2.8	3.94	242
September	31	2.6	7.78	463
The year	722	2.6	73.8	53,400

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, 1921.

GAGE.—Stevens continuous 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 at 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 but 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 that of present gage. All gage readings referred to present datum.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

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 in riffle.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 6.15 feet at 11 a. m. December 30, 1920 (discharge, 1,920 second-feet); minimum stage recorded, 0.98 foot September 16 and 17, 1921 (discharge, 8.2 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 1,500 second-feet. Staff gage read to hundredths once daily prior to April 19, 1921, after which, except as noted in footnote to table of daily discharge, operation of water-stage recorder was satisfactory. Daily discharge prior to April 19, 1921, ascertained by applying daily gage height to rating table; thereafter by applying to rating table daily mean gage height obtained from recorder graph by inspection. Records April to September 1921, excellent; others good.

Discharge measurements of Little Nisqually River near Alder, Wash., for the period Aug. 9, 1920, to Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1920.		*Feet.*	*Sec.-ft.*	1921.		*Feet.*	*Sec.-ft.*
Aug. 9	R. B. Kilgore	1.08	11.5	May 18	John McCombs	2.13	176
Sept. 16	H. W. Newton	2.07	150	Aug. 26	do	1.02	10.3
21	do	1.85	112				

Daily discharge, in second-feet, of Little Nisqually River near Alder, Wash., for the years ending Sept. 30, 1920 and 1921.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1920.			1920.			1920.		
1			10	12		21	12	110
2						22	12	
3	15		11	12		23	12	
4			12	12	230	24	12	
5		20	13	12		25	12	
			14	12				170
6	12		15	12		26	12	
7	12					27	16	
8	12		16	12	158	28	24	
9	12	14	17	12		29	83	
			18	12	90	30	48	
			19	12				
			20	12		31	32	

Daily discharge, in second-feet, of Little Nisqually River near Alder, Wash., for the years ending Sept. 30, 1920 and 1921—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920-21.												
1	76	44	154	446	151	449	104	154	88	50	13	15
2	207	44	165	1,130	196	355	100	142	85	44	12	14
3	411	43	154	804	213	317	95	124	86	41	12	13
4	1,200	38	260	548	170	263	80	116	}	38	12	12
5	548	38	204	759	156	213	77	104		33	12	12
6	320	38	165	464	112	170	74	100	80	32	12	10
7	232	35	131	299	142	151	65	98		30	12	10
8	178	33	120	299	186	124	62	95		26	12	10
9	142	32	191	149	287	108	62	88	}	25	12	10
10	112	32	204	97	942	104	57	172	62	24	12	10
11	311	30	342	100	1,130	90	97	170	68	24	12	9.5
12	336	27	218	112	942	83	160	138	60	24	11	9.0
13	263	43	290	138	428	77	207	135	57	22	10	9.0
14	305	33	191	299	330	71	151	160	61	23	9.5	9.0
15	342	32	142	588	293	70	116	168	58	20	10	9.0
16	308	160	124	509	175	442	112	224	54	20	9.5	8.6
17	305	418	120	240	147	1,870	83	202	51	20	10	8.2
18	221	588	154	213	124	1,010	108	170	51	20	20	10
19	165	453	178	186	116	528	178	144	55	20	14	26
20	131	401	154	140	108	336	191	138	54	18	12	22
21	120	305	133	116	104	246	266	138	53	17	12	71
22	100	346	116	97	240	196	509	131	52	16	11	44
23	92	401	104	93	240	191	375	124	45	16	10	33
24	83	275	320	80	336	186	272	127	43	15	10	25
25	76	290	260	71	349	181	221	142	43	14	10	28
26	68	336	199	71	311	175	215	122	41	13	10	29
27	61	398	232	71	293	138	194	93	41	12	10	31
28	62	296	672	102	394	160	191	80	33	12	10	40
29	54	232	672	97	-------	116	213	72	32	12	10	33
30	54	178	1,920	90	-------	52	181	74	46	12	9.5	30
31	48	-------	1,180	86	-------	108	-------	85	-------	14	9.0	-----

NOTE.—Gage not read Aug. 1–5, 15, 16, 22, 23, 31, Sept. 1–8, 10–15, 17–20, 22–30, and Dec. 31, 1920; recorder not operating June 4–9, 1921; discharge ascertained by comparison with records for East Creek. Braced figures show mean discharge for periods included.

Monthly discharge of Little Nisqually River near Alder, Wash., for the years ending Sept. 30, 1920 and 1921.

[Drainage area, 28.5 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1920.						
August	83	12	17.1	0.600	0.69	1,050
September	----------	14	124	4.35	4.85	7,380
1920-21.						
October	1,200	48	224	7.86	9.06	13,800
November	588	27	187	6.56	7.32	11,100
December	1,920	104	305	10.7	12.34	18,800
January	1,130	71	274	9.61	11.08	16,800
February	1,130	104	308	10.8	11.25	17,100
March	1,870	52	277	9.72	11.21	17,000
April	509	57	161	5.65	6.30	9,580
May	224	72	130	4.56	5.26	7,990
June	----------	32	60.0	2.11	2.35	3,570
July	50	12	22.8	.800	.92	1,400
August	20	9.0	11.3	.396	.46	695
September	71	8.2	20.0	.702	.78	1,190
The year	1,920	8.2	164	5.75	78.33	119,000

TACOMA POWER CONDUIT NEAR LA GRANGE, 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, 1921.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 10.0 feet on January 3 (discharge, 878 second-feet). No flow when waste gates are opened wide for cleaning settling basin.

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

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

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

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

Discharge measurements of Tacoma power conduit near La Grande, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Aug. 26	6.48	467
29	5.11	331

Daily discharge, in second-feet, of Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	574	580	594	527	524	450	490	496	371	366	328	362
2	574	570	592	458	518	470	452	441	351	324	328	352
3	530	582	596	580	520	436	364	416	368	252	325	352
4	637	586	590	590	508	460	439	406	331	252	328	257
5	593	592	567		499	457	441	408	240	324	328	239
6	584	586	599		404	396	425	406	335	334	323	365
7	580	494	595		500		418	474	354	312	210	365
8	554	596	592		518		384	405	348	338	330	367
9	568	587	600	590	497		392	424	346	318	338	346
10	512	580	612		503	488	399	425	381	230	326	356
11	570	572	596		497		407	410	336	328	321	263
12	574	534	578		489		414	390	255	324	310	347
13	597	546	605	590	476		422	353	358	322	300	308
14	595	462	605	578	543	580	425	324	348	326	224	298
15	607	498	614	570	510	498	400	256	352	325	326	290
16	598	498	596	542	506	473	397	362	352	306	329	296
17	535	510	597	582	504	470	420	364	364	235	437	306
18	592	508	599	565	508	456	420	402	352	284	321	316
19	586	560	568	547	496	484	438	411	248	334	342	411
20	590	490	600	573	407	380	450	372	331	362	316	428
21	590	470	598	576	474	463	454	327	340	344	238	402
22	578	494	610	576	430	434	463	435	368	354	330	419
23	590	502	608	470	453	442	486	362	358	360	347	404
24	496	501	610	575	454	429	344	334	340	236	338	407
25	586		546	544	426	447	440	356	324	349	338	312
26	578	540	568	504	440	437	424	390	266	350	333	386
27	596		579	511	364	454	425	396	334	343	321	392
28	579		571	516	486	426	433	324	335	343	234	404
29	580	573	552	503	-------	430	438	352	358	324	336	444
30	582	588	551	416	-------	403	430	350	340	328	326	439
31	494	-------	564	514	-------	444	-------	354	-------	250	360	-------

NOTE.—Water-stage recorder not operating satisfactorily Nov. 25–28, Jan. 5–12, Mar. 7–13, Apr. 9–12, and July 18; discharge interpolated. Braced figures show mean discharge for periods indicated.

Monthly discharge of Tacoma power conduit near La Grande, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	637	494	574	35,300
November	596	462	539	32,100
December	614	546	589	36,200
January		416	552	33,900
February	543	364	480	26,700
March		380	459	28,200
April	490	344	424	25,200
May	496	256	385	23,700
June	381	240	336	20,000
July	366	230	315	19,400
August	437	210	319	19,600
September	444	239	354	21,100
The year	637	210	444	321,000

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, 1921.

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 during year, from water-stage recorder, 5.72 feet at 8 a. m. December 30 (discharge, 2,670 second-feet); minimum stage, from recorder, 1.27 feet on September 15 (discharge, 162 second-feet).

1909–1921: Maximum stage, estimated from partial gage-height record, 6.4 feet at noon December 18, 1917 (discharge, 4,800 second-feet); minimum discharge, estimated 112 second-feet 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; not affected by ice. Standard rating curve well defined below 1,000 second-feet. Parallel curves used October 1–4, October 4 to December 30, December 30 to February 10, February 11 to March 17, March 18 to April 22, April 22 to August 11, September 16–20, and 21–30. Shifting-control method used August 12 to September 15. Operation of water-stage recorder satisfactory. Daily discharge prior to January 2 ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph or, for days of considerable variation of stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals; subsequent to January 2 daily discharge determined by use of discharge integrator. Records good.

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

84390—24†—WSP 532——3

Discharge measurements of Puyallup River near Electron, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 18	William Chambers	2.13	409	Apr. 20	William Chambers	1.74	342
31	do	1.94	336	May 5	do	1.85	361
Nov. 5	do	1.72	251	July 4	do	2.30	544
15	do	1.52	190	21	do	2.30	535
Dec. 17	do	1.80	283	Aug. 4	do	2.20	486
Jan. 12	do	1.83	410	11	do	2.22	519
21	do	1.67	350	Sept. 15	do	1.31	171
Feb. 1	do	1.40	249	15	McCombs and Chambers	1.35	186
21	do	1.77	344	16	John McCombs	1.34	174
Mar. 8	do	1.90	402	24	William Chambers	1.67	287
14	do	1.55	261				
Apr 1	do	1.68	322				

Daily discharge, in second-feet, of Puyallup River near Electron, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	708	315	369	990	257	739	320	433	818	933	649	454
2	871	308	372	2,010	274	672	323	421	837	715	636	326
3	1,200	304	365	1,400	271	681	296	383	921	596	599	292
4	1,580	276	400	1,150	247	627	278	365	982	551	540	282
5	1,060	256	349	1,260	235	543	264	365	996	563	546	250
6	890	243	330	887	216	491	255	347	1,190	599	704	267
7	730	234	304	721	349	439	242	358	1,450	742	803	286
8	599	226	286	610	402	392	241	350	1,140	821	755	322
9	510	217	290	509	615	363	253	343	964	707	663	295
10	464	214	297	451	1,920	348	308	428	922	697	585	254
11	599	210	308	414	1,790	319	364	402	945	684	578	236
12	552	202	290	402	1,460	297	379	387	894	665	579	198
13	485	226	293	417	1,060	286	397	424	874	679	689	184
14	599	214	253	562	830	264	350	568	774	664	703	182
15	548	207	256	600	681	262	317	656	688	642	660	180
16	497	408	279	485	545	613	296	773	603	617	617	194
17	456	664	283	481	489	1,290	284	726	555	621	651	205
18	408	866	304	455	434	1,160	336	715	589	657	618	296
19	372	752	304	429	401	790	367	704	682	666	487	389
20	342	642	283	385	357	646	348	685	751	623	486	339
21	468	522	266	351	335	540	758	679	886	576	450	671
22	452	578	256	321	605	489	1,220	678	852	635	411	433
23	464	578	253	309	1,060	439	838	689	864	701	392	337
24	493	472	345	297	873	438	648	765	911	727	356	299
25	480	468	345	282	801	426	563	841	869	664	325	342
26	444	472	326	284	710	382	505	764	820	628	330	476
27	420	464	664	286	740	357	465	649	775	607	358	498
28	506	416	1,180	276	785	342	462	551	707	612	427	504
29	424	400	1,040	262	-------	344	510	533	801	617	477	390
30	369	384	2,050	254	-------	330	448	610	1,070	637	457	359
31	342	-------	1,200	247	-------	320	-------	726	-------	635	450	-------

Monthly discharge of Puyallup River near Electron, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 91 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1,580	342	591	6.49	7.48	36,300
November	866	202	391	4.30	4.80	23,300
December	2,050	253	456	5.01	5.78	28,000
January	2,010	247	574	6.31	7.28	35,300
February	1,920	216	669	7.35	7.65	37,200
March	1,290	262	504	5.54	6.39	31,000
April	1,220	241	421	4.63	5.17	25,100
May	841	343	559	6.14	7.08	34,400
June	1,450	555	871	9.57	10.68	51,800
July	933	551	661	7.26	8.37	40,600
August	803	325	548	6.02	6.94	33,700
September	671	180	325	3.57	3.98	19,360
The year	2,050	180	547	6.01	81.60	396,000

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, 1921.

GAGE.—Chain gage on highway bridge; installed December 15, 1920; read by Mrs. H. D. Foster and Miss Edith Johnson. Vertical staff in two sections on downstream side of bridge pier on right bank used prior to January 15, 1920. Several temporary staff gages just below bridge used January 16 to December 14, 1920. Datum of gage lowered 1.00 foot August 5, 1918.

DISCHARGE MEASUREMENTS.—Made from bridge at gage or, occasionally, from bridge 2½ miles upstream.

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, 7.58 feet at 2 p. m. December 30 (discharge, 11,200 second-feet); minimum stage recorded, 0.70 foot September 16 (discharge, 460 second-feet).

1915–1921: Maximum stage recorded, 12.6 feet at 8 p. m. December 18, 1917 (discharge, 19,300 second-feet); minimum discharge recorded, 342 second-feet October 10, 1919.

ICE.—Stage-discharge relation slightly affected by ice for short periods during severe winters.

DIVERSIONS.—None.

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

ACCURACY.—Stage-discharge relation changed October 4 and December 29, and gradually December 30 to February 11. Three rating curves fairly well defined. Shifting-control method used December 30 to February 11. Gage read to half-tenths once daily October to December; to hundredths once daily thereafter. Slight diurnal fluctuation. Daily discharge ascertained by applying daily gage height to rating table or by shifting-control method. 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 8	John McCombs	1.41	712	Feb. 12	Calkins and Lee	5.91	7,760
Dec. 11	do	2.28	1,650	Mar. 29	John McCombs	1.94	1,550
30	R. B. Kilgore	7.18	10,500	June 1	R. B. Kilgore	2.73	2,430
31	do	4.73	6,600	Aug. 10	do	1.67	1,240

Daily discharge, in second-feet, of Puyallup River at Alderton, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,360	910	1,390	5,310	1,060	3,050	1,020	1,710	2,280	2,910	1,400	1,110
2	2,640	910	1,340	9,950	930	2,780	1,110	2,040	2,280	2,040	1,400	840
3	4,120	860	1,220	6,770	1,020	2,520	840	1,710	2,400	1,600	1,400	800
4	6,740	910	1,390	5,310	1,020	2,520	720	1,250	2,400	1,600	1,200	680
5	5,080	730	1,340	7,150	1,160	2,160	885	1,600	2,520	1,600	1,110	680
6	3,820	650	1,120	3,950	885	1,820	840	1,400	2,780	1,500	1,160	600
7	2,780	770	1,010	3,630	1,020	1,820	840	1,200	3,950	1,600	1,400	680
8	2,500	650	910	3,050	1,400	1,400	840	1,060	2,910	2,160	1,600	680
9	2,500	575	815	2,520	2,040	1,400	800	1,200	2,520	1,820	1,600	800
10	2,360	575	910	2,400	6,580	1,400	720	1,250	2,780	1,600	1,250	680
11	1,970	540	1,610	2,280	7 530	1,300	930	1,250	2,280	1,710	1,250	600
12	2,230	505	1,390	1,500	7,530	1,200	1,060	1,200	2,520	1,600	1,200	565
13	1,970	575	1,390	1,710	5,670	1,160	1,110	1,160	2,400	1,600	1,250	495
14	1,970	610	1,120	2,520	3,630	1,060	975	1,300	2,280	1,600	1,400	495
15	2,360	540	1,060	3,190	2,650	1,060	840	1,400	1,820	1,500	1,400	495
16	2,100	650	1,170	2,520	1,930	1,500	840	2,160	1,500	1,400	1,250	460
17	2,100	1,120	1,010	2,400	1,710	4,450	800	2,520	1,400	1,400	1,250	495
18	1,970	3,070	1,010	2,040	1,500	6,770	640	2,780	1,400	1,400	1,400	565
19	1,850	2,780	1,220	2,160	1,600	4,110	800	2,040	1,820	1,500	1,200	1,110
20	1,850	2,500	1,120	1,820	1,500	2,910	975	2,780	1,820	1,400	1,060	975
21	1,970	1,970	1,010	1,820	1,400	1,820	930	2,040	2,280	1,300	1,020	1,300
22	2,100	1,610	1,120	1,500	1,400	1,820	975	1,930	1,710	1,400	975	1,110
23	1,970	2,500	1,010	1,250	4,960	1,820	4,960	1,930	2,160	1,500	840	930
24	1,500	1,850	1,340	1,300	4,110	1,710	4,280	2,040	2,280	1,600	760	760
25	1,500	1,610	1,610	1,200	3,480	1,400	1,820	2,280	2,280	1,600	720	680
26	1,390	1,730	1,220	1,200	3,050	1,600	1,820	2,160	1,710	1,400	720	720
27	1,220	2,500	2,780	1,200	2,520	1,500	1,930	1,820	2,040	1,400	680	1,110
28	1,500	2,100	5,890	1,500	2,650	1,300	1,930	1,400	1,710	1,300	760	1,400
29	1,390	1,730	5,890	1,060	-------	1,500	2,280	1,300	1,710	1,400	840	1,110
30	1,220	1,500	11,000	1,250	-------	1,200	1,710	1,400	2,280	1,400	885	885
31	1,120	-------	6,580	1,160	-------	1,200	-------	1,820	-------	1,400	840	-------

Monthly discharge of Puyallup River at Alderton, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	6,740	1,120	2,330	5.68	6.55	143,000
November	3,070	505	1,320	3.22	3.59	78,600
December	11,000	815	2,030	4.95	5.71	125,000
January	9,950	1,060	2,790	6.80	7.84	172,000
February	7,530	885	2,710	6.61	6.88	151,000
March	6,770	1,060	2,040	4.98	5.74	125,000
April	4,960	640	1,340	3.27	3.65	79,700
May	2,780	1,060	1,710	4.17	4.81	105,000
June	3,950	1,400	2,210	5.39	6.01	132,000
July	2,910	1,300	1,590	3.88	4.47	97,800
August	1,600	680	1,140	2.78	3.20	70,100
September	1,400	460	794	1.94	2.16	47,200
The year	11,000	460	1,830	4.46	60.61	1,330,000

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, 1921.

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 during year, from water-stage recorder, 13.60 feet at 12.30 p. m. December 30 (discharge, 24,900 second-feet); minimum discharge as low as 1,320 second-feet on September 13 and 14, and probably lower on same and other days when water surface was below stilling-well intake.

1914–1921: Maximum stage recorded, 34.15 feet at 4.45 p. m. December 18, 1917 (discharge, 40,500 second-feet); minimum stage recorded, 17.36 feet at 8 p. m. November 18, 1917 (discharge, 726 second-feet).

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

DIVERSIONS.—Two hydroelectric plants, owned by 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 to the river. Water for the Dieringer plant is diverted from White River at Buckley into Lake Tapps (capacity, 51,000 acre-feet), and after use is discharged into Stuck River.

REGULATION.—See "Diversions."

ACCURACY.—Stage-discharge relation changed December 30, April 22, and continuously from June 2 to September 30. Standard rating curve well defined; used December 30 to April 22. Parallel curves used October 1 to December 29 and April 23 to June 1. Shifting-control method used June 2 to September 30. 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 except for period for which shifting-control method was used, and except for period August 19 to September 30 for which it was determined by applying a single daily staff gage reading, corrected for shifting control, to the rating table, the resulting discharge being corrected by a predetermined coefficient to reduce it to mean discharge for the day. Records good October to July except those estimated; others 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 10	John McCombs	3.80	2,200	Feb. 17	John McCombs	5.16	4,060
Dec. 11	R. B. Kilgore	4.81	3,270	Mar. 30	do	4.72	3,320
30	D. J. Calkins	13.36	24,400	June 1	R. B. Kilgore	6.80	6,910
31	do	9.10	13,500	Aug. 10	do	3.95	2,960
Feb 12	G. L. Parker	10.41	16,500	Sept. 28	John McCombs	3.20	2,430
15	D. J. Calkins	6.47	6,970				

Daily discharge, in second-feet, of Puyallup River at Puyallup, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,930		2,720	9,250	2,720	8,530	3,160	3,860	6,430	7,580	3,040	1,940
2	3,550		2,620	16,000	2,720	6,430	3,040	4,430	6,660	5,750	2,820	1,940
3	6,890		2,530	15,200	3,410	5,970	2,620	3,860	7,120	4,220	2,720	1,740
4	12,200		2,620	10,500	4,650	5,530	2,620	3,550	7,350	4,030	2,530	1,680
5	10,000	2,180	2,030	12,200	4,030	4,650	2,620	3,700	7,350	4,220	2,440	1,740
6	7,580		2,270	8,530	4,220	4,430	2,530	3,410	8,290	4,220	2,350	1,740
7	6,200		2,270	6,660	4,430	4,430	2,530	3,410	10,200	4,430	2,530	1,680
8	3,550		2,270	5,750	4,650	3,860	2,350	3,160	8,530	5,530	3,160	1,680
9	2,720	1,960	2,270	4,650	5,310	3,410	2,350	3,280	6,200	4,870	2,930	1,680
10	2,270	1,960	2,350	4,430	15,000	3,160	2,030	3,550	6,430	4,430	2,720	1,680
11	2,620	1,750	2,930	3,860	17,800	3,040	2,530	3,700	5,530	4,220	2,720	1,680
12	4,030	1,890	2,530	4,650	16,300	2,820	2,930	3,160	5,090	4,220	2,530	1,510
13	3,410	1,890	2,820	3,860	11,500	2,930	3,040	2,620	5,090	4,030		1,470
14	3,160	1,690	2,440	4,430	8,530	3,550	2,930	2,720	5,310	3,870		1,470
15	3,860	1,890	2,350	5,530	6,660	3,410	2,620	3,280	5,090	3,710	2,400	1,570
16	3,550	2,030	2,440	4,220	6,660	5,750	2,530	5,750	4,220	3,550		1,570
17	2,820	2,530	2,350	4,220	4,030	12,000	2,620	6,200	4,220	3,280	2,930	1,570
18	3,040	4,430	2,350	5,530	4,220	14,200	3,160	5,310	4,220	3,550	2,620	1,620
19	2,530	5,090	2,110	4,030	3,860	8,290	3,550	5,310	4,430	3,550	2,340	1,740
20	2,440	4,870	2,190	4,030	4,030	6,200	3,550	6,200	5,310	3,410	2,100	1,810
21	2,530	4,030	2,190	3,550	4,430	5,090	4,430	5,750	5,970	3,040	2,020	2,020
22	2,930	3,860	2,350	3,280	4,220	4,220	12,200	5,750	6,200	2,930	1,940	2,100
23	2,720	4,870	2,350	3,280	10,000	3,860	9,500	5,750	5,970	2,930	1,880	1,810
24	2,720	4,030	2,530	3,550	8,770	3,700	5,090	5,750	6,430	3,160	1,880	1,740
25	3,040	3,280	2,350	3,040	8,050	3,700	4,220	6,890	5,970	3,550	1,680	1,680
26	2,720	4,430	2,190	2,820	7,350	3,410	4,030	7,120		3,160	1,810	1,680
27	2,530	5,530	4,650	3,040	6,660	3,410	3,550	5,970	6,000	3,040	1,680	2,020
28	2,620	3,860	11,500	3,160	8,050	3,700	3,280	4,430		2,930	1,680	2,100
29	2,820	3,160	11,500	2,930	-------	3,410	3,410	4,030	5,970	2,820	1,740	2,100
30	2,440	3,040	20,200	2,930	-------	3,160	3,040	4,030	6,890	2,720	1,680	1,740
31	2,390	-------	13,800	3,160	-------	3,040	-------	4,650	-------	2,720	1,940	-------

NOTE.—Intake clogged or water below intake October 30 to November 8, and August 13–18; recorder not operating properly June 26–28 and July 14 and 15; discharge determined by interpolation or from general information. Intake out of water for part or all of 9 days in November, 14 days in December, 8 days in April, 20 days in August, and throughout September; recorder graph completed from general information until August 18, after which staff gage readings were used. Braced figures show mean discharge for periods indicated.

Monthly discharge of Puyallup River at Puyallup, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 914 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	12,200	2,270	3,830	----------	----------	236,000
November	5,530	1,690	2,980	----------	----------	177,000
December	20,200	2,030	4,000	----------	----------	246,000
January	16,000	2,820	5,560	----------	----------	342,000
February	17,800	2,720	6,870	----------	----------	382,000
March	14,200	2,820	4,940	----------	----------	304,000
April	12,200	2,030	3,600	----------	----------	214,000
May	7,120	2,620	4,530	----------	----------	279,000
June	10,200	4,220	6,150	----------	----------	366,000
July	7,580	2,720	3,860	----------	----------	237,000
August	3,160	1,680	2,320	----------	----------	143,000
September	2,100	1,470	1,750	----------	----------	104,000
The year	20,200	1,470	4,180	4.57	62.04	3,030,000

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

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, 1921.

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.

The high water on January 23, 1919, cut through the left bank, making a channel back of the water-stage recorder. In this channel a staff gage was installed at railway bridge April 2, 1919; moved 700 feet upstream June 11, 1919. Gage read by O. E. Osgood and F. C. Rowland.

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, 12,100 second-feet December 30; minimum combined daily discharge, 456 second-feet September 16.

1899–1901; 1911; 1913–1921: 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, the most radical change taking place when the city of Tacoma's pipe-line protection was destroyed by flood on February 10. Stage-discharge relation for secondary channel changed gradually January 1–14. Two standard rating curves used for main channel; the first, applicable October 1 to February 10, well defined; the second, applicable February 10 to September 30, well defined below 5,000 second-feet. Curves parallel to first standard curve were used October 1–5, October 5 to November 20, November 20 to December 30, December 30 to January 5, and January 18 to February 10. Shifting-control method used January 6–17. The second standard curve was used direct March 18 to September 15; parallel curves used February 10 to March 17 and September 16–26; shifting-control method used September 27–30. For the secondary channel, two poorly defined rating curves were used, applicable October 1 to January 1 and January 15 to August 26; no curve defined for period January 2–14. Water-stage recorder on main channel operated satisfactorily. Staff gage on secondary channel read to hundredths once or twice daily. Daily discharge for main channel ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage

heights for shorter intervals. Daily discharge for secondary channel ascertained by applying daily or mean daily gage height to rating table, except for many days for which gage readings are not an index of the mean discharge for the day owing to flume regulation, for which discharge was ascertained by a comparison with flow in flume and main channel. Daily discharge in the table given below is the combined flow of the main and secondary channels. Records fair.

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

Discharge measurements of White River at Buckley, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
	MAIN CHANNEL.	*Feet.*	*Sec.-ft.*		MAIN CHANNEL—con.	*Feet.*	*Sec.-ft.*
Oct. 7	Osgood and Vesey	26.00	944	June 10	Osgood, Vesey, and Currier	24.94	2,610
22	do	24.53	60.8	24	Osgood and Vesey	24.80	2,430
Nov. 13	do	24.20	34.9	July 6	do	24.21	1,620
30	do	25.17	410	25	do	23.60	1,050
Dec. 14	Osgood and Roland	24.68	158	Aug. 10	do	23.00	589
24	Osgood and Vesey	24.06	41.7	26	do	21.68	37.8
Jan. 5	do	26.76	3,580	Sept. 13	Osgood and Wolslegel	21.66	32.2
18	Osgood, Roland, and Vesey	25.91	1,520	26	Osgood and Hill	21.70	14.5
27	Osgood and Currier	23.70	172		SOUTH CHANNEL.		
Feb. 18	Osgood and Vesey	23.44	1,130				
21	Osgood, Vesey, and Currier	23.64	1,320	Nov. 30	Osgood and Vesey	1.73	13.2
Mar. 19	do	24.96	2,660	Jan. 5	do	2.21	45.9
24	Osgood and Vesey	23.00	603	Feb. 21	do	1.61	9.2
Apr. 9	do	22.68	458	Mar. 25	do	1.48	4.2
25	do	23.86	1,260	June 6	do	1.92	29.5
May 10	Osgood, Vesey, and Currier	24.46	1,860	27	do	1.71	15.6
25	do	25.52	3,490	July 6	do	1.61	9.6
				25	do	1.51	4.5

Daily discharge, in second-feet, of White River at Buckley, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	388	254	295	4,580	120	3,610	745	1,850	3,490	2,400	875	110
2	923	57	235	7,730	87	1,730	760	1,790	3,660	2,110	751	104
3	2,320	52	200	5,960	141	1,670	691	1,670	3,840	1,790	723	114
4	3,270	47	188	4,210	117	1,310	577	1,610	3,930	1,910	662	165
5	2,700	32	176	3,850	334	1,290	574	1,670	4,010	1,730	572	521
6	1,990	111	171	2,590	633	1,450	540	1,610	4,280	1,610	589	199
7	1,360	309	168	2,240	356	1,270	476	1,730	4,730	1,670	915	65
8	338	137	164	2,070	449	1,050	450	1,670	3,930	1,910	875	71
9	72	22	164	1,920	732	830	449	1,610	2,930	1,850	683	65
10	66	17	186	1,660	4,700	656	502	1,850	2,620	1,850	601	65
11	139	16	254	1,450	6,230	651	658	1,850	2,320	1,550	444	55
12	215	15	410	1,460	5,850	765	804	1,170	2,050	1,500	305	38
13	288	15	220	966	4,740	1,270	877	1,580	1,910	1,500	334	45
14	514	15	172	549	3,920	1,350	745	1,040	2,600	1,450	402	77
15	640	15	63	985	2,980	1,310	639	1,400	2,110	1,400	364	32
16	573	13	49	702	920	2,250	631	2,620	1,910	1,310	946	16
17	883	39	44	841	1,170	4,540	1,150	2,620	1,980	1,260	656	17
18	391	512	43	1,330	1,230	4,380	1,230	2,180	2,050	1,230	344	10
19	228	653	40	555	1,250	2,720	1,350	2,880	2,110	1,190	296	12
20	214	1,230	38	652	1,400	1,980	1,310	3,250	2,110	1,140	131	12
21	236	1,230	37	453	1,280	1,150	2,010	2,890	2,180	811	157	17
22	372	866	41	708	2,070	806	4,460	3,090	2,190	625	207	15
23	513	903	40	981	3,750	664	3,570	3,000	2,260	752	105	13
24	837	974	44	542	3,660	633	1,770	3,010	2,320	1,350	216	13
25	446	1,110	44	190	3,580	579	1,310	3,670	2,060	1,150	88	13
26	310	1,210	294	179	3,410	632	1,150	3,840	1,860	996	37	15
27	256	1,700	593	196	3,330	1,230	982	3,220	2,060	907	33	17
28	333	1,860	2,970	212	3,580	907	750	2,490	1,990	859	37	18
29	286	506	2,540	370	-------	768	733	2,400	2,060	818	58	17
30	496	428	11,400	665	-------	745	721	2,360	2,330	802	58	17
31	626	-------	5,680	488	-------	731	-------	2,540	-------	996	74	-------

NOTE.—See under "Accuracy" in station description.

Monthly discharge of White River and flume at Buckley, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 424 square miles.]

Month.	Discharge in second-feet.						Combined run-off.	
	Combined.		River (mean).	Flume (mean).	Combined.			
	Maximum.	Minimum.			Mean.	Per square mile.	Inches.	Acre-feet.
October	3,670	901	717	719	1,440	3.40	3.92	88,500
November	2,290	575	478	653	1,130	2.67	2.98	67,200
December	12,100	700	870	725	1,600	3.77	4.35	98,400
January	8,060	848	1,650	530	2,180	5.14	5.93	134,000
February	6,570	810	2,210	360	2,570	6.06	6.31	143,000
March	4,600	1,310	1,450	651	2,100	4.95	5.71	129,000
April	4,510	1,091	1,090	645	1,740	4.10	4.57	104,000
May	4,190	1,610	2,260	424	2,680	6.32	7.29	165,000
June	4,730	2,220	2,660	551	3,210	7.57	8.45	191,000
July	3,040	1,500	1,370	648	2,020	4.76	5.49	124,000
August	1,440	731	404	721	1,120	2.64	3.04	68,900
September	944	456	64.9	607	672	1.58	1.76	40,000
The year	12,100	456	1,260	605	1,870	4.41	59.80	1,350,000

NOTE.—See under "Diversions" in the station description. Records for White River flume follow.

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, 1921.

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 during year, from water-stage recorder, 6.10 feet at 1.30 p. m. May 13 (discharge, 1,800 second-feet); no flow in flume when headgates are closed.

1913–1921: Maximum stage, 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 headgates are closed.

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

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

ACCURACY.—Stage-discharge relation permanent October to December; changed continuously thereafter; not affected by ice. Rating curve used October 1 to December 31, well defined. Shifting-control method used January 1 to September 30, with an arbitrary standard curve. Operation of water-stage recorder satisfactory. Daily discharge October to December ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for

shorter intervals. Daily discharge January 1 to September 30 ascertained by use of discharge integrator after adjusting gage-height graph in accordance with the method used for shifting control. Records excellent October to December; good for remainder of year.

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

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

Discharge measurements of White River flume at Buckley, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 22	Osgood and Vesey	4.26	1,210	Apr. 26	Osgood and Vesey	4.94	1,140
Nov. 11	do	2.52	586	May 25	do	2.86	586
29	do	3.02	743	June 10	do	4.69	1,090
Dec. 9	do	2.80	678	27	do	2.99	613
24	do	2.88	690	July 6	do	2.89	603
Jan. 15	Roland and Vesey	5.03	1,200	25	do	3.42	755
27	Osgood and Currier	3.39	746	Aug. 10	do	3.14	690
Mar. 4	Osgood and Vesey	5.26	1,420	25	do	3.13	697
25	do	4.30	992	Sept. 13	Osgood and Wolslegel	2.44	514
Apr. 8	do	3.02	645	26	Osgood and Hill	2.94	596

Daily discharge, in second-feet, of White River flume at Buckley, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	804	611	931	220	732	294	606	33	0	638	555	768
2	731	777	916	333	781	1,580	634	31	0	654	693	691
3	382	777	881	424	814	1,510	644	0	0	577	699	596
4	397	726	952	419	798	1,420	705	0	0	300	652	536
5	104	709	846	404	476	1,100	738	0	0	502	666	226
6	277	566	777	314	181	566	606	0	0	600	678	456
7	764	328	765	208	598	549	638	0	0	598	450	600
8	1,390	526	726	166	714	594	644	0	586	609	579	683
9	1,300	626	709	128	759	764	642	0	1,090	504	717	638
10	1,140	610	692	312	561	821	688	0	1,120	355	700	602
11	1,160	594	663	444	342	819	650	0	1,270	644	796	651
12	1,110	560	514	266	158	623	628	532	1,240	635	932	558
13	874	594	733	826	0	92	638	1,020	1,380	636	949	501
14	932	594	643	1,210	0	0	632	1,450	634	628	948	470
15	821	579	708	1,210	196	0	624	1,540	660	627	964	440
16	786	743	794	1,150	1,220	0	529	1,570	572	653	278	440
17	294	1,300	760	761	780	0	0	1,480	324	619	541	464
18	712	1,540	743	325	464	216	0	1,580	166	636	868	490
19	730	1,260	726	788	351	458	0	559	168	734	732	666
20	687	585	709	620	0	472	0	0	335	753	854	609
21	814	346	692	726	45	945	0	290	517	894	881	905
22	783	730	692	442	36	1,020	49	170	583	1,090	720	716
23	570	767	660	178	40	999	250	416	564	1,030	784	592
24	227	461	709	510	37	989	1,140	570	688	444	572	540
25	645	275	881	775	0	1,070	1,180	385	987	646	674	562
26	753	203	560	756	0	862	1,150	0	1,010	736	712	722
27	723	238	836	755	0	171	1,140	328	758	722	698	803
28	794	432	826	750	0	438	1,370	370	626	709	738	926
29	794	760	474	480	-------	597	1,540	184	626	704	769	727
30	513	760	657	185	-------	600	1,330	243	630	702	778	646
31	280	-------	297	360	-------	602	-------	462	-------	514	768	-------

Monthly discharge of White River flume at Buckley, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	1,390	104	719	44,200
November	1,540	203	653	38,900
December	952	297	725	44,600
January	1,210	128	530	32,600
February	1,220	0	360	20,000
March	1,580	0	651	40,000
April	1,540	0	645	38,400
May	1,570	0	424	26,100
June	1,380	0	551	32,800
July	1,090	300	648	39,800
August	964	278	721	44,300
September	926	226	607	36,100
The year	1,580	0	605	438,000

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, 1921.

GAGE.—Stevens continuous water-stage recorder on right bank, 0.7 mile below power plant; installed April 8, 1914; inspected by T. S. Beals, E. C. Hoffstrom, 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 9, 1919, at gage height 3.2 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 6.02 feet 5 p. m. to 6 p. m. January 5 (discharge, 748 second-feet); minimum discharge, 8.2 second-feet, the result of current-meter measurement made August 19, while power plant was shut down for repairs.

1914–1921: 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.

DIVERSIONS.—Seattle municipal power plant diverts water directly from Cedar Lake through a pressure pipe and returns it to river at plant above gage. Practically the entire low-water flow is carried through 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 August 19. Standard rating curve well defined; parallel curve used August 19 to September 30. Operation of water-stage recorder excellent. Daily discharge ascertained by use of discharge integrator. Records excellent.

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

Discharge measurements of Cedar River at Cedar Falls, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 10	R. B. Kilgore	5.58	523	Aug. 2	R. B. Kilgore	5.17	319
Aug. 1	do	5.14	312	19	F. H. Hoffstrom	(a)	8.2

a Water surface below gage and channel so far from gage that gage height was not determined.

Daily discharge, in second-feet, of Cedar River at Cedar Falls, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	312	328	330	344	433	428	409	368	380	390	286	186
2	311	332	333	368	440	439	404	385	389	400	298	187
3	304	332	337	582	440	427	368	389	397	364	296	194
4	364	332	336	598	423	438	392	392	396	348	291	170
5	344	332	314	653	405	430	398	388	383	382	292	172
6	343	318	340	688	366	401	392	384	420	376	292	178
7	335	298	342	629	400	436	386	391	418	375	254	188
8	331	319	340	570	392	432	377	356	410	373	284	190
9	320	324	342	478	392	440	355	384	404	363	232	192
10	291	322	346	484	446	436	328	398	410	321	205	190
11	328	272	342	488	497	433	355	394	401	348	208	177
12	329	234	322	456	454	418	375	390	376	347	208	186
13	340	318	334	459	390	396	365	387	400	342	209	190
14	342	292	326	495	411	424	365	390	406	332	177	188
15	348	310	324	522	402	428	352	362	356	333	202	186
16	343	314	322	509	411	434	341	411	392	325	201	174
17	324	322	318	522	411	464	307	400	386	280	203	104
18	348	340	316	498	419	476	340	406	378	300	198	58
19	350	335	302	486	416	446	350	404	346	316	88	116
20	358	274	316	479	390	395	349	403	370	313	160	154
21	356	320	313	482	408	416	376	407	361	309	166	170
22	358	326	316	465	412	423	390	375	362	304	194	173
23	354	348	314	430	424	422	382	312	354	309	196	175
24	320	351	318	471	380	424	334	312	354	270	198	178
25	354	326	308	460	349	422	368	380	360	296	198	169
26	352	342	298	460	373	406	370	388	334	303	196	178
27	346	337	332	448	383	374	389	380	363	304	196	178
28	343	306	358	419	426	406	382	371	380	295	161	196
29	342	332	375	434	------	404	401	336	386	294	190	204
30	330	336	422	399	------	398	394	334	388	298	190	171
31	304	------	372	434	------	395	------	371	------	262	189	------

Monthly discharge of Cedar River at Cedar Falls, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 83 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	364	291	336			20,700
November	351	234	319			19,000
December	422	298	333			20,500
January	688	344	491			30,200
February	497	349	410			22,800
March	476	374	423			26,000
April	409	307	370			22,000
May	411	312	379			23,300
June	420	334	382			22,700
July	400	262	328			20,200
August	298	88	215			13,200
September	204	58	172			10,200
The year	688	58	346	4.17	56.60	251,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not computed owing to regulation. Yearly figures represent the natural flow 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, 1921; 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, 1916, about gage height 2.5 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorded, 7.9 feet February 11–12 (discharge, 1,920 second-feet); minimum stage, from recorder, 4.52 feet on September 18 (discharge, 262 second-feet).

1914–1921: Maximum stage, from recorder, 13.55 feet at 10 p. m. December 29, 1917 (discharge, 7,500 second-feet); minimum stage, from recorder, 4.35 feet at 1 a. m. October 15, 1914 (discharge, 162 second-feet).

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

DIVERSIONS.—None above 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 May 10. Two rating curves well defined. Operation of water-stage recorder excellent. Daily discharge ascertained by use of discharge integrator. Records excellent except for period March to July for which, because of doubt as to rating applicable, records are considered good.

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

Discharge measurements of Cedar River near Landsberg, Wash., during the year ending Sept. 30, 1921.

[Made by R. B. Kilgore.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Feb. 11	7.70	1,790
Aug. 3	5.64	592
7	5.42	528

Daily discharge, in second-feet, of Cedar River near Landsberg, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	580	562	642	1,170	986	1,140	948	956	741	760	565	407
2	644	564	646	1,470	989	1,120	938	988	746	820	572	418
3	747	567	646	1,550	997	1,100	895	968	754	744	571	436
4	1,100	558	656	1,430	966	1,080	908	948	750	712	566	415
5	896	555	619	1,500	924	1,040	918	931	739	728	566	406
6	796	540	635	1,440	870	1,080	902	908	782	718	566	405
7	734	514	635	1,320	930	1,020	886	900	820	714	534	414
8	680	536	634	1,240	948	999	872	855	781	704	554	429
9	640	540	670	1,100	1,040	984	848	878	776	688	524	423
10	597	538	688	1,080	1,560	970	814	910	788	648	483	413
11	694	510	788	1,050	1,770	965	828	814	802	664	476	398
12	696	439	726	1,010	1,750	946	867	798	758	666	471	402
13	670	539	768	1,040	1,420	914	868	790	774	657	466	399
14	714	516	707	1,340	1,280	931	844	787	782	646	444	398
15	696	528	690	1,450	1,180	942	813	771	750	641	456	393
16	678	564	674	1,280	1,140	1,100	798	960	750	640	461	384
17	642	626	658	1,220	1,100	1,550	744	902	761	595	472	336
18	650	732	654	1,170	1,070	1,580	784	874	759	607	469	264
19	643	724	639	1,120	1,050	1,350	809	874	744	612	392	309
20	632	664	664	1,090	1,000	1,180	804	858	750	611	407	372
21	664	620	666	1,070	1,010	1,120	1,040	846	766	607	433	405
22	656	705	660	1,030	1,040	1,100	1,270	800	752	599	436	391
23	632	812	652	984	1,150	1,060	1,120	750	746	598	434	386
24	592	733	725	1,010	1,090	1,070	986	703	743	568	435	385
25	616	694	752	994	1,030	1,060	1,000	778	740	584	430	384
26	605	715	732	988	1,020	1,020	996	778	700	586	424	395
27	595	710	890	983	1,050	946	1,010	768	730	583	418	394
28	600	649	1,250	971	1,120	966	1,000	750	732	575	392	438
29	584	662	1,220	944	-------	944	1,040	708	730	572	406	426
30	568	654	1,640	896	-------	930	996	703	752	574	407	390
31	543	-------	1,240	944	-------	885	-------	727	-------	545	408	-------

Monthly discharge of Cedar River near Landsberg, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 135 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1,100	543	670	-------	-------	41,200
November	812	439	609	-------	-------	36,200
December	1,640	619	770	-------	-------	47,300
January	1,550	896	1,160	-------	-------	71,300
February	1,770	870	1,120	-------	-------	62,200
March	1,580	885	1,070	-------	-------	65,800
April	1,270	744	918	-------	-------	54,600
May	988	703	838	-------	-------	51,500
June	820	700	757	-------	-------	45,000
July	820	545	644	-------	-------	39,600
August	572	392	472	-------	-------	29,000
September	438	264	394	-------	-------	23,400
The year	1,770	264	784	5.81	78.87	567,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not computed owing to regulation. Yearly figures represent natural flow 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, 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, 1921.

GAGE.—Stevens continuous water-stage recorder on right bank; installed September 14, 1920; inspected by F. C. Doolittle. Prior to September 14, 1920, inclined and vertical staff gage at same site and datum. Location of gage unchanged since establishment. Datum raised 0.61 foot April 26, 1911, and lowered 1.00 foot to same datum as present gage April 19, 1914.

DISCHARGE MEASUREMENTS.—Made from cable 1 mile below gage, from bridge 100 feet below gage, or by wading nearly 1 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 during year, from water-stage recorder, 14.7 feet at 8 p. m. February 11 (discharge, 21,000 second-feet); minimum stage, from recorder, 1.37 foot at 2 a. m. September 18 (discharge, 466 second-feet).

1902–1905; 1911–1921: Maximum stage recorded, 22.6 feet at 9 a. m. December 18, 1917 (discharge, 47,000 second-feet); minimum stage recorded, 0.54 foot September 30, 1915 (discharge, 262 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 16,000 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 obtained from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent.

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

Discharge measurements of South Fork of Skykomish River near Index, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
February 12	11.46	13,200
September 22	4.13	2,000

Daily discharge, in second-feet, of South Fork of Skykomish River near Index, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,920	1,350	1,720	5,380	1,020	5,620	2,100	2,570	7,480	5,340	1,410	872
2	5,830	1,290	1,650	10,200	1,060	4,670	2,200	2,390	7,150	4,670	1,350	798
3	8,960	1,580	1,840	6,860	1,140	4,930	2,080	2,160	7,990	3,700	1,260	890
4	16,500	1,380	2,480	4,540	1,060	4,410	1,840	2,120	8,910	3,370	1,140	990
5	7,950	1,260	2,040	3,810	990	3,590	1,650	2,210	8,530	3,370	1,090	965
6	5,290	1,140	1,720	2,960	915	3,060	1,510	2,390	8,910	3,370	1,040	776
7	4,800	1,090	1,540	2,480	1,020	2,660	1,440	2,860	11,200	3,590	1,090	733
8	3,810	1,040	1,410	2,300	1,200	2,300	1,440	2,660	8,200	4,050	1,090	843
9	3,060	990	1,380	2,000	1,410	2,120	1,510	2,660	7,150	3,370	1,060	843
10	2,570	940	1,440	1,720	10,300	2,040	1,760	3,540	6,830	3,160	1,020	753
11	3,650	866	1,760	1,580	17,900	1,880	1,580	3,590	7,820	3,260	965	896
12	3,370	820	1,650	1,540	13,900	1,680	2,760	3,160	6,670	3,260	890	733
13	2,760	820	1,760	1,650	6,940	1,580	3,060	3,590	6,510	3,260	866	653
14	3,700	798	1,480	4,360	4,670	1,510	2,570	5,060	6,060	3,160	890	594
15	3,160	776	1,290	6,540	3,480	1,480	2,210	6,060	5,340	2,860	843	556
16	2,660	1,130	1,200	3,700	2,760	2,220	2,000	9,140	4,670	2,570	798	501
17	2,390	2,950	1,090	2,760	2,390	5,660	2,040	7,650	4,050	2,480	915	483
18	2,300	5,300	1,040	2,300	2,040	6,360	2,160	6,990	3,700	2,480	1,170	483
19	2,160	4,800	990	2,080	1,880	4,360	2,260	6,210	4,800	2,480	965	1,160
20	1,960	4,540	965	1,840	1,720	3,160	2,300	5,620	5,200	2,300	866	2,120
21	2,160	3,590	940	1,650	1,540	2,570	3,920	6,210	5,910	1,960	820	4,420
22	2,210	2,960	890	1,540	1,580	2,390	5,060	6,360	5,620	1,960	776	2,160
23	1,920	3,260	866	1,440	3,040	2,300	4,050	6,060	5,620	2,040	713	1,760
24	2,120	2,570	915	1,350	3,590	2,390	4,410	7,150	6,060	2,040	713	1,410
25	2,260	2,390	1,020	1,260	3,590	2,760	2,960	8,170	5,760	1,960	693	1,440
26	2,040	2,390	1,020	1,200	3,700	2,390	3,160	6,510	5,200	1,720	633	3,740
27	1,840	3,060	1,320	1,140	3,590	2,040	2,860	4,930	5,060	1,580	614	4,290
28	2,040	2,480	6,710	1,090	4,670	1,920	3,260	4,050	4,670	1,580	594	5,250
29	1,840	2,080	7,520	1,020	-------	1,960	3,370	4,050	4,800	1,540	594	4,290
30	1,620	1,840	14,900	990	-------	1,920	2,860	5,200	5,480	1,510	575	2,300
31	1,440	-------	7,010	990	-------	1,960	-------	6,670	-------	1,440	594	-------

NOTE.—No gage-height record Apr. 1-2; discharge determined by comparison with flow of near-by streams.

Monthly discharge of South Fork of Skykomish River near Index, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 351 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	16,500	1,440	3,590	10.2	11.76	221,000
November	5,300	776	2,050	5.84	6.52	122,000
December	14,900	866	2,370	6.75	7.78	146,000
January	10,200	990	2,720	7.75	8.94	167,000
February	17,900	915	3,680	10.5	10.93	204,000
March	6,360	1,480	2,900	8.26	9.52	178,000
April	5,060	1,440	2,550	7.26	8.10	152,000
May	9,140	2,120	4,770	13.6	15.68	293,000
June	11,200	3,700	6,380	18.2	20.31	380,000
July	5,340	1,440	2,760	7.86	9.06	170,000
August	1,410	575	904	2.58	2.97	55,600
September	5,250	483	1,590	4.53	5.05	94,600
The year	17,900	483	3,010	8.58	116.62	2,180,000

NORTH FORK OF SKYKOMISH RIVER AT INDEX, WASH.

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

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

RECORDS AVAILABLE.—August 24, 1910, to September 30, 1921.

GAGE.—Vertical and inclined staff on right bank one-third of a mile above highway bridge at Index; installed November 4, 1918; read by Mary E. Axtell. For description of previous gages see Water-Supply Paper 512.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.15 feet at 4.45 p. m. February 11 (discharge, 10,900 second-feet); minimum stage recorded, 0.65 foot September 16 and 17 (discharge, 226 second-feet).

1911–1921: Maximum stage recorded, 13.0 feet at 5 a. m. December 29, 1917 (discharge, 17,000 second-feet); minimum stage recorded, 0.45 foot at 1 p. m. September 29, 1915 (discharge, 97 second-feet).

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

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined below 5,000 second-feet. Staff gage read to hundredths once daily or oftener during floods. Some diurnal fluctuation during summer. Daily discharge ascertained by applying daily gage height to rating table. Records below 5,000 second-feet excellent; others good.

Discharge measurements of North Fork of Skykomish River at Index, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Feb. 14	2.78	1,940
Sept. 23	1.92	1,080

Daily discharge, in second-feet, of North Fork of Skykomish River at Index, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,670	640	895	2,270	434	2,550	940	1,040	3,950	2,700	850	434
2	2,860	600	805	5,140	464	2,020	1,040	968	3,950	2,550	760	378
3	4,140	850	940	3,210	530	2,550	940	895	4,940	2,020	680	352
4	7,020	720	1,240	2,140	464	2,020	760	940	5,550	1,780	565	600
5	3,570	640	1,090	1,560	464	1,780	720	1,040	4,340	1,780	530	403
6	2,410	600	850	1,340	378	1,400	640	1,190	5,340	1,780	565	309
7	2,270	530	760	1,090	464	1,190	600	1,340	6,390	2,270	530	378
8	1,900	565	680	990	530	1,040	600	1,400	3,950	2,140	548	464
9	1,450	464	680	850	600	850	680	1,340	3,950	2,020	565	352
10	1,140	434	720	760	8,120	850	895	1,450	3,210	1,780	530	352
11	2,410	403	760	680	9,470	850	1,240	1,780	4,540	1,780	464	403
12	1,780	352	720	640	6,390	850	1,400	1,670	3,390	1,780	434	330
13	1,560	378	895	680	2,700	640	1,450	2,020	3,570	1,900	464	290
14	2,020	352	720	2,020	2,020	600	1,240	3,030	3,030	2,020	464	272
15	1,670	352	600	2,860	1,560	600	1,040	3,950	2,550	1,780	434	240
16	1,560	940	497	1,670	1,190	1,040	940	5,340	2,550	1,560	378	226
17	1,340	2,270	497	1,240	990	2,700	940	3,570	2,020	1,560	760	226
18	1,190	3,210	434	940	895	2,410	1,090	3,570	2,020	1,780	850	240
19	1,040	2,410	403	895	760	1,780	1,090	3,030	2,700	1,670	497	1,040
20	895	2,550	403	760	720	1,290	1,140	2,550	2,860	1,340	434	1,240
21	1,450	1,670	352	680	640	1,090	2,410	3,390	3,390	1,140	464	2,550
22	1,090	1,340	352	600	600	1,090	2,270	3,210	3,210	1,340	352	2,140
23	1,040	1,340	352	565	1,560	1,040	1,780	3,030	3,390	1,450	330	1,040
24	1,240	1,240	378	530	1,560	1,090	1,340	4,140	3,210	1,400	330	680
25	1,290	1,340	565	497	1,780	1,290	1,290	3,950	3,210	1,290	330	1,240
26	1,190	1,340	434	464	1,780	990	1,560	3,030	2,550	940	290	5,140
27	940	1,450	600	464	1,670	850	1,340	2,550	2,700	940	272	4,740
28	1,190	1,290	3,570	434	2,270	805	1,400	1,900	2,550	940	272	2,270
29	895	1,040	3,210	403	-------	760	1,400	2,410	2,550	1,040	272	1,450
30	850	895	6,810	403	-------	805	1,140	3,570	3,570	850	272	1,140
31	720	-------	3,210	403	-------	850	-------	4,140	-------	850	330	-------

NOTE.—Gage not read Mar. 11, May 2, and Aug. 8; discharge interpolated.

Monthly discharge of North Fork of Skykomish River at Index, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 143 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	7,020	720	1,800	12.6	14.53	110,000
November	3,210	352	1,070	7.48	8.34	63,700
December	6,810	352	1,110	7.76	8.95	68,260
January	5,140	403	1,200	8.39	9.67	73,800
February	9,470	378	1,820	12.7	13.22	101,000
March	2,700	600	1,280	8.95	10.32	78,700
April	2,410	600	1,180	8.25	9.20	70,200
May	5,340	895	2,500	17.5	20.18	154,000
June	6,390	2,020	3,500	24.5	27.33	208,000
July	2,700	850	1,620	11.3	13.03	99,600
August	850	272	478	3.34	3.85	29,400
September	5,140	226	1,030	7.20	8.03	61,300
The year	9,470	226	1,550	10.8	146.65	1,120,000

SULTAN RIVER NEAR SULTAN, WASH.

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

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 18, 1911, to September 30, 1921.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 13.4 feet 6 p. m. to 7 p. m. February 11 (discharge, 14,400 second-feet); minimum stage recorded, 0.93 foot at 6 a. m. September 18 (discharge, 106 second-feet).

1911–1921: Maximum stage recorded, 16.6 feet at about 9 a. m. December 18, 1917, determined from high-water mark in well (discharge, 20,600 second-feet); minimum stage recorded, 0.28 foot August 24, 1920 (discharge, 54 second-feet).

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

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge, except as noted in footnote to table of daily discharge, ascertained by applying to rating table mean daily gage height obtained 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 for January and February good, otherwise excellent.

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

Discharge measurements of Sultan River near Sultan, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 9	R. B. Kilgore	3.26	752	June 22	R. B. Kilgore	4.57	1,440
June 21	do	5.23	1,810	Sept. 24	John McCombs	2.78	568

Daily discharge, in second-feet, of Sultan River near Sultan, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,660	279	567	2,420	680	2,380	680	832	1,560	1,430	273	203
2	2,480	319	604	6,800	641	1,660	930	955	1,300	1,560	260	209
3	4,360	799	809	2,750	742	2,100	700	856	1,560	1,100	214	301
4	4,780	480	1,130	1,600	532	1,460	567	742	1,600	856	182	567
5	2,190	382	764	1,780	401	1,060	480	764	1,490	764	171	414
6	1,520	312	585	1,100	336	809	430	742	1,630	721	165	276
7	1,460	276	497	832	514	660	385	880	2,160	721	171	281
8	1,110	246	447	742	742	549	376	809	1,400	809	189	430
9	764	224	480	622	1,030	514	447	809	1,280	622	189	376
10	622	207	657	514	9,310	622	700	1,160	1,220	604	171	276
11	2,240	189	930	447	16,800	514	1,030	1,250	1,840	622	161	260
12	1,600	174	742	430	5,810	430	1,130	1,030	1,380	604	153	211
13	1,080	173	832	634	2,060	382	1,370	1,160	1,280	604	156	176
14	1,650	187	567	3,910	1,310	348	930	1,560	1,160	604	157	155
15	1,340	170	430	3,120	930	324	721	1,660	1,080	532	147	140
16	1,170	595	430	1,370	700	1,410	622	2,100	905	447	131	121
17	1,000	1,490	430	980	585	4,200	641	1,770	786	411	282	118
18	830	1,880	414	905	514	3,370	742	1,600	696	447	1,230	112
19	660	1,850	385	786	464	1,700	856	1,400	1,100	447	516	485
20	567	2,360	370	622	401	1,060	930	1,340	1,260	414	273	980
21	832	1,380	363	532	354	832	3,340	1,560	1,930	327	273	1,970
22	832	956	318	480	380	764	2,380	1,460	1,370	357	246	897
23	622	1,560	287	414	1,030	809	1,460	1,370	1,220	395	189	764
24	641	930	363	382	1,220	905	1,100	1,660	1,250	401	224	567
25	660	980	567	357	1,190	1,080	1,030	1,740	1,130	376	226	965
26	549	980	447	348	1,130	832	1,470	1,250	1,000	281	179	3,770
27	464	1,310	1,520	360	1,160	641	1,220	930	1,100	246	156	2,290
28	549	905	4,930	382	2,100	585	1,250	764	930	258	143	1,780
29	480	721	4,720	336	-------	604	1,190	791	905	243	134	1,030
30	382	604	5,950	318	-------	567	955	1,220	2,000	255	127	721
31	324	-------	2,130	354	-------	585	-------	1,560	-------	273	135	-------

NOTE.—Recorder not operating Oct. 1–7, 16–18, and Jan. 15 to Feb. 9; discharge Oct. 16–18, interpolated; for other days of missing gage-height record, discharge determined from curves giving relation between gage heights at this station and at a station 1½ miles upstream maintained by Sound Power Co.

Monthly discharge of Sultan River near Sultan, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	4,780	324	1,270	78,100
November	2,360	170	764	45,500
December	5,950	287	1,090	67,000
January	6,800	318	1,180	72,600
February	10,800	336	1,680	93,300
March	4,200	324	1,090	67,000
April	3,340	376	1,000	59,500
May	2,100	742	1,220	75,000
June	2,160	696	1,320	78,600
July	1,560	243	572	35,200
August	1,230	127	233	14,300
September	3,770	112	695	41,400
The year	10,800	112	1,000	728,000

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, 1921.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 9.2 feet at 5 a. m. December 30 (discharge, 11,800 second-feet); minimum stage, from recorder, 1.87 feet August 28 and 29 (discharge, 275 second-feet).

1907–1921: Maximum stage, from recorder, 12.2 feet at 10 a. m. December 18, 1917 (discharge, 18,300 second-feet); discharge may have been greater during floods in November, 1909, and November, 1910; minimum stage, from recorder, 1.50 feet at 1 p. m. September 30, 1915 (discharge, 146 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 30 and February 10–11. Two rating curves used prior to February 11, well defined below 7,000 second-feet; curve used February 11 to September 30, well defined below 5,000 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 obtained 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. 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.

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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 6	Kilgore and Neth	3.81	1,610	May 25	D. J. F. Calkins	5.16	3,390
7	do	3.52	1,340	July 19	Neth and Van Wagoner	3.14	974
Feb. 21	Neth and Bertrand	2.74	797	Sept. 18	McCombs and Neth	1.90	279
Mar. 19	do	4.44	2,210	20	do	4.28	2,140
May 23	Calkins and Neth	4.50	2,330				

Daily discharge, in second-feet, of Middle Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,280	582	830	3,520	681	2,960	915	1,280	2,800	2,520	637	443
2	3,470	535	800	7,350	727	2,180	985	1,200	2,670	2,380	619	471
3	5,160	594	860	4,470	781	2,310	950	1,090	3,140	1,680	577	1,030
4	7,090	535	1,180	2,900	733	1,980	848	1,060	3,300	1,410	518	1,060
5	3,720	485	920	2,520	668	1,510	776	1,120	3,220	1,360	479	848
6	2,420	448	770	1,710	643	1,240	711	1,120	3,470	1,410	458	589
7	2,340	419	706	1,350	775	1,090	673	1,280	4,520	1,410	495	524
8	1,760	396	664	1,260	1,050	985	655	1,160	3,140	1,620	501	667
9	1,230	374	658	1,090	1,520	915	698	1,200	2,740	1,280	495	692
10	1,020	357	746	907	8,480	848	867	1,640	2,740	1,200	479	565
11	1,520	333	1,060	774	9,440	815	1,200	1,620	3,220	1,240	439	583
12	1,660	310	1,060	720	6,450	763	1,280	1,360	2,740	1,240	405	485
13	1,180	329	1,140	852	3,310	704	1,510	1,610	2,520	1,200	392	415
14	1,780	337	860	3,040	2,110	661	1,160	2,310	2,310	1,200	396	365
15	1,500	317	729	4,020	1,460	637	985	2,740	2,040	1,120	392	329
16	1,180	674	712	2,230	1,160	1,220	880	3,980	1,740	1,020	370	310
17	1,060	2,020	664	1,600	1,020	4,190	915	2,900	1,460	985	412	292
18	955	3,620	627	1,390	915	3,770	1,020	2,670	1,410	950	553	292
19	890	2,660	594	1,210	880	2,290	1,090	2,380	2,110	950	469	1,090
20	830	2,500	570	1,050	796	1,570	1,120	2,180	2,180	915	387	2,190
21	1,020	1,700	547	899	724	1,280	3,330	2,450	2,520	808	370	2,840
22	1,020	1,590	523	803	777	1,160	3,760	2,600	2,240	789	353	1,480
23	860	2,500	485	727	2,220	1,090	2,460	2,520	2,180	848	321	1,090
24	920	1,500	547	675	2,240	1,200	1,740	2,900	2,380	880	314	880
25	955	1,380	770	625	2,110	1,410	1,510	3,140	2,380	848	314	815
26	860	1,440	712	619	1,920	1,160	1,680	2,520	2,110	756	292	1,520
27	770	1,400	1,170	601	1,800	985	1,490	1,860	1,980	679	279	1,580
28	890	1,140	5,110	607	2,520	915	2,180	1,460	1,800	685	275	2,720
29	830	990	4,820	560	-------	915	2,110	}	1,860	679	275	1,520
30	724	890	8,640	531	-------	880	1,560	1,900	2,470	661	282	1,090
31	641	-------	4,050	548	-------	880	-------	}	-------	649	296	-------

NOTE.—Recorder not operating May 29 to June 1; discharge determined by comparison with flow of Skykomish River. Braced figure shows mean discharge for period included.

Monthly discharge of Middle Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 184 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	7,090	641	1,660	9.02	10.40	102,000
November	3,620	310	1,080	5.87	6.55	64,300
December	8,640	485	1,400	7.61	8.77	86,100
January	7,350	531	1,650	8.97	10.34	101,000
February	9,440	643	2,070	11.20	11.66	115,000
March	4,190	637	1,440	7.83	9.03	88,500
April	3,760	655	1,370	7.45	8.31	81,500
May	3,980	1,060	1,970	10.70	12.34	121,000
June	4,520	1,410	2,510	13.60	15.17	149,000
July	2,520	649	1,140	6.20	7.15	70,100
August	637	275	414	2.25	2.59	25,500
September	2,840	292	959	5.21	5.81	57,100
The year	9,440	275	1,470	7.99	108.12	1,060,000

NORTH FORK OF SNOQUALMIE RIVER NEAR NORTH BEND, WASH.

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

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

RECORDS AVAILABLE.—July 4, 1907, to September 30, 1921.

GAGE.—Friez water-stage recorder on right bank 200 yards southeast of ranch house; installed September 26, 1916; inspected by A. R. Neth. 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. Right bank not subject to overflow; left bank fairly high and not subject to overflow except at extremely high stages. Stage of zero flow, according to measurements made September 14, 1918, gage height −0.4 foot.

EXTREMES OF DISCHARGE.—Maximum mean daily discharge during year; estimated 4,500 second-feet for December 30 and February 11; minimum stage recorded, 1.89 feet at noon August 31 (discharge, 112 second-feet).

1907–1921: Maximum stage, determined by leveling to high-water mark 14.5 feet November 18, 1911 (discharge, 11,100 second-feet); water above gage November 18, 19, 23, 24, 29, and 30, 1909, and stage may have exceeded that reached in 1911. Minimum stage recorded, 1.0 foot September 26–28, 1910 (discharge, 56 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 3,000 second-feet. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection, or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records good except 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 8	Kilgore and Neth	3.54	784	July 18	Neth and Van Wagoner	2.80	341
May 24	Calkins and Neth	4.30	1,540	Sept. 19	McCombs and Neth	2.87	368

Daily discharge, in second-feet, of North Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1921.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.
1	668	314	451		395	1,730	603	929	1,430	1,300	188	175
2	1,590	301	451		417	1,340	701	912	1,300	1,340	181	189
3	2,100	345	506	2,500	426	1,730	623	810	1,480	980	172	295
4		318	800		377	1,340	516	754	1,530	810	164	384
5		288	551		346	1,010	456	778	1,480	730	158	338
6	1,800	267	438	1,070	324	802	412	762	1,690	686	154	241
7		253	395	912	395	686	390	852	2,180	679	154	222
8		240	360	895	552	589	369	746	1,430	679	150	317
9	667	230	387	886	1,070	539	390	738	1,380	552	148	331
10	551	220	407	754	2,000	499	510	1,100	1,340	527	144	287
11	1,010	208	528	679	4,500	466	810	1,050	1,530	521	139	241
12	1,080	199	465	643	3,360	477	909	861	1,250	499	134	207
13	740	202	496	662	2,050	403	1,030	1,010	1,160	477	130	183
14	1,150	213	407	2,380	1,340	381	730	1,380	1,120	456	127	170
15	883	199	364	2,340	1,020	369	570	1,480	1,160	426	124	158
16	717	361	383	1,360	794	823	510	2,100	980	377	119	148
17	667	1,380	379	1,050	679	2,380	516	1,680	810	354	133	143
18	581	1,720	371	912	589	2,110	603	1,530	802	346	275	146
19	528	1,360	360	762	533	1,420	715		1,250	334	194	568
20	480	1,460	345	643	482	1,020	738	1,400	1,140	317	152	880
21	770	1,000	328	558	431	818	2,160		1,430	281	144	1,460
22	740	890	311	510	455	738	2,280	1,430	1,200	268	141	645
23	581	1,600	301	466	1,290	708	1,530	1,340	1,140	271	134	493
24	600	1,940	342	431	1,300	852	1,130	1,530	1,120	268	134	395
25	557	866	419	403	1,200	989	1,000	1,630	989	262	154	369
26	470	908	391	390	1,130	762	1,050	1,250	912	238	143	935
27	411	836	1,040	381	1,100	687	1,080	963	954	222	134	891
28	494	653	2,820	377	1,480	583	1,530	810	861	217	128	1,250
29	465	562	3,010	354	-------	577	1,430	920	870	204	120	653
30	395	496	4,500	338	-------	539	1,120	1,200	1,400	200	119	466
31	345	-------	2,500	338	-------	533	-------	1,380	-------	192	117	-------

NOTE.—Intake clogged Oct. 4–9, Dec. 30 to Jan. 6, Jan. 15, Feb. 10–12; recorder not operating May 19–21; discharge determined from occasional staff gage readings and by comparison with flow of near-by streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of North Fork of Snoqualmie River near North Bend, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 102 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	-------	345	911	8.93	10.30	56,000
November	1,940	199	661	6.48	7.23	39,300
December	4,500	301	800	7.84	9.04	49,200
January	-------	338	1,060	10.4	11.99	65,200
February	4,500	324	1,070	10.5	10.93	59,400
March	2,380	369	898	8.80	10.14	55,200
April	2,280	369	880	8.63	9.63	52,400
May	2,100	738	1,170	11.5	13.26	71,900
June	2,180	802	1,240	12.2	13.61	73,800
July	1,340	192	484	4.75	5.48	29,800
August	275	117	149	1.46	1.68	9,160
September	1,460	143	439	4.30	4.80	26,100
The year	4,500	117	812	7.96	108.09	587,000

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, 1921.

GAGE.—Friez water-stage recorder on left bank at Cooper ranch; installed October 2, 1916; inspected by A. R. Neth. 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 during year, from water-stage recorder, 9.47 feet at 10 a. m. December 30 (discharge, 4,410 second-feet); minimum stage, from recorder, 1.79 feet at 3.15 p. m. September 17 (discharge, 128 second-feet).

1907–1921: 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.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed slightly December 30. Two rating curves 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 obtained from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. 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 mean discharge. Records good.

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

Discharge measurements of South Fork of Snoqualmie River at North Bend, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 5	R. B. Kilgore	4.44	1,130	May 24	Calkins and Neth	4.86	1,320
7	do	3.66	748	July 18	Neth and Van Wagoner	2.77	387
Feb. 14	Neth and Bertrand	4.72	1,320	Sept. 18	McCombs and Neth	1.82	134
21	do	3.46	680	19	do	2.04	176
May 23	Calkins and Neth	4.71	1,250	20	do	3.57	692

Daily discharge, in second-feet, of South Fork of Snoqualmie River at North Bend, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	407	284	407	1,420	617	1,540	770	816	1,380	911	200	160
2	746	273	386	2,960	617	1,380	770	770	1,270	1,010	195	168
3	1,510	276	382	2,160	638	1,240	748	748	1,350	863	188	252
4	2,320	258	432	1,370	596	1,190	703	703	1,440	770	181	285
5	1,360	247	393	1,180	576	1,060	660	748	1,380	725	175	252
6	915	239	362	911	535	960	638	770	1,440	703	170	212
7	796	228	339	770	535	863	617	840	1,660	681	168	198
8	706	220	317	748	576	816	617	793	1,350	681	170	198
9	579	215	329	703	638	793	617	770	1,190	638	172	198
10	520	208	355	638	2,260	770	638	887	1,220	596	172	195
11	559	208	466	617	3,940	748	725	911	1,190	576	172	210
12	620	186	444	617	3,260	703	793	816	1,140	555	168	192
13	520	188	473	681	1,800	681	863	863	1,110	535	168	170
14	641	184	403	1,260	1,300	660	770	1,080	1,080	503	164	156
15	641	182	352	1,790	1,060	660	660	1,240	1,010	472	160	143
16	559	236	326	1,220	887	816	617	1,760	936	435	156	134
17	520	492	308	985	816	1,670	596	1,540	887	414	160	130
18	470	990	293	887	770	2,010	617	1,320	840	386	164	137
19	444	915	278	840	748	1,490	638	1,280	985	369	156	210
20	407	819	273	793	703	1,140	660	1,230	1,010	352	141	724
21	436	706	267	770	660	985	1,130	1,190	1,040	326	144	819
22	481	641	250	748	681	911	1,930	1,270	985	307	139	572
23	429	990	250	725	985	887	1,410	1,240	960	301	135	403
24	418	750	278	703	1,140	887	1,060	1,320	985	288	135	320
25	414	641	330	681	1,110	936	911	1,490	936	279	135	295
26	386	662	339	660	1,100	863	863	1,300	887	261	132	355
27	355	641	447	638	1,080	816	816	1,080	840	249	130	417
28	362	559	1,430	638	1,240	770	887	936	816	237	132	815
29	349	492	1,580	617	-------	770	1,010	911	793	223	134	640
30	320	444	3,730	596	-------	770	887	1,040	863	215	135	476
31	302	-------	1,960	596	-------	748	-------	1,240	-------	208	143	-------

NOTE.—Recorder not operating May 19–20; discharge interpolated.

Monthly discharge of South Fork of Snoqualmie River at North Bend, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 84 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	2,320	302	629	7.49	8.64	38,700
November	990	182	446	5.31	5.92	26,500
December	3,730	250	586	6.98	8.05	36,000
January	2,960	596	965	11.5	13.26	59,300
February	3,940	535	1,100	13.1	13.64	61,100
March	2,010	660	985	11.7	13.49	60,600
April	1,930	596	821	9.77	10.90	48,900
May	1,760	703	1,060	12.6	14.53	65,200
June	1,660	793	1,100	13.1	14.62	65,500
July	1,010	208	486	5.79	6.68	29,900
August	200	130	158	1.88	2.17	9,720
September	819	130	315	3.75	4.18	18,700
The year	3,940	130	719	8.56	116.08	520,000

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 in Snohomish County.

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

RECORDS AVAILABLE.—August 11, 1917, to September 30, 1921.

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; gage heights prior to October 1, 1920, referred to original datum.

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 probably occurred on February 11 when water-stage recorder was out of order; mean discharge for day estimated as 6,000 second-feet by hydrographic comparison with record for Sultan River. Minimum stage, from recorder, 0.89 foot August 14–16 (discharge, 41 second-feet).

1918–1921: Maximum stage recorded, 10.05 feet December 18, 1917, from high-water mark in well (discharge, 9,300 second-feet); minimum stage, from water-stage recorder, 1.08 feet September 29 and 30, 1919 (discharge, 27 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed February 10–11; not affected by ice. Two rating curves well defined below 3,000 second-feet. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge, and except for period February to April when clogged intake pipe interfered with correct registering of low-water gage heights. Daily discharge ascertained by applying to rating table mean daily gage height obtained 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 February to April; others excellent except for periods when water-stage recorder was not operating.

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

Discharge measurements of Deer Creek at Oso, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 12	H. W. Newton	4.63	1,390	Sept. 13	D. J. F. Calkins	1.24	72.0
June 5	Lasley Lee	3.54	741	20	do	2.36	378

NOTE.—Datum of gage heights is 0.50 foot lower than that of measurements previously published.

Daily discharge, in second-feet, of Deer Creek at Oso, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	990	186	423	1,500	362	1,250	349	510	840	480	62	719
2	1,830	179	618	4,040	371	782	400	572	782	466	61	232
3		273	994	1,520	365	782	337	452	930	346	57	147
4		205	1,110	1,020	290	595	296	397	960	289	53	362
5		165	546	1,690	237	460	276	397	840	262	51	175
6	1,600	145	394	687	196	376	247	404	900	235	49	123
7		131	360	493	475	317	226	463	1,160	224	50	209
8		120	336	474	451	276	217	394	645	217	48	255
9		110	386	416	667	254	228	376	728	183	48	165
10	336	104	498	351		284	319	676	635	173	47	117
11	1,960	96	644	310	5,000	259	482	782	1,460	167	46	96
12	1,630	92	532	323		226	946	564	730	155	44	80
13	810	120	502	440	1,130	210	1,100	633	689	149	43	73
14	1,270	134	303	3,540	635	195	526	900	577	136	42	71
15	1,140	124	242	1,740	463	197	391	960	522	130	41	69
16	820	562	235	756	379	1,090	332	1,020	428	114	41	66
17	810	1,250	316	523	343	1,680	340	870	367	105	57	61
18	559	1,630	333	514	319	1,630	414	870	337	104	373	78
19	437	1,760	314	458	302	814	521	700	463	101	142	394
20	368	1,580	266	376	272	482	550	694	661	96	82	792
21	669	731	264	328	240	376	2,130	810	829	91	92	1,390
22	458	437	230	290	259	358	1,380	782	514	84	81	341
23	360	989	216	268	759	376	810	755	463	82	64	327
24	393	462	300	252	782	421	605	1,020	452	82	60	231
25	413	1,070	415	230	700	474	546	970	400	81	73	422
26	341	992	283	228	662	340	530	620	367	74	59	1,490
27	312	1,550	1,630	266	964	294	482	442	367	72	51	1,440
28	598	671		290	1,960	276	514	404	312	71	48	915
29	323	527	2,600	247	-------	269	605	518	304	68	47	404
30	259	458		235	-------	257	514	755	956	64	45	289
31	216	-------		247	-------	259	-------	960	-------	64	155	-------

NOTE.—Water-stage recorder not operating Oct. 3–9, Dec. 28 to Jan. 2, and Feb. 10–12; discharge estimated by comparison with flow of Sultan River near Sultan, Wash. Braced figures show mean discharge for periods included.

Monthly discharge of Deer Creek at Oso, Wash., for the year ending Sept. 30, 1921

[Drainage area, 84 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	----------	216	919	10.9	12.57	56,500
November	1,760	92	562	6.69	7.46	33,400
December	----------	216	745	8.87	10.23	45,800
January	4,040	228	776	9.24	10.65	47,700
February	----------	196	1,020	12.1	12.60	56,600
March	1,680	195	512	6.10	7.03	31,500
April	2,130	217	554	6.60	7.36	33,000
May	1,020	376	667	7.94	9.15	41,000
June	1,460	304	654	7.79	8.69	38,900
July	480	64	160	1.90	2.19	9,840
August	373	41	71.4	.850	.98	4,390
September	1,490	61	384	4.57	5.10	22,800
The year	----------	41	582	6.93	94.01	421,000

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 1922; area in British Columbia, 390 square miles.[1]

RECORDS AVAILABLE.—June 1, 1919, to September 30, 1921.

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; practically 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, 11.95 feet at 7 a. m. June 7 (discharge, 25,200 second-feet); minimum stage, from recorder, 3.92 feet at 2 p. m. February 9 (discharge, 930 second-feet).

1919–1921: Maximum stage recorded on June 7, 1921; minimum stage recorded, 3.30 feet at 10 p. m. November 11, 1919 (discharge, 555 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed slightly October 5 and May 8; not affected by ice. Rating curves well defined. 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 of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent.

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

Discharge measurements of Skagit River below Ruby Creek, near Marblemount, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 25	Parker and Davis	5.44	2,670	May 30	Davis and Parker	8.47	9,260
26	do	5.38	2,630	Aug. 8	John McCombs	5.92	3,280
May 29	do	8.23	8,470	Sept. 30	D. J. F. Calkins	5.35	2,460

[1] White, A. V., Water powers of British Columbia, p. 483, Conservation Commission of Canada, 1919.

Daily discharge, in second-feet, of Skagit River below Ruby Creek, near Marblemount, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,460	2,030	1,910	2,360	1,070	3,400	2,160	2,500	14,800	9,550	4,250	2,140
2	2,810	1,970	1,910	2,640	1,050	3,320	2,290	2,570	16,200	7,760	4,160	1,840
3	3,650	1,970	1,850	2,570	1,040	3,480	2,220	2,570	17,200	6,710	3,720	1,560
4	10,200	1,850	2,100	2,360	998	3,480	2,160	2,570	22,200	6,450	3,180	1,470
5	10,600	1,730	2,030	2,220	982	3,320	2,030	2,800	22,200	6,320	2,880	1,400
6	9,550	1,670	1,910	2,030	960	3,100	1,970	3,020	22,200	5,940	2,950	1,350
7	8,040	1,560	1,850	1,910	975	2,870	1,910	3,720	24,700	6,320	3,100	1,400
8	6,260	1,560	1,730	1,790	952	2,720	1,910	3,980	20,700	7,490	3,320	1,500
9	5,120	1,450	1,670	1,670	945	2,570	1,910	4,250	16,200	6,710	3,250	1,450
10	4,520	1,400	1,670	1,500	2,090	2,500	2,100	5,030	14,400	6,190	3,100	1,300
11	4,820	1,400	1,620	1,400	5,900	2,430	2,500	5,250	13,500	6,450	2,950	1,200
12	4,340	1,300	1,560	1,450	7,770	2,220	2,940	4,930	12,600	6,710	2,880	1,120
13	3,810	1,300	1,500	1,400	5,900	2,160	3,400	5,140	12,600	6,710	2,810	1,060
14	3,560	1,250	1,400	1,940	4,620	2,030	3,320	6,710	11,800	6,710	2,950	1,010
15	3,320	1,250	1,350	3,100	3,810	1,970	3,240	8,900	10,200	6,320	2,810	990
16	3,020	1,350	1,300	2,640	3,240	1,910	3,020	12,200	8,900	5,470	2,600	982
17	2,870	1,730	1,300	2,290	2,870	1,970	3,020	13,500	8,310	5,250	3,020	975
18	2,720	2,290	1,250	2,100	2,640	2,100	3,100	15,300	7,760	5,470	3,020	990
19	2,570	2,870	1,300	1,910	2,430	2,030	3,400	15,800	8,310	5,580	2,530	1,100
20	2,430	2,800	1,160	1,730	2,290	1,970	3,560	14,400	9,900	5,250	2,390	1,220
21	2,290	2,570	1,120	1,620	2,100	1,910	3,480	13,900	11,800	4,630	2,530	2,760
22	2,360	2,360	1,090	1,560	1,970	1,850	3,560	14,400	12,200	4,630	2,140	1,720
23	2,290	2,160	1,060	1,450	1,970	1,790	3,400	13,900	11,400	5,030	1,960	1,500
24	2,290	2,030	1,050	1,400	2,100	1,790	3,170	14,400	11,800	5,250	1,900	1,350
25	2,570	2,100	1,030	1,350	2,430	1,850	3,020	16,200	11,800	5,030	1,720	1,350
26	2,570	2,100	990	1,300	2,800	1,850	2,800	14,800	11,000	4,630	1,670	3,72
27	2,430	2,290	1,030	1,250	2,940	1,790	2,720	11,800	10,200	4,430	1,620	3,360
28	2,640	2,160	1,350	1,200	3,240	1,790	2,640	9,550	9,550	4,250	1,670	4,250
29	2,430	2,030	1,500	1,160	-------	1,850	2,640	8,600	9,200	3,980	1,670	3,100
30	2,220	1,970	2,500	1,160	-------	1,910	2,570	9,200	9,900	3,980	1,670	2,460
31	2,100	-------	2,570	1,120	-------	1,970	-------	11,800	-------	4,160	1,710	-------

Monthly discharge of Skagit River below Ruby Creek, near Marblemount, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 978 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	10,600	2,100	3,960	4.05	4.67	243,000
November	2,870	1,250	1,880	1.92	2.14	112,000
December	2,570	990	1,540	1.57	1.81	94,700
January	3,100	1,120	1,790	1.83	2.11	110,000
February	7,770	945	2,570	2.63	2.74	143,000
March	3,480	1,790	2,320	2.37	2.73	143,000
April	3,560	1,910	2,740	2.80	3.12	163,000
May	16,200	2,500	8,830	9.03	10.41	543,000
June	24,700	7,760	13,500	13.8	15.40	803,000
July	9,550	3,980	5,790	5.92	6.82	356,000
August	4,250	1,620	2,650	2.71	3.12	163,000
September	4,250	975	1,720	1.76	1.96	102,000
The year	24,700	945	4,110	4.20	57.03	2,980,000

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, edition of 1922. Area in British Columbia, 390 square miles.[2]

RECORDS AVAILABLE.—December 6, 1913, to September 30, 1921.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 10.7 feet at 7 a. m. June 7 (discharge, 30,800 second-feet); minimum stage recorded, 2.20 feet at 10 p. m. February 6 (discharge, 1,180 second-feet).

1913–1921: Maximum stage, from water-stage recorder, 12.0 feet at 6.30 p. m. December 29, 1917 (discharge, 37,300 second-feet); minimum stage, from recorder, 1.64 feet from 4 p. m. November 11 to 9 p. m. November 12, 1919 (discharge, 665 second-feet). Discharge may have been as low or lower on December 12, 1919, when stage-discharge relation was affected by ice.

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

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed at high water on May 26; not affected by ice. Two rating curves well defined. Operation of water-stage recorder satisfactory except that intake pipe to stilling well was partly clogged resulting in a lag between stage in stilling well and in river. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection. Records good.

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

[2] White, A. V., Water powers of British Columbia, p. 483, Conservation Commission of Canada, 1919.

Discharge measurements of Skagit River at Reflector Bar, near Marblemount, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 23	Kilgore and Parker	3.22	2,800	June 4	F. E. Davis	9.44	24,100
27	Davis and Parker	3.33	3,020	Aug. 6	John McCombs	4.00	4,270
May 26	do	7.44	16,500	9	do	4.25	4,720
28	G. L. Parker	5.98	10,700	Sept. 26	D. J. F. Calkins	4.43	5,260
June 2	do	7.78	17,900				

Daily discharge, in second-feet, of Skagit River at Reflector Bar, near Marblemount, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,710	2,560	2,240	2,960	1,300	4,050	2,460	2,960	16,800	12,300	6,480	3,290
2	3,940	2,560	2,210	3,380	1,300	3,940	2,660	3,060	18,500	10,000	6,320	2,630
3	4,690	2,560	2,190	3,280	1,290	4,170	2,560	2,960	20,600	8,340	5,400	2,300
4	11,800	2,370	2,460	2,960	1,250	4,170	2,560	2,960	25,400	7,980	4,570	2,140
5	13,100	2,190	2,370	2,860	1,220	3,940	2,460	3,170	27,600	7,980	4,070	2,000
6	11,800	2,060	2,240	2,560	1,190	3,710	2,300	3,490	26,300	7,290	4,190	1,920
7	10,200	1,960	2,170	2,370	1,230	3,380	2,240	4,170	29,800	7,800	4,840	2,140
8	7,690	1,880	2,050	2,260	1,220	3,170	2,210	4,540	25,000	9,620	5,250	2,300
9	6,200	1,800	1,980	2,080	1,220	3,060	2,280	4,930	20,200	8,700	4,970	2,070
10	5,470	1,700	1,930	1,870	2,720	2,960	2,460	5,760	17,600	7,980	4,700	1,850
11	5,760	1,630	1,930	1,780	7,550	2,860	2,960	5,760	16,000	8,160	4,440	1,640
12	5,330	1,530	1,840	1,820	10,200	2,660	3,600	5,610	15,500	8,520	4,320	1,540
13	4,670	1,550	1,800	1,780	7,010	2,560	3,940	5,900	15,100	8,880	4,570	1,450
14	4,420	1,520	1,670	2,500	5,760	2,370	3,940	7,860	14,300	8,880	4,700	1,430
15	4,050	1,500	1,620	3,940	4,670	2,300	3,710	10,600	12,700	8,520	4,440	1,400
16	3,820	1,590	1,570	3,280	4,050	2,300	3,600	14,800	11,100	7,290	4,070	1,410
17	3,600	2,060	1,550	2,860	3,600	2,370	3,490	16,400	10,400	6,960	4,970	1,430
18	3,380	2,760	1,500	2,660	3,280	2,560	3,600	18,100	10,400	7,460	4,700	1,490
19	3,170	3,380	1,460	2,370	3,060	2,460	3,940	18,500	10,800	7,800	3,840	1,640
20	3,060	3,280	1,380	2,170	2,860	2,370	4,050	17,300	12,700	7,120	3,720	1,910
21	3,060	2,960	1,350	2,010	2,560	2,280	4,170	16,900	15,500	6,160	3,950	4,200
22	2,960	2,760	1,310	1,880	2,460	2,240	4,170	17,300	16,400	6,320	3,190	2,460
23	2,860	2,560	1,280	1,790	2,460	2,190	4,050	16,400	15,100	7,120	2,900	2,140
24	2,860	2,370	1,280	1,690	2,660	2,190	3,820	17,300	15,500	7,290	2,720	1,920
25	3,280	2,460	1,250	1,620	3,060	2,240	3,600	19,400	15,500	6,960	2,460	2,000
26	3,170	2,460	1,220	1,550	3,280	2,170	3,380	17,200	14,300	6,320	2,380	4,110
27	3,060	2,760	1,260	1,500	3,490	2,120	3,170	13,500	13,500	6,160	2,380	4,910
28	3,490	2,560	1,820	1,440	3,940	2,120	3,060	10,800	12,300	5,840	2,540	6,020
29	3,280	2,460	1,960	1,380	-------	2,190	3,170	9,620	12,300	5,690	2,540	4,070
30	2,960	2,320	3,280	1,350	-------	2,230	3,060	10,800	13,100	5,690	2,630	3,090
31	2,760	-------	3,280	1,350	-------	2,280	-------	13,100	-------	6,160	2,630	-------

Monthly discharge of Skagit River at Reflector Bar, near Marblemount, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	13,100	2,760	4,950	4.50	5.19	304,000
November	3,380	1,500	2,270	2.06	2.30	135,000
December	3,280	1,220	1,850	1.68	1.94	114,000
January	3,940	1,350	2,240	2.04	2.35	138,000
February	10,200	1,190	3,210	2.92	3.04	178,000
March	4,170	2,120	2,760	2.51	2.89	170,000
April	4,170	2,210	3,220	2.93	3.27	192,000
May	19,400	2,960	10,400	9.45	10.90	640,000
June	29,800	10,400	16,700	15.2	16.96	994,000
July	12,300	5,690	7,650	6.95	8.01	470,000
August	6,480	2,380	4,030	3.66	4.22	248,000
September	6,020	1,400	2,430	2.21	2.47	145,000
The year	29,800	1,190	5,140	4.67	63.54	3,730,000

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, 1921.

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 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 during period of record, from water-stage recorder, 10.1 feet at midnight September 11, 1920 (discharge, 4,380 second-feet); minimum stage, from recorder, 2.97 feet, 10 a. m. to 11 a. m. November 12, 1919 (discharge, 84 second-feet).

ICE.—Stage-discharge relation affected by ice during extremely cold weather; flow estimated by means of observer's notes, weather records, and results at near-by gaging stations.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed July 16, 1919, and June 7, 1921; affected by ice December 9–18, 1919. Rating curves fairly 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 except for short intervals during which diurnal fluctuation was small, for which it was ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection. Records good.

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

Discharge measurements of Thunder Creek near Marblemount, Wash., during the years ending Sept. 30, 1919–1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1918.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Nov. 6	Moore and Hunt	3.97	240	July 10	McCombs and Moore	7.40	2,040
11	do	4.18	297	Oct. 24	Parker and Davis	4.45	422
1919.				28	do	4.56	494
Feb. 18	Hunt and Davis	3.50	133	29	do	4.41	426
Mar. 6	Hunt and Moore	3.29	118	1921.			
Apr. 21	Tom Hunt	4.92	468	May 27	do	6.04	1,080
28	Hunt and Moore	5.75	845	28	F. E. Davis	5.67	879
June 15	McCombs and Hunt	5.62	757	June 1	G. L. Parker	7.00	1,750
15	do	5.57	763	Aug. 7	John McCombs	6.54	1,460
July 23	Hunt and Moore	6.68	1,600	7	do	6.91	1,750
Oct. 3	G. H. Moore	3.63	204	Sept. 27	D. J. F. Calkins	5.64	889
1920.				28	do	6.11	1,120
Mar. 26	Moore and Davis	3.56	170	29	do	5.16	661

Daily discharge, in second-feet, of Thunder Creek near Marblemount, Wash., for the years ending Sept. 30, 1919–1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919.												
1						124	368	832	764	1,060	1,500	851
2						123	419	732	804	1,240	1,400	763
3						122	464	627	848	1,450	1,310	769
4						121	519	557		1,690	1,210	689
5						119	508	502	1,000	1,850	1,190	648
6						118	463	484		1,490	1,230	575
7						116	425	531	865	1,100	1,380	646
8						114	391	630	832	1,120	1,310	554
9						113	387	698	815	1,410	1,240	649
10						116	468	646		1,710	1,310	638
11						116	460	602		1,950	1,450	855
12						116	421	553	750	1,750	1,340	1,150
13						114	393	515		1,520	1,170	724
14						114	359	477		1,690	1,020	778
15					142	116	340	616		2,380	1,190	782
16					147	118	332	643	750	2,690	1,420	823
17					150	139	435	586	830	2,050	1,640	762
18					147	164	560	557	948	1,510	1,620	719
19					145	162	562	721	1,500	1,400	1,500	796
20					140	157	559	918	1,940	1,540	1,400	641
21					137	157	519	1,060	1,730	1,770	1,380	537
22					136	158	487	1,430	1,660	1,810	1,210	561
23					132	162	487	1,240	1,540	1,650	1,020	659
24					131	164	549	1,080	1,280	1,570	1,080	692
25					129	164	575	1,670	1,300	1,450	1,230	705
26					128	165	646	2,490	1,570	1,140	1,190	632
27					127	167	822	3,110	1,430	1,190	940	453
28					126	174	859	2,360	1,260	1,310	818	336
29						191	837	1,710	1,020	1,370	896	304
30						253	845	1,170	930	1,400	1,060	304
31						332		880		1,450	1,290	
1919–20.												
1	258	156	279	339	592	156	170	325	354	2,280	1,450	637
2	229	146	235	309	525	154	166	318	460	2,210	1,500	794
3	202	127	229	281	467	148	162	341	615	2,120	1,430	837
4	199	129	235	268	434	146	162	361	813	2,090	1,380	808
5	260	121	206	250	418	145	168	393	858	1,850	1,690	718
6	331	115	204	229	538	143	164	468	767	1,690	1,850	641
7	383	113	199	216	554	143	162	666	751	1,770	1,840	654
8	430	106	170	207	471	145	158	836	844	1,960	1,980	694
9	244	105		202	428	146	156	793	700	2,060	1,980	622
10	201	105		195	388	145	156	762	656	2,140	1,960	633
11	243	96	160	188	355	145	156	680	672	2,010	1,770	2,030
12	262	92		185	329	154	166	664	655	1,820	1,850	2,500
13	257	105		180	308	311	174	682	684	1,680	1,880	1,170
14	216	164		182	283	323	170	694	852	2,040	1,720	1,380
15	190	1,510		202	267	254	170	673	1,060	2,090	1,660	1,060
16	183	1,980	195	203	254	226	168	698	1,000	2,270	1,470	1,130
17	170	1,600	1,690	455	244	209	164	970	1,050	2,220	1,060	1,000
18	154	940	402	717	239	202	164	759	970	2,280	738	1,290
19	143	787	323	602	232	195	183	640	890	2,260	774	776
20	143	593	534	470	220	193	185	586	881	1,960	970	874
21	246	715	542	397	210	202	176	528	1,030	1,620	1,230	1,040
22	139	819	494	342	196	201	170	466	1,340	1,500	1,450	754
23	174	940	529	293	193	198	170	435	1,020	1,480	1,390	654
24	156	728	704	278	187	193	172	402	781	1,490	1,130	588
25	137	557	606	264	183	190	188	374	675	1,210	800	552
26	129	434	537	238	180	183	231	364	662	1,290	821	511
27	119	390	613	242	173	181	331	374	775	1,450	1,020	686
28	122	374	515		166	177	395	367	1,130	1,730	837	598
29	119	337	459	700	160	176	380	355	1,570	1,980	685	625
30	113	305	422			186	355	331	2,090	1,740	599	710
31	113		372			176		320		1,510	571	

Daily discharge, in second-feet, of Thunder Creek near Marblemount, Wash., for the years ending Sept. 30, 1919–1921—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920–21.												
1	1,020	339	280	371	187	494	297	334	1,840	2,120	1,960	940
2	798	336	278	450	185	468	312	338	1,920	1,360	1,820	622
3	1,050	336	278	436	184	495	306	326	2,190	1,090	1,430	529
4	2,800	307	287	393	180	495	291	329	2,710	1,100	1,150	494
5	2,260	291	274	353	174	468	282	340	2,800	1,150	1,040	448
6	1,880	280	264	329	168	435	269	384	2,950	1,040	1,230	467
7	1,290	265	260	305	174	402	264	461	3,800	1,290	1,566	602
8	807	260	251	284	170	376	261	492	2,840	1,820	1,730	662
9	649	252	250	264	170	362	273	521	2,300	1,500	1,570	544
10	586	243	242	243	405	351	293	617	1,980	1,380	1,450	444
11	622	236	237	237	1,040	327	346	602	1,740	1,500	1,360	359
12	543	226	228	237	1,340	310	378	572	1,620	1,620	1,360	308
13	483	226	226	232	818	291	411	613	1,640	1,780	1,520	278
14	474	221	217	326	629	280	400	799	1,510	1,820	1,620	284
15	460	217	213	460	525	269	395	1,120	1,210	1,720	1,490	293
16	432	232	208	396	445	266	380	1,660	1,100	1,400	1,290	325
17	413	283	203	352	405	278	373	1,710	1,040	1,430	1,640	347
18	404	377	202	326	374	306	379	1,850	1,100	1,690	1,500	392
19	387	441	197	297	346	295	399	1,670	1,290	1,820	1,190	424
20	375	402	194	274	323	281	408	1,460	1,620	1,590	1,200	610
21	406	354	190	260	297	272	432	1,550	2,220	1,310	1,260	1,280
22	391	332	185	248	283	269	473	1,590	2,100	1,500	864	543
23	374	320	183	238	314	265	441	1,530	1,950	1,760	787	449
24	417	301	182	231	348	270	413	1,690	2,090	1,930	719	348
25	485	297	179	221	393	276	389	1,830	2,080	1,780	619	398
26	455	293	177	216	431	272	374	1,540	1,850	1,620	626	1,210
27	433	325	178	209	447	262	354	1,150	1,800	1,650	676	1,260
28	483	312	296	204	488	263	351	896	1,660	1,570	774	1,170
29	428	297	311	197	------	272	362	815	1,780	1,520	830	667
30	390	288	468	192	------	271	342	1,000	2,340	1,660	880	493
31	361	------	422	184	------	278	------	1,470	------	1,850	888	------

NOTE.—No gage-height record available for Feb. 24 to Mar. 5, 1919; discharge interpolated. No gage-height record available for June 4–6, 9–15, 1919, and Jan. 28–31, 1920; probable gage-height graph estimated by comparison with record obtained at Reflector Bar.. Braced figures show mean discharge for periods included.

Monthly discharge of Thunder Creek near Marblemount, Wash., for the years ending Sept. 30, 1919–1921.

[Drainage area, 111 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919.						
February 15–28	150	126	137	1.23	0.64	3,800
March	332	113	148	1.33	1.53	9,100
April	859	332	515	4.64	5.18	30,600
May	3,110	477	988	8.90	10.26	60,800
June	1,940	------	1,070	9.64	10.76	63,700
July	2,690	1,060	1,570	14.1	16.26	96,500
August	1,640	818	1,260	11.4	13.14	77,500
September	1,150	304	666	6.00	6.69	39,600
The period	------	------	------	------	------	382,000
1919–20.						
October	430	113	202	1.82	2.10	12,400
November	1,980	92	490	4.41	4.92	29,200
December	1,690	------	381	3.43	3.95	23,400
January	------	180	346	3.12	3.60	21,300
February	592	160	317	2.86	3.08	18,200
March	323	143	185	1.67	1.92	11,400
April	395	156	196	1.77	1.98	11,700
May	970	318	536	4.83	5.57	33,000
June	2,090	354	887	7.99	8.91	52,800
July	2,280	1,210	1,860	16.8	19.37	114,000
August	1,980	571	1,340	12.1	13.95	82,400
September	2,500	511	899	8.10	9.04	53,500
The year	2,500	92	639	5.76	78.39	463,000

Monthly discharge of Thunder Creek near Marblemount, Wash., for the years ending Sept. 30, 1919–1921—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1920–21.						
October	2,800	361	721	6.50	7.49	44,300
November	441	217	296	2.67	2.98	17,600
December	468	177	244	2.20	2.54	15,000
January	460	184	289	2.60	3.00	17,800
February	1,340	168	402	3.62	3.77	22,300
March	495	262	330	2.97	3.42	20,300
April	473	261	355	3.20	3.57	21,100
May	1,850	326	1,010	9.10	10.49	62,100
June	3,800	1,040	1,970	17.7	19.75	117,000
July	2,120	1,040	1,560	14.1	16.26	95,900
August	1,960	619	1,230	11.1	12.80	75,600
September	1,280	278	573	5.16	5.76	34,100
The year	3,800	168	750	6.76	91.83	543,000

NORTH FORK OF SAUK RIVER NEAR BARLOW PASS, WASH.

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

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

RECORDS AVAILABLE.—October 1, 1917, to December 9, 1920, when station was discontinued.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage during period October 1 to December 9, 1920, from water-stage recorder, 9.2 feet at 5 a. m. October 4 (discharge, 3,200 second-feet); minimum stage from recorder, 2.16 feet November 15 (discharge, 234 second-feet).

1918–1920: Maximum stage recorded, 14.0 feet (determined by leveling to high-water mark) December 29, 1917 (discharge, 11,000 second-feet); minimum stage recorded, 1.00 foot, probably on October 20, 1917, when recorder clock was stopped and stage but not time recorded (discharge, 75 second-feet). Stage may have been lower in December, 1919.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined below 1,500 second-feet; poorly defined above. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharges ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection. Records excellent except for extremely high water.

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

Discharge measurements of North Fork of Sauk River near Barlow Pass, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 7	H. W. Newton	6.09	1,140
Aug. 19	John McCombs	3.03	370

Daily discharge, in second-feet, of North Fork of Sauk River near Barlow Pass, Wash., for the period Oct. 1 to Dec. 9, 1920.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	805	377	349	11	1,040	264		21	486	596	
2	1,040	377	340	12	805	248		22	455	530	
3	1,500	406	358	13	676	248		23	435	465	
4	2,830	368	386	14	701	241		24	486	425	
5	1,980	349	349	15	628	234		25	517	435	
6	1,520	331	331	16	582	322		26	496	425	
7	1,260	314	314	17	549	506		27	475	435	
8	920	296	305	18	517	778		28	549	396	
9	778	288	296	19	475	726		29	475	377	
10	726	272		20	455	661		30	435	358	
								31	406		

NOTE.—Recorder not operating Nov. 20-22; discharge interpolated.

Monthly discharge of North Fork of Sauk River near Barlow Pass, Wash., for the period Oct. 1 to Dec. 9, 1920.

[Drainage area, 76 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	2,830	406	807	10.6	12.22	49,600
November	778	234	402	5.29	5.90	23,900
December 1–9	386	296	336	4.42	1.48	6,000

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, 1921.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by N. Aall. 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 during year, from water-stage recorder, 8.1 feet, 4 a. m. to 6 a. m. October 4 (discharge, 8,960 second-feet); minimum stage, from recorder, 2.23 feet, September 17 and 18 (discharge, 269 second-feet).

1918–1921: Maximum stage recorded, 13.3 feet at 8 a. m. December 29, 1917 (discharge, 21,000 second-feet); minimum stage, from water-stage recorder, 2.12 feet at 3 a. m. October 7, 1919 (discharge, 173 second-feet); discharge may have been lower in December, 1919.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined below 4,000 second-feet. Operation of water-stage recorder satisfactory except as indicated in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent except for extremely high water, for which they are good, and except for periods when recorder did not operate, for which they are poor.

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

Discharge measurements of Sauk River above Whitechuck River, near Darrington, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 29	Lasley Lee	4.12	1,850
Sept. 17	D. J. F. Calkins	2.24	280

Daily discharge, in second-feet, of Sauk River above Whitechuck River, near Darrington, Wash., for the year ending Sept. 30, 1921.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	May.	June.	July.	Aug.	Sept.
1	1,620			1,770	447	1,710		3,850	3,010	1,320	641
2	2,770			2,810	466	1,590		3,850	2,380	1,260	552
3	4,060			2,240	546	1,650		4,190	1,900	1,070	509
4	7,480			1,650	496	1,650		4,730	1,770	914	546
5	4,370		700	1,590	441	1,370		4,550	1,770	828	515
6	3,170	400		1,210	417	1,200		4,550	1,830	806	453
7	2,690			998	429	1,070		5,640	1,960	897	466
8	1,960			922	496	947		4,370	2,380	989	521
9	1,590			835	502	882		3,680	2,020	963	509
10	1,370			741	3,110	843		3,420	1,960	914	460
11				687	5,910	820		3,850	2,090	843	533
12				674	5,430	741		3,510	2,230	777	447
13				667	3,010	687		3,340	2,300	777	387
14				1,390	1,960	660		3,010	2,230	835	340
15	1,500		600	2,180	1,480	615		2,610	2,090	762	310
16		1,000		1,370	1,190	835		2,380	1,770	687	281
17				1,060	1,030	1,480		2,160	1,710	824	275
18				914	905	2,020		1,960	1,830	1,220	298
19				835	835	1,590		2,460	1,900	882	595
20				755	762	1,210		2,850	1,710	734	897
21			399	694	721	998		3,420	1,420	734	2,410
22		1,080		628	680	938		3,170	1,480	667	1,070
23				609	784	897		3,170	1,650	584	980
24			478	565	998	897		3,340	1,710	571	798
25				552	1,090	897		3,340	1,650	558	835
26	800	850		515	1,160	858		3,010	1,420	496	2,840
27			558	496	1,170	777		2,930	1,270	472	3,060
28			1,560	490	1,420	734		2,770	1,320	478	2,940
29			1,890	472		734	1,900	2,770	1,320	478	1,650
30			4,020	441		728	2,380	3,260	1,270	484	1,210
31			2,240	435		750	3,340		1,320	472	

NOTE.—Gage-height record not available for periods Oct. 11 to Dec. 26 and Apr. 1 to May 28; discharge Oct. 11 to Dec. 26 based upon comparison with records for Sauk River at Darrington. See footnote to monthly-discharge table for method of determining mean discharge for April and May. 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, 1921.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	7,480		1,770	11.6	13.37	109,000
November			743	4.89	5.46	44,200
December	4,020		841	5.53	6.38	51,700
January	2,810	435	1,010	6.64	7.66	62,100
February	5,910	417	1,350	8.88	9.25	75,000
March	2,020	615	1,060	6.97	8.04	65,200
April			1,000	6.58	7.34	59,500
May			2,200	14.5	16.72	135,000
June	5,640	1,960	3,400	22.4	24.99	202,000
July	3,010	1,270	1,830	12.0	13.83	113,000
August	1,320	472	784	5.16	5.95	48,200
September	3,060	275	911	5.99	6.68	54,200
The year	7,480	275	1,410	9.28	125.67	1,020,000

NOTE.—Mean monthly discharge for April and May determined by means of percentage comparison with mean flow of Sauk River at Darrington less mean flow of Whitechuck River near Darrington. See footnote to table of daily discharge.

SAUK RIVER AT DARRINGTON, WASH.

LOCATION.—In SE. ¼ sec. 24, T. 32 N., R. 9 E., 700 feet above suspension footbridge, half a mile southeast of Darrington, 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, 1921.

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

DISCHARGE MEASUREMENTS.—Made from private road bridge half a mile below gage or by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year. 9.0 feet October 3 (discharge, 13,300 second-feet); minimum stage recorded, 2.09 feet September 16 (discharge, 552 second-feet).

1914–1921: Maximum stage, 15.0 feet at 9 a. m. December 29, 1917, determined by levels to high-water mark (discharge, 36,000 second-feet); minimum stage recorded, 0.78 foot September 28 and 29, 1915 (discharge, 340 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table except as noted in footnote to table of daily discharge. Records good for November; excellent for remainder of year.

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

Discharge measurements of Sauk River at Darrington, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 11	H. W. Newton	5.76	5,450	June 5	Lee and West	6.77	7,720
Nov. 2	Lee and West	3.10	1,200	Sept. 16	D. J. F. Calkins	2.09	554
May 28	Lasley Lee	4.63	2,910	19	....do	3.10	1,110

Daily discharge, in second-feet, of Sauk River at Darrington, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,080	1,240	1,430	4,950	900	2,940	1,430	1,640	5,870	4,950	2,350	900
2	5,870	1,150	1,430	5,870	900	2,940	1,530	1,640	6,110	3,670	1,860	900
3	13,300	1,110	1,640	4,950	830	2,780	1,330	1,530	7,310	2,940	1,750	980
4	11,600	1,080	1,970	3,670	765	2,630	1,240	1,530	8,050	2,780	1,640	1,060
5	7,070	1,040	1,640	2,940	765	1,970	1,150	1,640	7,550	2,940	1,530	830
6	5,870	1,000	1,430	2,220	765	1,860	1,060	1,640	8,050	2,940	1,530	900
7	4,080	967	1,240	1,860	830	1,860	1,060	1,860	7,310	3,670	1,430	900
8	3,290	930	1,240	1,750	980	1,750	1,150	1,860	6,590	3,670	1,530	900
9	2,800	893	1,330	1,530	1,430	1,640	1,240	1,970	6,110	3,480	1,640	830
10	2,300	857	1,430	1,330	10,300	1,530	1,330	2,090	6,350	3,290	1,640	710
11	5,410	820	1,530	1,240	9,050	1,430	1,430	2,090	6,350	3,290	1,430	664
12	3,670	783	1,640	1,530	7,310	1,240	1,430	2,220	5,870	3,480	1,430	624
13	3,290	747	1,530	2,350	4,510	1,150	1,530	2,630	5,180	3,670	1,530	588
14	3,670	710	1,330	5,410	2,940	1,060	1,640	3,290	4,510	3,480	1,430	588
15	2,780	710	1,240	3,290	2,350	1,150	1,530	4,290	4,080	3,290	1,430	555
16	2,630	1,150	1,150	2,350	1,970	1,240	1,640	6,110	3,670	3,290	1,330	555
17	2,220	2,490	1,060	1,970	1,750	1,860	1,640	5,410	3,290	3,290	1,240	588
18	2,090	4,730	980	1,750	1,530	2,350	1,640	4,950	3,670	3,290	1,970	900
19	1,860	3,670	990	1,530	1,430	2,090	1,640	4,730	4,080	3,290	1,430	1,150
20	1,640	2,940	900	1,430	1,330	1,970	1,640	4,950	4,950	2,630	1,060	1,860
21	1,640	2,490	830	1,240	1,240	1,860	2,780	4,950	5,870	2,350	1,240	2,940
22	1,750	1,970	830	1,150	1,330	1,750	2,490	4,730	5,870	2,630	1,240	1,530
23	1,860	1,750	900	1,060	1,530	1,640	2,220	5,180	6,110	2,630	1,060	1,640
24	1,860	1,640	900	980	1,970	1,640	2,090	5,870	5,410	2,940	1,060	1,430
25	1,970	1,640	900	900	1,970	1,530	2,090	5,180	4,950	2,630	900	1,430
26	1,860	1,970	1,060	900	2,090	1,430	1,860	4,510	4,510	2,630	900	3,670
27	1,860	2,090	1,750	900	2,220	1,430	1,860	3,670	4,730	2,350	830	6,110
28	1,640	1,860	2,780	900	3,110	1,330	1,750	2,940	5,180	2,350	765	3,480
29	1,640	1,640	5,640	830	-------	1,240	1,860	3,290	5,640	2,090	830	2,350
30	1,430	1,530	7,800	830	-------	1,330	1,640	4,290	6,110	2,350	830	1,750
31	1,330	-------	3,670	900	-------	1,430	-------	5,410	-------	2,220	900	-------

NOTE.—Gage not read Oct. 9-10 (discharge determined by comparison with flow of near-by streams) and Nov. 3-13 (discharge interpolated).

Monthly discharge of Sauk River at Darrington, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 293 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	13,300	1,330	3,500	11.9	13.72	215,000
November	4,730	710	1,590	5.43	6.06	94,600
December	7,800	830	1,750	5.97	6.88	108,000
January	5,870	830	2,080	7.10	8.19	128,000
February	10,300	765	2,430	8.29	8.63	135,000
March	2,940	1,060	1,740	5.94	6.85	107,000
April	2,780	1,060	1,630	5.56	6.20	97,000
May	6,110	1,530	3,490	11.9	13.72	215,000
June	8,050	3,290	5,640	19.2	21.42	336,000
July	4,950	2,090	3,050	10.4	11.99	188,000
August	2,350	765	1,350	4.61	5.32	83,000
September	6,110	555	1,440	4.91	5.48	85,700
The year	13,300	555	2,470	8.43	114.46	1,790,000

SOUTH FORK OF SAUK RIVER NEAR BARLOW PASS, WASH.

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

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

RECORDS AVAILABLE.—October 1, 1917, to February 8, 1921, and August 20 to October 16, 1921, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by Nicolai Aall.

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

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

EXTREMES OF DISCHARGE.—Maximum stage during periods October 1, 1920, to February 8, 1921, and August 20 to October 16, 1921, from water-stage recorder, 6.5 feet at 2.30 a. m. October 4, 1920 (discharge, 3,140 second-feet); minimum stage from recorder, 2.07 feet December 26-27 (discharge, 43 second-feet).

1918–1921: Maximum stage recorded, 9.1 feet at 1.30 a. m. December 29, 1917 (discharge, 5,800 second-feet); minimum stage, from recorder, 1.86 feet at 7 p. m. October 20, 1919 (discharge, 35 second-feet); may have been lower in December, 1919.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve fairly well defined between 100 and 2,000 second-feet; extended to extremely high stages by study of flood peak discharge at all gaging stations on Sauk and Skagit rivers. Operation of water-stage recorder satisfactory Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection or, for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records good.

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

Discharge measurements of South Fork of Sauk River near Barlow Pass, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 2	H. W. Newton	4.46	1,220
Aug. 20	John McCombs	2.82	214

Daily discharge, in second-feet, of South Fork of Sauk River near Barlow Pass, Wash., for the period Oct. 1, 1920, to Oct. 16, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Aug.	Sept.	Oct.
1	458	135	155	458	61	-------	168	241
2	850	128	152	842	68	-------	140	195
3	1,390	157	163	614	76	-------	130	165
4	2,290	133	251	396	61	-------	150	145
5	1,130	116	201	369	55	-------	140	128
6	805	103	160	265	50	-------	119	116
7	693	93	137	213	68	-------	119	105
8	469	85	121	190	87	-------	137	97
9	361	79	112	160	-------	-------	130	91
10	315	72	112	137	-------	-------	125	87
11	738	68	133	123	-------	-------	140	83
12	532	58	112	116	-------	-------	108	83
13	386	57	119	114	-------	-------	89	145
14	406	55	91	441	-------	-------	77	408
15	357	52	77	638	-------	-------	67	572
16	303	103	74	340	-------	-------	60	512
17	276	408	70	241	-------	-------	55	-------
18	241	628	68	198	-------	-------	65	-------
19	213	607	67	170	-------	-------	237	-------
20	193	565	63	145	-------	201	474	-------
21	216	391	58	125	-------	210	853	-------
22	222	280	52	110	-------	179	335	-------
23	195	251	47	99	-------	145	319	-------
24	231	207	49	89	-------	145	245	-------
25	284	204	47	83	-------	137	273	-------
26	248	219	43	79	-------	119	1,200	-------
27	219	265	70	72	-------	110	1,190	-------
28	269	207	456	67	-------	112	890	-------
29	222	181	681	63	-------	116	476	-------
30	181	163	1,340	58	-------	119	324	-------
31	155	-------	657	60	-------	125	-------	-------

NOTE.—No record obtained Feb. 9 to Aug. 19; discharge not determined.

Monthly discharge of South Fork of Sauk River near Barlow Pass, Wash., for the period Oct. 1, 1920, to Oct. 16, 1921.

[Drainage area, 32.7 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	2,290	155	480	14.70	16.95	29,500
November	628	52	202	6.18	6.90	12,000
December	1,340	43	192	5.87	6.77	11,800
January	842	58	228	6.97	8.04	14,000
February 1-8	87	50	65.8	2.01	.60	1,040
August 20-31	210	110	143	4.37	1.95	3,400
September	1,200	55	294	8.99	10.03	17,500
October 1-16	572	83	198	6.06	3.61	6,280

84390—24†—WSP 532——6

WHITECHUCK RIVER NEAR DARRINGTON, WASH.

LOCATION.—In NW. ¼ sec. 16, T. 31 N., R. 11 E., at 4.5-mile post, 4½ miles above junction with Sauk River and 11 miles southeast of Darrington, Snohomish County.

DRAINAGE AREA.—75 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 19, 1919, to December 12, 1921, when station was discontinued. Records fragmentary.

GAGE.—Stevens continuous water-stage recorder on left bank; installed August 19, 1919; inspected by N. A. and B. L. Aall and J. J. Gallivan.

DISCHARGE MEASUREMENTS.—Made from cable 300 feet below gage or by wading near gage.

CHANNEL AND CONTROL.—Control is heavy boulder riffle just below gage; practically permanent. Banks high and wooded. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during period of record, from water-stage recorder, 6.4 feet about noon December 12, 1921, when recorder installation was damaged and record terminated (discharge, 4,540 second-feet); minimum stage recorded, 0.9 foot sometime between November 4 and 14, 1919, when recorder was not operating properly and for which period graph is not interpretable in regard to time (discharge, 111 second-feet); probably lower discharge in December, 1919, when recorder was not operating.

ICE.—Stage-discharge relation not affected by ice during periods of record.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed by fallen trees on control November 15, 1919; on September 15, 1920, the trees were washed from control and stage and discharge reverted to original relationship. Rating curves fairly well defined below 1,200 second-feet; extended above that point. 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 from recorder graph by inspection or, for days of considerable range in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records good except those for extremely high water and those estimated.

COOPERATION.—Part of gage-height record furnished by American Nitrogen Products Co.

Discharge measurements of Whitechuck River near Darrington, Wash., during the years ending Sept. 30, 1920 and 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1919.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Oct. 19	Lasley Lee	1.15	157	July 22	Lee and Newton	2.97	589
22	do	1.57	239	Sept. 9	H. W. Newton	2.39	458
1920.				1921.			
July 18	Lee and Newton	3.58	867	May 30	Lasley Lee	3.22	825
18	do	3.71	988	Aug. 17	John McCombs	2.87	730
22	H. W. Newton	2.88	594	Sept. 18	D. J. F. Calkins	1.45	236

Daily discharge, in second-feet, of Whitechuck River near Darrington, Wash., for the period Oct. 19, 1919, to Dec. 12, 1921.

Day.	1919.		1920.							
	Oct.	Dec.	Jan.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			348		1,540	530		776		285
2			336		1,380	545		915		282
3			325		1,300	560		1,570		292
4			314		1,220	538		2,550		306
5			295		1,080	560		1,580		280
6			279		1,070	582		1,240	300	264
7			270		1,200	582		916		257
8					1,260	593		705		253
9					1,280	580		610		248
10					1,160	605		565		253
11					1,010	575		755		253
12					940	550		610		246
13					880	552		525		255
14					1,360	520		545		231
15					1,160	485		509		228
16					1,160	462		463		226
17				940	1,030	405		445		224
18				830	975	275		417	350	224
19	158			780	882	314		389		220
20	169			830	780	387		369		215
21	264			1,040	680	439		424		204
22	253			1,010	640	460		392		200
23	209			760	640	460		363		195
24	189			640	590	373		424	309	195
25	173			605	545	560		497	324	193
26	169			620	575	575		466	322	184
27	165			730	590	410		424	329	217
28	171			940	673	487			309	375
29	167			1,200	687	428	545	400	299	488
30	158	420		1,020	605	390	579		287	836
31	156	372			545	336				500

Day.	1921.									
	Jan.	Feb.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	414	220		1,480	1,380		342	324	610	1,010
2	610	228		1,530	1,030		287	302	489	635
3	493			1,730	860		285	287	428	481
4	398			2,000	780		290	275	445	414
5	383			1,900	805		264	259	525	392
6	332	250		2,000	832		264	244	759	383
7	314			2,480	860		316	239	635	366
8	297			1,780	1,200		339	235	474	363
9	264			1,530	1,030	750	322	233	414	386
10	248			1,330	1,000		287	242	380	1,230
11	242			1,430	1,060		253	248	405	2,390
12	239			1,330	1,120		220	235	377	2,670
13	239			1,280	1,160		213	304	363	
14	421			1,160			213	448	355	
15	430	500	700	970			202	509	334	
16	319			915			217	389	329	
17	312			860		705	220	366	316	
18	306			832		610	239	314	306	
19	287			970		505	312	553	297	
20	278			1,160		497	375	567	287	
21	264			1,380		470	722	424	287	
22	262			1,380	900	392	339	350	334	
23	255			1,280		363	324	312	312	
24	250			1,480		339	300	309	316	
25	244	350		1,430		319	300	334	337	
26	239			1,330		314	878	389	418	
27	239			1,280		337	865	375	865	
28	233			1,240		361	774	1,840	509	
29	226			1,280		380	493	1,580	424	
30	224		1,000	1,430		363	408	983	812	
31	222		1,240			369		807		

NOTE.—No record available Nov. 1 to Dec. 29, 1919, Jan. 8 to June 16, and Sept. 1–28, 1920; discharge not determined. Recorder not operating satisfactorily Oct. 28 to Nov. 23, 1920, Feb. 3–28, May 1–29, and July 14 to Aug. 16, 1921; discharge determined by means of percentage comparison with flow of Suiattle River below Lime Creek, near Darrington. In the same manner mean discharge for March and April, 1921, was estimated as 300 second-feet. Braced figures show mean discharge for periods included.

Monthly discharge of Whitechuck River near Darrington, Wash., for the period Oct. 19, 1919, to Dec. 12, 1921.

[Drainage area, 75 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919–20.						
October 19–31	264	156	185	2.47	1.19	4,770
January 1–7	348	270	310	4.13	1.08	4,300
June 17–30	1,200	605	853	11.4	5.94	23,700
July	1,540	545	950	12.7	14.64	58,400
August	605	275	488	6.51	7.50	30.000
1920–21.						
October	2,550		679	9.05	10.43	41,800
November			323	4.31	4.81	19,20
December	836	184	278	3.71	4.28	17.100
January	610	222	306	4.08	4.70	18,800
February			366	4.88	5.08	20,300
March			300	4.00	4.61	18,400
April			300	4.00	4.46	17.900
May			727	9.69	11.17	44,700
June	2,480	832	1,410	18.8	20.98	83,900
July	1,380		946	12.6	14.53	58,200
August		314	591	7.88	9.08	36,300
September	878	202	362	4.83	5.39	21,500
The year	2,550		550	7.33	99.52	398,000
1921.						
October	1,840	233	461	6.15	7.09	28,300
November	865	287	438	5.84	6.52	26,100
December 1–12	2,670	363	893	11.9	5.31	21,200
The period						75,600

NOTE.—See footnote to tables of daily discharge.

SUIATTLE RIVER BELOW LIME CREEK, NEAR DARRINGTON, WASH.

LOCATION.—In sec. 18, T. 32 N., R. 12 E. (unsurveyed), half a mile below Lime Creek, 1 mile above Suiattle ranger station, 2 miles below Buck Creek, and 14 miles east of Darrington, Snohomish County.

DRAINAGE AREA.—213 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1920, to November 11, 1921, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder on right bank; installed October 30, 1920. Gage heights October 1–15, 1920, determined from reference point; October 16–29, from staff gage to which recorder is referred. Recorder inspected by W. L. Stilwell and John West, and during summer by Jack Gailey, an employee of United States Forest Service.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of large boulders. Control is long stretch of channel with steep and uniform gradient.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 7.1 feet at 6 a. m. June 7 (discharge, 5,890 second-feet); minimum stage recorded, 1.68 feet at 3.30 p. m. February 6 (discharge, 469 second-feet).

ICE.—Stage-discharge relation not affected by ice during period of record.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to half-tenths twice daily October 1–15, 1920; to hundredths October 16–29. Operation of water-stage recorder satisfactory after October 29, 1920, except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspection of recorder graph except as noted in footnote to table of daily discharge. Records excellent except those estimated, which are fair.

Discharge measurements of Suiattle River below Lime Creek, near Darrington, Wash., during the period Oct. 24, 1920, to Nov. 11, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 24	Lee and West	2.93	1,090	June 3	Lee and West	5.72	4,010
29	do	2.80	1,070	Aug. 13	John McCombs	3.74	1,790
31	do	2.58	904	Nov. 11	do	2.63	917
June 2	do	5.40	3,700				

Daily discharge, in second-feet, of Suiattle River below Lime Creek, near Darrington, Wash., for the period Oct. 1, 1920, to Nov. 11, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920–21.												
1	1,240	872	738	1,030	509	1,060	690	714	3,700	3,030	2,190	995
2	1,320	872	714	1,320	517	995	714	690	3,630	2,400	2,040	816
3	2,040	900	738	1,170	517	1,100	738	690	4,010	2,040	1,790	789
4	4,530	816	764	1,030	493	1,030	690	690	4,400	1,990	1,600	764
5	2,620	789	690	960	481	960	644	690	4,140	2,040	1,480	738
6	3,150	738	690	843	473	872	622	738	4,400	2,040	1,700	738
7	2,570	738	667	789	485	843	600	764	5,330	2,300	1,890	843
8	1,890	714	644	764	485	789	600	900	4,010	2,740	1,940	843
9	1,650	690	644	714	489	764	600	900	3,630	2,520	1,790	789
10	1,400	667	644	690	1,590	738	622	930	3,270	2,520	1,650	714
11	1,740	644	667	667	2,820	714	667	1,140	3,270	2,620	1,560	644
12	1,440	622	644		2,500	667	789	1,100	3,150	2,790	1,520	622
13	1,320	622	644		1,600	644	816	995	3,150	2,910	1,600	579
14	1,200	622	600	800	1,240	622	843	1,140	2,970	2,850	1,690	558
15	1,170	600	579		1,030	622	789	1,520	2,620	2,820	1,440	558
16	1,140	738	579	789	900	690	738	2,140	2,460	2,400	1,400	558
17	1,100	900	579	764	843	872	714	3,150	2,350	2,400	1,600	579
18	1,100	1,250	579	738	789	930	738	3,150	2,300	2,570	1,520	600
19	1,030	1,170	558	714	738	816	764	3,270	2,570	2,680	1,320	690
20	960	1,060	558	667	714	738	789	3,030	3,030	2,350	1,320	762
21	960	930	538	644	667	714	764	2,790	3,510	2,090	1,200	1,390
22	995	872	538	622	644	714	843	2,910	3,390	2,240	1,060	789
23	960	843	517	600	764	714	960	3,150	3,390	2,460	1,030	738
24	1,140	789	517	579	789	690	900		3,630	2,520	960	667
25	1,240	764	517	558	872	714	789		3,390	2,350	900	690
26	1,170	789	513	558	900	714	789		3,150	2,090	872	1,620
27	1,140	816	558	558	960	667	764	2,500	3,030	2,090	900	1,480
28	1,170	764	900	538	1,060	644	738		3,030	2,040	960	1,420
29	1,030	738	997	517		644	738		3,150	2,040	995	995
30	900	738	1,700	517		667	764		3,390	2,090	995	843
31	900		1,170	517		667				2,140	1,030	

Day.	Oct.	Nov.	Day.	Oct.	Nov.	Day.	Oct.	Nov.
1921.			1921.			1921.		
1	764	1,480	11	667	960	21	1,100	
2	714	1,240	12	644		22	930	
3	714	1,100	13	738		23	816	
4	690	1,060	14	920		24	764	
5	667	1,240	15	995		25	764	
6	644	1,490	16	843		26	816	
7	622	1,440	17	789		27	789	
8	644	1,200	18	714		28	2,860	
9	622	1,060	19	1,200		29	3,030	
10	644	995	20	1,520		30	2,190	
						31	1,790	

NOTE.—Water-stage recorder not operating Jan. 12–15 and May 24 to June 1; discharge estimated by comparison with flow of Whitechuck River near Darrington, Wash., and Baker River below Anderson Creek, near Concrete, Wash.

Monthly discharge of Suiattle River below Lime Creek, near Darrington, Wash., for the period Oct. 1, 1920, to Nov. 11, 1921.

[Drainage area, 213 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1920-21.						
October	4,530	900	1,490	7.00	8.07	91,600
November	1,250	600	802	3.77	4.21	47,700
December	1,700	513	690	3.24	3.74	42,400
January	1,320	517	744	3.49	4.02	45,700
February	2,820	473	924	4.34	4.52	51,300
March	1,100	622	775	3.64	4.20	47,700
April	960	600	741	3.48	3.88	44,100
May		690	1,840	8.64	9.96	113,000
June	5,330	2,300	3,380	15.9	17.74	201,000
July	3,030	1,990	2,390	11.2	12.91	147,000
August	2,190	872	1,410	6.62	7.63	86,700
September	1,620	558	827	3.88	4.33	49,200
The year	5,330	473	1,340	6.29	85.21	967,000
1921.						
October	3,030	622	1,020	4.79	5.52	62,700
November 1-11	1,490	960	1,210	5.68	2.32	26,400
The period						89,100

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, Skagit County.

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

RECORDS AVAILABLE.—September 10, 1910, to September 30, 1921.

GAGE.—Stevens continuous water-stage recorder referred to inside staff gage, on left bank; installed September 24, 1915; inspected by D. C. Gillman, W. C. Speer, and 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, and subject to overflow at about 11-foot stage.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 9.7 feet midnight to 2 a. m. October 4 (discharge, 18,700 second-feet); minimum stage, from recorder, 2.68 feet at 4 a. m. November 13 (discharge, 649 second-feet).

1910–1921: 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 December 15–16, 1919 (discharge, 219 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 700 and 10,000 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 daily mean gage height determined from recorder graph by inspection or, for a few days when range of stage was considerable, by averaging results obtained by applying mean gage heights for shorter intervals. Records excellent except for extremely high stages.

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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 19	R. B. Kilgore	3.84	1,550	Apr. 6	R. B. Kilgore	3.12	933
20	do	3.76	1,460	June 30	do	6.79	6,820
Dec. 21	do	3.07	880	July 1	do	6.31	5,200
22	do	3.00	840	Sept. 22	D. J. F. Calkins	4.54	2,150
Apr. 5	do	3.10	976	23	do	4.18	1,840

Daily discharge, in second-feet, of Baker River below Anderson Creek, near Concrete, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,580	1,150	1,440	2,770	918	2,560	1,190	1,230	5,020	5,020	2,910	2,380
2	4,160	1,070	1,490	3,210	950	2,170	1,230	1,270	4,890	3,530	2,630	2,380
3	7,120	1,070	1,630	2,770	1,020	2,270	1,190	1,230	5,450	2,770	2,170	1,870
4	17,800	998	2,220	2,070	934	2,220	1,070	1,230	6,410	2,560	1,870	1,920
5	11,500	918	1,770	1,870	840	1,920	998	1,270	6,080	2,560	1,770	1,620
6	6,080	854	1,540	1,580	794	1,670	926	1,440	6,080	2,560	1,770	1,440
7	5,480	827	1,400	1,400	861	1,490	910	1,720	8,180	2,980	2,170	1,580
8	3,540	788	1,270	1,310	854	1,360	903	1,670	5,630	3,970	2,440	1,670
9	2,560	751	1,230	1,190	912	1,270	974	1,770	5,020	3,370	2,320	1,490
10	2,420	715	1,270	1,070	4,090	1,270	2,150	2,120	4,650	3,210	2,220	1,270
11	5,710	693	1,270	990	11,300	1,150	1,580	2,120	5,950	3,450	2,120	1,070
12	3,800	660	1,190	982	9,660	1,060	1,890	1,970	4,890	3,620	2,120	934
13	2,770	704	1,230	974	4,340	990	2,170	2,220	4,440	3,700	2,270	834
14	2,500	688	1,060	1,700	2,770	934	1,870	3,060	3,970	3,620	2,270	814
15	2,270	775	974	2,840	2,020	903	1,580	3,790	3,370	3,370	1,970	814
16	2,020	1,560	926	2,120	1,620	1,050	1,400	4,890	3,060	2,840	1,770	840
17	1,920	2,720	982	1,670	1,440	1,520	1,360	4,650	2,840	2,910	3,270	840
18	1,720	3,140	1,010	1,540	1,270	1,670	1,440	4,650	2,700	3,140	3,140	1,030
19	1,580	3,370	1,010	1,400	1,150	1,540	1,580	4,060	3,880	3,210	2,270	1,620
20	1,440	2,980	1,030	1,230	1,060	1,310	1,620	3,700	5,000	2,910	2,020	2,920
21	1,580	2,170	896	1,150	958	1,190	1,870	3,970	7,280	2,500	2,270	6,370
22	1,540	1,770	847	1,050	950	1,110	1,920	3,880	5,410	2,700	1,770	2,540
23	1,400	1,620	827	974	1,280	1,110	1,770	3,620	4,890	3,140	1,540	1,820
24	1,580	1,400	840	910	1,620	1,150	1,580	4,250	5,160	3,450	1,490	1,400
25	1,970	1,770	834	861	1,870	1,150	1,400	4,650	5,020	3,210	1,490	2,220
26	1,870	1,870	794	889	2,020	1,070	1,310	3,620	4,650	2,560	1,360	6,350
27	1,770	2,120	1,110	926	2,120	1,010	1,230	2,700	}	2,500	1,360	6,480
28	2,440	1,870	2,630	934	2,700	990	1,230	2,270	5,000	2,630	1,400	5,560
29	1,870	1,620	2,840	882	-------	990	1,310	2,500	}	2,630	1,400	3,000
30	1,490	1,490	5,030	875	-------	990	1,230	3,370	6,580	2,770	1,400	2,070
31	1,270	-------	3,640	889	-------	1,050	-------	4,440	-------	2,910	1,490	-------

NOTE.—Braced figure shows mean discharge for period included, estimated because of faulty gage-height record, by comparison with flow of Middle Fork of Nooksack River near Deming, Wash.

Monthly discharge of Baker River below Anderson Creek, near Concrete, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 184 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	17,800	1,270	3,510	19.1	22.02	216,000
November	3,370	660	1,470	7.99	8.91	87,500
December	5,030	794	1,490	8.10	9.34	91,600
January	3,210	861	1,450	7.88	9.08	89,200
February	11,300	794	2,230	12.1	12.60	124,000
March	2,560	903	1,360	7.39	8.52	83,600
April	2,170	903	1,400	7.61	8.49	83,300
May	4,890	1,230	2,880	15.7	18.10	177,000
June	8,180	2,700	5,050	27.4	30.57	300,000
July	5,020	2,500	3,110	16.9	19.48	191,000
August	3,270	1,360	2,020	11.0	12.68	124,000
September	6,480	814	2,240	12.2	13.61	133,000
The year	17,800	660	2,350	12.8	173.40	1,700,000

NOOKSACK RIVER BASIN.

NOOKSACK RIVER AT EXCELSIOR, WASH.

LOCATION.—In sec. 31, T. 40 N., R. 8 E. (unsurveyed), at highway bridge 600 feet below Nooksack Falls (Excelsior) power plant, half a mile below Wells Creek, and 6 miles east of Glacier, in Whatcom County.

DRAINAGE AREA.—96 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 25, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Vertical staff in two sections on downstream end of right abutment; read by Mrs. H. E. Barnes.

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

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel. Channel fairly straight for 600 feet above gage; curves below. Banks high and not subject to overflow. Riffle control, 100 feet below gage; likely to shift at extreme high water. Current swift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.4 feet at 3.45 p. m. October 4 (discharge, 4,650 second-feet); minimum stage recorded, 0.40 foot February 5–9 (discharge, 186 second-feet).

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

DIVERSIONS.—At extreme low water the entire flow above Nooksack Falls, half a mile above gage, is diverted through the power plant and returned to river 600 feet above gage. Wells Creek, which enters river just below falls, is not diverted.

REGULATION.—Pondage above diversion dam is too slight to affect flow appreciably.

ACCURACY.—Stage-discharge relation changed October 4. Two rating curves fairly well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of Nooksack River at Excelsior, Wash., during the period Aug. 26, 1920, to Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1920.		*Feet.*	*Sec.-ft.*	1921.		*Feet.*	Sec.-*ft.*
Aug. 26	Lasley Lee	1.93	724	June 24	R. B. Kilgore	3.20	2,130
Sept. 1	do	1.50	441	25	do	3.12	2,030
Oct. 15	R. B. Kilgore	1.74	810	Sept. 10	D. J. F. Calkins	1.10	422
16	do	1.64	739	10	do	1.10	430

Daily discharge, in second-feet, of Nooksack River at Excelsior, Wash., for the years ending Sept. 30, 1920 and 1921.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1920.								
1		452	11		1,530	21		1,530
2		815	12		1,720	22		1,170
3		590	13		1,260	23		1,010
4		452	14		1,720	24		748
5		562	15		1,720	25		715
6		506	16		1,170	26	715	650
7		562	17		815	27	1,350	748
8		426	18		715	28	682	682
9		452	19		650	29	1,090	650
10		748	20		1,090	30	562	682
						31	426	

Daily discharge, in second-feet, of Nooksack River at Excelsior, Wash., for the years ending Sept. 30, 1920 and 1921—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920-21.												
1	970	402	478	533	206	620	259	314	2,020	1,720	1,170	1,010
2	970	378	478	850	206	650	259	314	1,920	1,350	1,260	930
3	2,880	378	452	590	196	715	244	334	2,120	1,170	1,010	1,010
4	4,410	334	748	506	196	590	218	334	2,440	1,090	850	715
5	4,050	314	533	478	186	506	218	314	2,220	1,170	748	650
6	2,330	294	478	426	186	478	206	356	2,770	1,170	930	590
7	2,120	276	426	356	186	402	206	452	2,770	1,170	1,010	748
8	1,350	259	378	314	186	356	206	452	1,920	1,620	1,090	682
9	1,090	244	378	276	186	334	206	478	2,020	1,260	1,090	590
10	1,170	230	334	259	1,350	334	276	650	1,720	1,530	1,090	426
11	1,720	230	334	259	2,770	294	378	590	2,660	1,530	1,010	378
12	1,260	230	294	230	1,920	259	533	533	1,820	1,440	1,010	334
13	1,090	259	259	230	1,090	244	590	620	1,720	1,350	1,010	334
14	850	230	259	426	748	230	478	970	1,620	1,530	930	294
15	815	259	244	533	533	230	378	1,260	1,350	1,350	1,010	314
16	715	533	230	378	426	230	356	1,720	1,350	1,170	930	276
17	650	1,010	259	356	378	259	356	1,620	1,350	1,350	1,350	334
18	620	1,090	259	334	334	334	402	1,620	1,170	1,260	1,090	478
19	590	1,440	244	334	334	314	452	1,530	1,620	1,260	890	478
20	620	1,090	244	314	294	276	478	1,260	2,330	1,170	970	650
21	650	780	230	276	259	259	533	1,440	2,770	1,090	1,090	1,090
22	533	620	206	244	244	244	478	1,530	2,020	1,170	1,010	650
23	478	533	206	230	259	230	426	1,350	2,120	1,440	780	506
24	590	562	206	218	378	230	378	1,820	2,120	1,350	650	378
25	715	590	206	206	378	230	334	1,920	2,020	1,170	715	715
26	650	620	206	230	426	230	314	1,530	2,020	1,090	650	1,620
27	590	650	206	244	506	218	294	1,170	2,920	1,350	590	2,220
28	890	533	590	230	682	206	294	1,010	1,820	1,170	715	1,170
29	620	506	478	218	------	206	314	1,010	1,620	1,090	682	780
30	506	478	1,170	230	------	206	294	1,260	2,330	1,260	715	590
31	426	------	590	206	------	206	------	1,620	------	1,090	715	------

Monthly discharge of Nooksack River at Excelsior, Wash., for the years ending Sept. 30, 1920 and 1921.

[Drainage area, 96 square miles.]

Month.	Discharge in second-feet.				Run-off	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1920.						
Aug. 26-31	1,350	426	804	8.38	1.87	9,570
September	1,720	426	885	9.22	10.29	52,700
The period						62,300
1920-21.						
October	4,410	426	1,190	12.4	14.30	73,200
November	1,440	230	512	5.33	5.95	30,500
December	1,170	206	374	3.90	4.50	23,000
January	850	206	339	3.53	4.07	20,800
February	2,770	186	537	5.59	5.82	29,800
March	715	206	326	3.40	3.92	20,000
April	590	206	345	3.59	4.00	20,500
May	1,920	314	1,010	10.5	12.11	62,100
June	2,770	1,170	1,990	20.7	23.09	118,000
July	1,720	1,090	1,290	13.4	15.45	79,300
August	1,350	590	928	9.67	11.15	57,100
September	2,220	276	698	7.27	8.11	41,500
The year	4,410	186	796	8.29	112.47	576,000

MIDDLE FORK OF NOOKSACK RIVER NEAR DEMING, WASH.

LOCATION.—In NW. ¼ sec. 13, T. 38 N., R. 5 E., at highway bridge just below mouth of Heisler's Creek, 5½ miles southeast of Deming, Whatcom County, and 4 miles above mouth.

DRAINAGE AREA.—72 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 28, 1920, to September 30, 1921, when station was discontinued. October 10, 1910, to March 14, 1911, fragmentary gage-height record.

GAGE.—Vertical staff in two sections, on downstream end of right abutment; read by F. F. Filbert. October 10, 1910, to March 14, 1911, vertical staff in two sections 75 feet below present gage.

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

CHANNEL AND CONTROL.—Bed composed of small boulders and sand. Contro is small boulder riffle 150 feet below gage; sensitive for low stages.

EXTREMES OF DISCHARGE.—Maximum mean daily discharge during period August 28, 1920, to September 30, 1921, 7,500 second-feet on October 4; estimated by hydrographic comparison with records for Nooksack River at Excelsior and Baker River below Anderson Creek. Minimum stage recorded, 1.22 feet November 13 (discharge, 195 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed October 4, 1920, and gradually over the period June 28 to September 8, 1921. Standard rating curve fairly well defined; used August 28 to October 4, 1920. Two parallel curves used, applicable October 4, 1920, to June 27, 1921, and September 9–30, 1921. Shifting-control method used June 28 to September 8, 1921. Gage read once a day to hundredths four or five times a week; single reading daily during summer may not represent mean daily stage owing to diurnal fluctuation caused by glacial run-off. Daily discharge ascertained by applying daily gage height to rating table or, for days when gage was not read, by interpolating or estimating on basis of comparison with flow of near-by streams. Records fair.

Discharge measurements of Middle Fork of Nooksack River near Deming, Wash., during the period Aug. 28, 1920, to Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1920.		*Feet*	*Sec.-ft.*	1921.		*Feet*	*Sec.-ft.*
Aug. 29	Lasley Lee	3.15	1,360	June 27	R. B. Kilgore	2.46	852
31	do	1.58	244	Sept. 9	D. J. F. Calkins	1.68	306
Sept. 1	do	1.70	283	11	do	1.41	227
Oct. 14	R. B. Kilgore	2.35	779				

Daily discharge, in second-feet, of Middle Fork of Nooksack River near Deming, Wash., for the years ending Sept. 30, 1920 and 1921.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1920.			1920.			1920.		
1		323	11		4,560	21		1,300
2		303	12		990	22		1,000
3		367	13		750	23		820
4		221	14		1,190	24		840
5		250	15		1,120	25		860
6		250	16		1,040	26		470
7		250	17		770	27		700
8		425	18		500	28	367	470
9		600	19		670	29	1,300	443
10		1,000	20		985	30	367	416
						31	250	

Daily discharge, in second-feet, of Middle Fork of Nooksack River near Deming, Wash., for the years ending Sept. 30, 1920 and 1921—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920-21.												
1	2,000	313	500	780	283	416	276	367	1,750	1,200	443	323
2	3,530	303	600	1,640	274	543	303	400	1,520	1,090	443	370
3	3,960	313	565	1,160	266	670	266	392	1,640	670	394	416
4	7,500	323	530	670	251	585	251	380	1,760	635	345	530
5	3,670	280	416	600	236	500	236	367	1,300	600	300	448
6	2,170	236	443	530	250	416	228	323	1,360	635	345	367
7	670	221	470	416	300	370	221	416	1,410	670	443	405
8	635	236	431	392	820	323	200	367	1,640	900	565	443
9	600	250	392	345	2,760	313	250	484	1,880	820	500	283
10	530	236	404	334	4,710	303	367	600	1,500	565	568	266
11	2,000	221	416	323	6,000	284	448	600	1,760	692	635	208
12	1,090	208	303	300	1,640	266	530	600	990	820	582	208
13	935	195	300	600	323	236	750	670	968	800	530	208
14	780	820	250	750	286	302	392	740	945	705	470	208
15	840	860	286	900	250	367	368	900	808	635	431	208
16	900	900	323	600	276	418	345	1,500	670	565	392	214
17	530	1,040	345	530	303	470	303	600	745	500	750	221
18	530	1,190	367	443	324	500	486	635	820	532	443	283
19	530	930	303	405	345	367	670	670	1,090	565	418	406
20	530	670	300	367	283	345	618	785	1,040	600	392	530
21	600	530	250	356	350	345	565	900	990	635	392	700
22	565	635	243	345	416	345	550	1,300	1,090	708	380	303
23	530	740	236	283	473	324	470	1,470	1,190	780	367	335
24	635	965	243	283	530	303	367	1,640	1,090	500	345	367
25	750	1,190	250	283	565	293	345	2,000	990	500	323	470
26	470	1,100	221	314	600	283	323	820	820	500	280	995
27	443	900	1,050	345	323	250	303	710	860	500	236	1,520
28	416	670	1,880	350	500	276	283	600	990	500	323	995
29	392	585	2,500	266	-------	303	350	750	1,140	500	303	470
30	367	500	1,410	283	-------	276	323	900	1,300	500	283	323
31	323	-------	1,100	283	-------	250	-------	1,300	-------	443	303	-------

Monthly discharge of Middle Fork of Nooksack River near Deming, Wash., for the years ending Sept. 30, 1920 and 1921.

[Drainage area, 72 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1920.						
September	4,560	221	796	11.1	12.38	47,400
1920-21.						
October	7,500	323	1,270	17.6	20.29	78,100
November	1,190	195	585	8.12	9.06	34,800
December	2,500	221	559	7.76	8.95	34,400
January	1,640	266	499	6.93	7.99	30,700
February	6,000	236	855	11.9	12.39	47,500
March	670	236	363	5.04	5.81	22,300
April	750	200	380	5.28	5.89	22,600
May	2,000	323	780	10.8	12.45	48,000
June	1,880	670	1,200	16.7	18.63	71,400
July	1,200	443	654	9.08	10.47	40,200
August	750	236	417	5.79	6.68	25,600
September	1,520	208	434	6.03	6.73	25,800
The year	7,500	195	665	9.24	125.34	481,000

SOUTH FORK OF NOOKSACK RIVER AT SAXON BRIDGE, WASH.

LOCATION.—In SE. ¼ sec. 21, T. 37 N., R. 5 E., at highway bridge known as Saxon Bridge, in Whatcom County, 1 mile below Skookum Creek and 2½ miles northeast of Wickersham.

DRAINAGE AREA.—129 square miles (measured on topographic maps).

RECORDS AVAILABLE.—August 30, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Vertical staff spiked to downstream end of bridge pier on left bank; read by L. Hesse and K. A. Zeiger.

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

CHANNEL AND CONTROL.—Bed composed of small boulders and cobble stone. Riffle control short distance below gage. High-water control is long gravel bar. Left bank is overflowed at extremely high stage. Stage of zero flow, according to measurement made September 12, 1921, gage height about 0.9 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9.0 feet at 5 p. m., February 11, 1921 (discharge, 13,100 second-feet); minimum discharge, 121 second-feet September 8, 1920.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed February 10–11, 1921. Rating curves fairly well defined below 7,000 second-feet. Gage read to half-tenths once daily or oftener during floods. Daily discharge ascertained by applying daily gage height to rating table except as indicated in footnote to table of daily discharge. Records goods except for extremely high stages.

COOPERATION.—Gage-height record furnished by Bloedel-Donovan Lumber Mills.

Discharge measurements of South Fork of Nooksack River at Saxon Bridge, Wash., during the period Aug. 30, 1920, to Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1920.		*Feet.*	*Sec.-ft.*	1921.		*Feet.*	*Sec.-ft.*
Aug. 30	Lasley Lee	3.47	432	June 28	R. B. Kilgore	3.50	797
31	do	3.24	293	29	do	3.59	867
Sept. 2	do	2.97	180	Sept. 8	D. J. F. Calkins	3.02	537
Oct. 12	R. B. Kilgore	4.98	2,210	12	do	2.42	218
13	do	4.57	1,590				
18	do	4.18	1,070				

Daily discharge, in second-feet, of South Fork of Nooksack River at Saxon Bridge, Wash., for the years ending Sept. 30, 1920 and 1921.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1920.			1920.			1920.		
1		235	11		2,280	21		3,000
2		184	12		5,620	22		9,920
3		173	13		3,410	23		2,280
4		154	14		7,530	24		1,490
5		154	15		2,450	25		1,350
6		138	16		1,560	26		1,350
7		138	17		835	27		3,410
8		121	18		885	28		1,280
9		138	19		565	29		885
10		526	20		1,100	30	434	690
						31	302	

Daily discharge, in second-feet, of South Fork of Nooksack River at Saxon Bridge, Wash., for the years ending Sept. 30, 1920 and 1921—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	May.	June.	July.	Aug.	Sept.
1920-21.										
1	1,490	526	690		389	700	1,310		303	352
2	2,630	490	990	4,000	422	745	935		303	1,140
3	6,150	526	835		389	745	805		280	457
4	5,360	490	785		332	745	805		280	720
5	4,600	454		1,490	389	685			257	457
6	2,450	454	565	835		685	1,500	625	257	625
7	3,000	422	565	738	490	685		625	257	870
8	1,720	389	604	647	454	715	1,220	745	257	511
9	1,220	389	565	550	389	745	1,220	625	257	278
10	1,100	360	565	454	7,820	935	1,140		257	303
11	6,150	332	785	389	10,500	935	2,150		257	270
12	2,450	332		389	4,100	935	1,150		257	236
13	1,490	389	785	690		935	1,410		257	215
14	1,950	422		1,950	1,880	1,310	1,070		236	215
15	1,490	454		3,410	1,000	1,310	870		215	178
16	1,220	3,200		1,500	870	1,310	805		215	178
17	1,160	2,280		938	745	1,310	805		215	178
18	1,100	3,200		785		1,310	745		215	200
19	990	1,640		690		1,310	872		257	457
20	885	1,100		565		1,310	1,000		257	625
21	990	990		490		1,310	1,630		275	1,880
22	1,040	690		422		1,310	1,140		257	625
23	835	938		377		1,310	1,000		215	511
24	885	604		332		1,410	1,000		215	457
25	885	2,110		332		1,630	1,000		303	850
26	785	1,280		332		1,070	968		257	8,400
27	785	2,630		332		935	935	328	215	6,150
28	1,420	1,760		360		805	805	328	196	3,000
29	785	885		332		870	870	328	178	1,140
30	604	785		307		935	1,310	328	178	745
31	526			282		1,630			178	

NOTE.—Gage not read, discharge not determined, Dec. 5, 12, 14–31, 1920, Feb. 6, 13, 18–28, Mar. 1 to Apr 30, and July 1–5 and 10–26, 1921. Gage not read, discharge interpolated, Nov. 14, 28, 1920, Jan. 9, 23, 30, May 8, 15, 22, 29, June 19, 26, Aug. 7, 14, 28, and Sept. 11, 1921. Gage not read, discharge estimated by comparison with flow of Deer Creek near Oso, Wash., Jan. 1–4, 16, May 1, June 5–7, 12, Aug. 21, and Sept. 4, 18, and 25, 1921. Braced figures show mean discharge for periods included.

Monthly discharge of South Fork of Nooksack River at Saxon Bridge, Wash., for the period Aug. 30, 1920, to Sept. 30, 1921.

[Drainage area, 129 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1920.						
September	9,920	121	1,800	14.0	15.62	107,000
October	6,150	526	1,880	14.6	16.83	116,000
November	3,200	332	1,020	7.91	8.82	60,700
1921.						
January		282	1,160	8.99	10.36	71,300
May	1,630	685	1,050	8.14	9.38	64,600
June	2,150	745	1,120	8.68	9.68	66,600
August	303	178	244	1.89	2.18	15,000
September	8,400	178	1,080	8.37	9.34	64,300

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, 1921.

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

DISCHARGE MEASUREMENTS.—Made from bridge.

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

EXTREMES OF DISCHARGE.—Maximum daily mean stage recorded during year, 37.95 feet June 13 (discharge, 270,000 second-feet); minimum daily mean stage recorded, 9.42 feet January 28 and 29 (discharge, 19,700 second-feet).

1913–1921: Maximum stage recorded, 41.6 feet June 14 and 15, 1913 (discharge, 312,000 second-feet); minimum stage recorded, 7.40 feet March 28, 1917 (discharge, 9,600 second-feet).

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

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

REGULATION.—None.

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

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

Discharge measurements of Columbia River at Trail, B. C., during the year ending Sept. 30, 1921.

[Made by Beeston and Pirie.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 19	23.07	124,000
Sept. 13	16.21	63,200

Daily discharge, in second-feet, of Columbia River at Trail, B. C., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	72,400	53,100	34,600	24,100	20,000	22,200	23,500	55,600	207,000	246,000	159,000	90,600
2	71,100	51,500	34,200	24,100	19,900	22,300	23,500	57,000	208,000	246,000	159,000	88,400
3	70,700	50,100	33,800	23,900	19,800	22,400	23,800	57,800	209,000	243,000	158,000	86,200
4	71,000	48,800	33,400	23,800	19,900	22,400	24,200	59,000	213,000	236,000	156,000	83,700
5	71,500	47,800	33,000	23,800	19,900	22,400	24,800	60,200	220,000	230,000	153,000	81,200
6	72,200	46,800	32,600	23,800	20,000	22,400	25,800	61,600	226,000	224,000	151,000	78,700
7	73,300	45,500	32,200	23,600	20,000	22,500	26,800	63,000	235,000	218,000	148,000	76,200
8	74,400	44,400	31,800	23,600	20,100	22,500	27,700	64,400	247,000	213,000	146,000	74,100
9	75,400	43,500	31,400	23,900	20,300	22,400	28,500	67,300	256,000	207,000	144,000	71,700
10	76,700	42,800	31,000	24,100	20,600	22,200	29,400	70,700	264,000	203,000	141,000	69,400
11	78,500	42,000	30,600	24,300	20,800	22,100	30,400	74,600	268,000	199,000	139,000	67,200
12	80,700	41,100	30,200	24,300	21,200	22,000	31,300	78,700	269,000	194,000	136,000	65,000
13	81,100	39,800	29,800	24,200	21,400	22,000	32,200	83,400	270,000	189,000	134,000	62,600
14	80,500	38,700	29,400	23,900	21,700	22,000	33,000	87,600	268,000	184,000	131,000	60,600
15	80,100	38,100	29,000	23,500	21,900	22,000	33,900	91,700	266,000	180,000	129,000	58,700
16	79,100	38,000	28,500	23,100	22,100	22,000	35,000	97,000	262,000	179,000	127,000	57,000
17	77,800	38,700	28,200	22,800	22,400	22,200	35,900	103,000	256,000	176,000	124,000	55,200
18	76,500	37,500	27,800	22,400	22,400	22,300	37,000	110,000	252,000	174,000	121,000	53,400
19	75,200	37,400	26,800	22,900	22,400	22,500	38,500	120,000	248,000	172,000	120,000	51,700
20	73,600	37,200	27,000	21,500	22,500	22,800	40,300	130,000	245,000	170,000	118,000	50,300
21	71,400	37,000	26,600	21,200	22,500	23,000	42,200	140,000	241,000	169,000	115,000	48,600
22	69,400	36,800	26,200	20,800	22,300	23,200	44,000	152,000	240,000	168,000	113,000	47,000
23	67,500	36,600	25,800	20,500	22,300	23,300	45,500	162,000	240,000	167,000	111,000	46,400
24	65,600	36,400	25,400	20,300	22,300	23,500	47,400	172,000	241,000	166,000	110,000	45,500
25	63,500	36,100	25,000	20,100	22,500	23,700	49,500	183,000	244,000	165,000	108,000	44,600
26	61,900	35,900	24,700	19,900	22,500	23,800	51,000	192,000	247,000	164,000	105,000	44,100
27	60,300	35,700	24,400	19,800	22,500	23,900	52,100	198,000	249,000	163,000	102,000	44,100
28	58,700	35,400	24,100	19,700	22,300	23,900	53,000	203,000	251,000	162,000	100,000	44,700
29	57,400	35,300	23,900	19,700	------	23,800	53,800	206,000	251,000	162,000	98,000	44,300
30	56,000	35,100	24,200	19,800	------	23,000	54,800	206,000	249,000	161,000	95,400	44,400
31	64,500	------	24,000	19,900	------	23,600	------	207,000	------	160,000	93,000	------

Monthly discharge of Columbia River at Trail, B. C., for the year ending Sept. 30, 1921.

[Drainage area, 34,000 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	81,100	54,500	70,900	2.09	2.41	4,360,000
November	53,100	35,100	40,700	1.20	1.34	2,420,000
December	34,600	23,900	23,700	.84	.97	1,760,000
January	24,300	19,700	22,400	.66	.76	1,380,000
February	22,500	19,800	21,400	.63	.66	1,190,000
March	23,900	22,000	22,700	.67	.77	1,400,000
April	54,800	23,500	36,600	1.08	1.20	2,180,000
May	207,000	55,600	117,000	3.44	3.97	7,190,000
June	270,000	207,000	245,000	7.21	8.04	14,600,000
July	246,000	160,000	190,000	5.59	6.45	11,700,000
August	159,000	93,000	127,000	3.74	4.31	7,810,000
September	90,600	44,100	61,200	1.80	2.01	3,640,000
The year	270,000	19,700	82,300	2.42	32.89	59,600,000

COLUMBIA RIVER AT VERNITA, WASH.

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

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

RECORDS AVAILABLE.—Flood heights only, at Wenatchee, 1894 to 1903; continuous gage-height record at Wenatchee, April 18, 1904, to December 31, 1916; at Beverly January 1–13, 1917; at Vernita, January 14, 1917, to September 30, 1921; daily discharge ascertained from May 1, 1913, to September 30, 1921. 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 history 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 of a mile below gage; apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 31.3 feet June 11 (discharge, 484,000 second-feet); Minimum stage recorded, 2.60 feet at 8.30 a. m. February 11 (discharge, 41,200 second-feet).

1913–1921: 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 Company, 58.0 feet June 7, 1894 (discharge estimated, by extending rating curve, 710,000 second-feet). The Chief of Engineers, United States Army,[3] gives a crest elevation of the 1894 flood and an elevation of zero of the Weather Bureau gage, from which it appears that the gage height was 59.8 feet (discharge estimated, 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.

DIVERSIONS.—Some water diverted for irrigation.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

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

The following discharge measurement was made by R. B. Kilgore:
February 23: Gage height, 5.50 feet; discharge, 63,200 second-feet.

[3] Chief Eng. Rept., 1895, pt. 5, p. 3542.

Daily discharge, in second-feet, of Columbia River at Vernita, Wash., for the year ending September 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	94,900	81,100	62,900	50,500	45,800	60,500	80,200	136,000	405,000	396,000	206,000	109,000
2	94,000	79,300	62,100	58,100	45,200	60,500	81,100	133,000	412,000	391,000	202,000	107,000
3	93,000	78,400	61,300	52,000	45,200	59,700	81,100	134,000	419,000	387,000	199,000	104,000
4	93,000	76,600	60,500	56,500	44,500	59,700	82,000	136,000	427,000	380,000	196,000	102,000
5	94,900	74,800	60,500	59,700	44,500	61,300	82,000	137,000	439,000	373,000	191,000	99,700
6	96,800	73,100	60,500	59,700	43,800	62,900	82,900	138,000	446,000	361,000	187,000	96,800
7	98,700	71,400	59,700	58,900	41,900	62,100	82,900	140,000	453,000	350,000	184,000	94,000
8	101,000	69,700	58,100	58,900	42,600	62,100	82,900	144,000	463,000	339,000	178,000	91,100
9	101,000	67,200	57,300	56,500	41,900	62,900	82,900	149,000	470,000	330,000	174,000	90,200
10	102,000	65,400	55,700	58,100	42,600	63,800	82,000	156,000	479,000	321,000	168,000	87,400
11	103,000	64,600	55,000	57,300	41,900	64,600	82,000	165,000	484,000	311,000	162,000	90,200
12	103,000	62,900	55,000	56,500	45,800	64,600	83,800	172,000	479,000	302,000	158,000	93,000
13	103,000	61,300	55,700	55,000	52,700	65,400	85,600	184,000	479,000	294,000	153,000	91,100
14	106,000	60,500	55,700	54,200	53,400	64,600	87,400	191,000	477,000	284,000	150,000	89,200
15	107,000	60,500	55,000	54,200	54,200	64,600	90,200	199,000	472,000	278,000	148,000	87,400
16	108,000	59,700	54,200	55,000	56,500	62,900	94,900	211,000	470,000	272,000	144,000	85,600
17	107,000	58,100	52,700	54,200	58,900	63,800	97,800	234,000	463,000	265,000	142,000	83,800
18	107,000	56,500	51,200	53,400	58,900	62,900	98,700	254,000	453,000	259,000	139,000	80,200
19	106,000	58,100	49,800	52,000	59,700	64,600	101,000	265,000	443,000	254,000	139,000	78,400
20	103,000	58,900	49,100	52,000	62,100	71,400	105,000	282,000	434,000	248,000	138,000	76,600
21	101,000	58,900	51,200	52,000	62,100	75,700	110,000	300,000	427,000	245,000	137,000	66,300
22	98,700	61,300	50,500	51,200	62,100	77,500	117,000	317,000	419,000	239,000	136,000	65,400
23	96,800	61,300	49,100	50,500	62,100	79,300	124,000	337,000	415,000	232,000	134,000	64,600
24	94,900	62,900	47,800	49,800	62,100	80,200	126,000	350,000	412,000	229,000	133,000	62,900
25	93,000	64,600	46,400	49,100	62,100	81,100	130,000	368,000	410,000	226,000	131,000	61,300
26	90,200	64,600	45,800	49,800	61,300	82,000	131,000	382,000	410,000	224,000	130,000	60,500
27	88,300	63,800	45,200	49,100	61,300	82,900	133,000	396,000	407,000	221,000	126,000	60,500
28	87,400	63,800	45,200	47,800	60,500	82,900	133,000	403,000	407,000	218,000	122,000	60,500
29	84,700	63,800	44,500	47,100	-------	82,000	133,000	405,000	405,000	213,000	117,000	59,700
30	84,700	63,800	44,500	47,100	-------	82,000	136,000	400,000	403,000	211,000	114,000	59,700
31	82,900	-------	45,200	46,400	-------	82,000	-------	400,000	-------	210,000	111,000	-------

Monthly discharge of Columbia River at Vernita, Wash., for the year ending September 30, 1921.

[Drainage area, 95,500 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet
October	108,000	82,900	97,600	1.02	1.18	6,000,000
November	81,100	56,500	65,600	.687	.77	3,900,000
December	62,900	44,500	53,100	.556	.64	3,260,000
January	59,700	46,400	53,300	.558	.64	3,280,000
February	62,100	41,900	52,700	.552	.57	2,930,000
March	82,900	59,700	69,400	.727	.84	4,270,000
April	136,000	80,200	101,000	1.06	1.18	6,010,000
May	405,000	133,000	246,000	2.58	2.97	15,100,000
June	484,000	403,000	439,000	4.60	5.13	26,100,000
July	396,000	210,000	286,000	2.99	3.45	17,600,000
August	206,000	111,000	153,000	1.60	1.84	9,410,000
September	109,000	59,700	81,900	.858	.99	4,870,000
The year	484,000	41,900	142,000	1.49	20.20	103,000,000

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, 1921.

GAGE.—Chain gage on left span of highway bridge; prior to completion of bridge, temporary staff gage fastened to an old stump on 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 years ending September 30, 1920 and 1921, 13.84 feet June 9, 1921 (discharge, 72,900 second-feet); minimum stage, 1.88 feet November 14, 1920 (discharge, 2,300 second-feet).

1910–1921: 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 affected by ice.

DIVERSIONS.—None of importance.

ACCURACY.—Stage-discharge relation permanent except as affected by ice. One rating curve used during period; well defined between 2,500 and 40,000 second-feet and fairly well defined above 40,000 second-feet; discharge measurements made during 1922 indicate that curve is applicable for 1921. Gage read to hundredths once daily except Sundays and holidays. Daily discharge ascertained by applying daily gage height to rating table except as noted in footnote to tables of daily discharge. Records good.

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

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

Daily discharge, in second-feet, of Kootenai River at Libby, Mont., for the years ending Sept. 30, 1920 and 1921.

Day.	Oct.	Nov.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1919-20.											
1	5,020	3,550			3,270	3,370	8,640	14,700	34,600	18,200	7,990
2	4,860	3,780			3,100	3,200	8,090	14,700	53,700	17,700	7,660
3	4,830	3,640			2,980	3,160	7,690	14,300	57,600	17,600	7,660
4	4,830	3,690			3,020	3,040	7,490	14,500	60,500	17,400	7,070
5	4,530	3,690			3,060	3,000	7,690	16,300	58,700	17,500	7,330
6	4,480	3,640			3,440	3,040	7,560	18,400	58,600	17,000	7,200
7	4,430	3,460			2,920	3,100	8,710	24,900	50,800	16,900	7,170
8	4,430	3,290			2,820	3,200	11,000	29,400	50,300	16,700	7,100
9	4,430	3,160			3,020	3,310	15,200	31,000	41,400	16,000	7,070
10	4,320	3,080			2,920	3,310	18,600	32,300	41,000	16,100	7,070
11	4,480	3,000			2,860	4,120	23,200	30,400	41,600	15,100	7,170
12	4,370	2,770			2,920	4,500	25,200	31,000	42,500	13,400	7,490
13	4,370	2,530			2,860	5,610	26,600	31,600	41,800	12,600	12,100
14	4,370	2,300			2,900	6,090	25,700	32,300	42,200	12,100	12,100
15	4,220	3,040			3,020	6,400	24,400	36,400	35,600	11,900	11,700
16	2,490				3,160	6,090	23,800	38,500	30,900	11,700	11,700
17	4,200				3,300	5,790	23,300	51,200	29,000	11,300	9,840
18	4,170				3,440	5,790	22,800	52,700	29,800	11,300	9,030
19	4,070				3,440	5,850	22,200	52,900	32,200	10,900	9,100
20	4,020				3,440	6,400	21,600	49,500	30,900	10,500	9,210
21	4,020				3,660	7,170	21,100	47,800	30,300	9,690	9,390
22	4,070				3,900	7,230	20,600	46,200	29,000	9,060	9,760
23	4,070				4,140	7,040	20,000	50,300	26,600	8,680	9,990
24	4,020				4,140	6,720	19,200	50,800	26,500	8,330	9,760
25	3,780				4,400	6,400	18,500	50,300	25,400	7,990	9,690
26	3,640				3,950	6,280	17,200	50,200	22,000	7,990	9,390
27	3,510				3,900	7,360	17,000	41,500	21,000	8,330	9,460
28	3,460				4,020	7,690	15,300	31,000	19,900	8,680	8,820
29	3,510				3,900	8,990	15,600	30,400	19,400	8,500	8,680
30	3,550				3,440	8,780	15,600	35,000	19,100	8,330	7,990
31	3,510				3,440		15,000		17,900	8,200	
1920-21.											
1	7,890			3,530	5,340	5,340	10,500	41,800	35,400	15,900	7,230
2	8,230			3,530	5,340	5,340	10,600	48,700	33,800	15,500	7,230
3	8,570			3,550	5,340	8,540	12,300	52,000	32,800	13,800	7,170
4	8,920			3,510	5,400	8,540	13,400	50,300	30,600	12,100	6,910
5	10,000			3,080	5,220	8,470	14,000	53,100	28,400	12,100	6,650
6	10,300			3,040	5,280	7,720	15,600	59,500	26,600	12,000	6,590
7	10,800			2,840	5,580	7,010	17,200	66,800	25,600	11,600	6,340
8	10,800			2,920	5,220	6,620	19,600	72,300	25,300	11,600	6,280
9	10,600			3,030	5,050	6,500	23,500	72,900	24,100	11,600	6,280
10	10,600			3,140	4,800	6,560	26,000	69,600	23,700	11,600	6,090
11	10,700			3,250	4,560	6,560	27,700	64,400	23,500	11,600	5,910
12	10,400		3,040	3,290	4,310	7,530	26,500	61,000	21,800	11,500	5,730
13	9,950		2,720	8,030	4,070	8,400	24,900	57,400	20,900	11,300	6,730
14	9,650		3,460	8,780	4,140	10,400	26,000	53,900	20,400	11,200	5,670
15	9,580		3,800	8,430	4,240	10,900	27,200	52,500	20,000	11,100	5,670
16	9,430		4,140	7,100	4,370	12,200	28,300	47,200	19,200	11,000	5,490
17	9,280		4,490	6,030	4,610	13,000	31,300	42,000	18,900	10,400	5,140
18	9,430		4,830	4,970	6,340	15,200	33,000	38,500	18,500	10,200	5,200
19	8,920		5,250	4,830	7,400	16,100	42,000	36,800	18,000	9,920	5,250
20	7,890		4,020	4,690	6,760	16,300	47,700	35,600	17,500	9,660	5,250
21	7,890		3,730	4,480	6,120	15,900	52,200	36,400	17,500	9,390	5,430
22	7,820		3,530	4,480	6,060	15,700	55,500	39,300	17,400	9,170	5,430
23	7,560		3,690	4,450	5,640	15,100	59,200	44,300	17,200	9,030	5,430
24	7,560		3,880	4,480	5,520	13,900	60,800	46,000	17,000	8,880	5,430
25	7,430		3,460	4,750	5,520	13,100	60,800	44,400	16,800	8,680	5,400
26	7,360		3,460	4,970	5,640	12,300	65,300	44,800	16,800	8,330	5,370
27	7,230		3,550	4,970	5,370	11,400	69,500	45,400	16,700	7,660	5,310
28	7,230		3,550	5,250	5,220	10,900	61,200	40,000	16,500	7,590	5,370
29	7,170		4,020		5,340	10,500	48,700	37,200	16,400	7,590	5,490
30	7,130		3,710		5,340	10,500	41,500	35,700	16,400	7,460	5,850
31	7,090		3,510		5,340		39,000		16,000	7,330	

NOTE.—Stage-discharge relation affected by ice Nov. 12, 13, 1919, Nov. 16, 1919, to Feb. 29, 1920, and Mar. 16 and 17, 1920; discharge not determined except for Nov. 12 and 13 and Mar. 16 and 17, for which it was interpolated. Gage not read Oct. 31, 1920, to Jan. 11, 1921, discharge not determined except for Oct. 31, for which it was estimated. Gage not read, discharge interpolated, Oct. 26, 1919, May 16–22, 1920, Jan. 16, 17, Feb. 9, 10, Mar. 10–12, 20, May 15, July 4, Aug. 11, 18, 20, and Sept. 4, 11, 18, and 25, 1921.

Monthly discharge of Kootenai River at Libby, Mont., for the years ending Sept. 30, 1920 and 1921.

[Drainage area, 11,000 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1919–20.						
October	5,020	2,490	4,130	0.375	0.43	254,000
November 1–15	3,780	2,300	3,240	.295	.16	96,400
March	4,400	2,820	3,380	.307	.35	208,000
April	8,990	3,000	5,400	.491	.55	321,000
May	26,600	7,490	17,200	1.56	1.80	1,060,000
June	52,900	14,300	35,000	3.18	3.55	2,080,000
July	60,500	17,900	36,200	3.29	3.79	2,300,000
August	18,200	7,990	12,400	.113	1.30	762,000
September	12,100	7,070	8,860	.805	.90	527,000
1920–21.						
October	10,800	7,090	8,820	.802	.92	542,000
January 12–31	5,250	2,720	3,790	.345	.26	150,000
February	8,780	2,840	4,620	.420	.44	257,000
March	7,400	4,070	5,310	.483	.56	326,000
April	16,300	5,340	10,600	.964	1.08	631,000
May	69,500	10,500	35,200	3.20	3.69	2,160,000
June	72,900	35,600	49,700	4.52	5.04	2,960,000
July	35,400	16,000	21,600	1.96	2.26	1,330,000
August	15,900	7,330	10,500	.955	1.10	646,000
September	7,230	5,140	5,880	.535	.60	350,000

MOYIE RIVER AT SNYDER, IDAHO.

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

DRAINAGE AREA.—717 square miles. (Area in United States measured on map issued by United States Geological Survey, 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, 1921, 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. 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.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.0 feet at 7 a. m. May 26 (discharge, 7,230 second-feet); minimum stage recorded, 2.98 feet September 8, 13, and 14 (discharge, 92 second-feet).

1911–1916, 1919–1921: Maximum stage recorded, 11.0 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 may have been lower in December, 1919, 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 changed May 25–26; not affected by ice. Two rating curves fairly well defined below 3,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except as noted in footnote to table of daily discharge. Records good.

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

Discharge measurements of Moyie River at Snyder, Idaho, during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 30	John McCombs	4.75	1,140
Sept. 13	R. B. Kilgore	2.98	93.9
14	do	2.98	94.5

Daily discharge, in second-feet, of Moyie River at Snyder, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	269	291	324	329	196	505	640	1,360	4,120	1,090	223	102
2	291	282	315	310	191	538	780	1,450	4,780	1,050	211	101
3	334	277	315	305	185	505	1,140	1,650	4,780	1,010	202	100
4	416	269	310	296	161	538	}	1,650	4,780	930	187	98
5	444	260	305	277	152	538	925	1,650	4,780	850	176	97
6	474	252	296	260	155	538	}	1,970	4,780	815	172	97
7	474	243	286	260	202	538		2,440	5,120	745	172	95
8	474	239	269	252	182	474	710	3,090	5,120	670	164	92
9	474	235	266	220	185	505	710	3,810	4,440	640	154	97
10	474	224	268	202	185	538	780	3,810	3,960	605	151	103
11	474	213	269	198	243	474	930	3,510	4,120	570	144	103
12	505	179	260	185	416	416	1,270	3,300	4,120	538	144	97
13	538	198	252	205	605	360	1,550	3,090	3,660	538	142	92
14	538	205	228	273	850	444	1,550	3,510	3,370	505	140	97
15	538	272	235	300	930	416	1,750	4,060	2,950	445	138	97
16	505	338	235	269	815	416	1,970	4,610	2,690	388	138	100
17	505	405	228	247	605	505	2,200	4,780	2,440	383	138	100
18	474	472	224	243	605	710	2,320	5,120	2,440	372	135	100
19	474	538	224	252	570	745	2,440	5,640	2,080	361	131	100
20	444	605	220	220	538	640	2,440	6,150	1,970	345	131	105
21	416	505	220	220	474	605	2,200	6,330	1,860	326	125	114
22	387	474	220	220	474	605	2,080	6,510	1,750	307	128	117
23	387	444	213	198	444	605	1,970	6,870	1,750	288	128	119
24	387	387	205	213	444	605	1,860	6,510	1,650	269	125	114
25	360	387	202	220	474	605	1,750	6,870	1,550	264	122	114
26	334	360	198	205	474	570	1,550	6,870	1,450	260	119	108
27	324	360	198	213	474	538	1,450	6,150	1,360	255	114	108
28	320	360	228	213	474	570	1,360	4,950	1,270	255	111	108
29	315	360	235	185	-------	570	1,450	4,440	1,180	245	108	108
30	305	334	296	202	-------	605	1,360	3,960	1,090	232	105	105
31	296	-------	334	202	-------	605	-------	3,960	-------	228	104	-------

NOTE.—Gage not read Nov. 15–19, Dec. 10, Feb. 1, 2, Apr. 4–7, May 12, 15, 19, June 21, July 21–23, Aug. 13, 14, Aug. 31 to Sept. 4, and Sept. 27; discharge ascertained by interpolation. Braced figure shows mean discharge for period indicated.

Monthly discharge of Moyie River at Snyder, Idaho, for the year ending Sept. 30, 1921.

[Drainage area, 717 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	538	269	418	0.583	0.67	25,700
November	605	179	332	.463	.52	19,800
December	334	198	254	.354	.41	15,600
January	329	185	239	.333	.38	14,700
February	930	152	418	.583	.61	23,200
March	745	360	543	.757	.87	33,400
April	2,440	640	1,460	2.04	2.28	86,900
May	6,870	1,360	4,190	5.84	6.73	258,000
June	5,120	1,090	3,050	4.25	4.74	181,000
July	1,090	228	509	.710	.82	31,300
August	223	104	145	.202	.23	8,920
September	119	92	103	.144	.16	6,130
The year	6,870	92	974	1.36	18.42	705,000

CLARK FORK BASIN.

CLARK FORK AT ST. REGIS, MONT.

LOCATION.—In sec. 19, T. 18 N., R. 27 W., at McLeod's ferry at St. Regis, Mineral County, half a mile below mouth of St. Regis River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 26, 1910, to September 30, 1921.

GAGE.—Vertical staff in two sections on left bank at old ferry landing; read by Archie McLeod.

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

CHANNEL AND CONTROL.—Bed permanent both above and below station. Banks high and not subject to overflow. Control is not sharply defined, being formed by bed of stream for a distance of several hundred feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 15.5 feet at 9.20 a. m. May 28 (discharge, 41,800 second-feet); minimum stage recorded, 4 feet September 5 (discharge, 2,340 second-feet).

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

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

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

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation permanent during year; not affected by ice. Rating curve well defined between 2,000 and 60,000 second-feet; discharge measurements made during 1922 indicate that curve is applicable for 1921. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table except as noted in footnote to table of daily discharge. Records good.

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

Daily discharge, in second-feet, of Clark Fork at St. Regis, Mont., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,420	4,230	4,040	4,420	3,010	4,820	6,560	10,200	30,200	13,200	3,670	2,460
2	4,420	4,230	4,040	4,420	3,010	5,030	6,780	10,500	31,600	12,300	3,670	2,460
3	4,820	4,040	4,040	4,420	3,010	5,030	7,960	10,800	32,100	8,700	3,490	3,490
4	4,820	4,230	4,040	4,420	3,010	5,240	8,700	11,400	34,500	10,800	3,490	2,920
5	5,240	4,040	4,040	4,420	3,010	5,680	9,450	12,300	35,500	10,800	3,320	2,340
6	5,240	3,850	3,850	4,230	2,860	6,120	9,700	13,500	36,500	10,200	3,320	2,460
7	5,460	3,850	3,850	4,040	2,590	5,900	9,970	18,400	37,000	9,450	3,160	2,460
8	5,680	3,850	3,320	3,850	2,590	5,900	10,200	22,600	38,000	8,950	3,160	2,460
9	5,900	4,040	3,670	3,490	2,860	5,680	10,200	25,000	37,500	8,450	3,160	2,590
10	5,680	3,850	3,850	3,490	2,860	5,680	10,200	25,900	37,000	7,960	3,160	2,590
11	5,680	3,670	3,850	3,320	3,490	5,460	10,200	25,400	34,500	7,720	3,010	2,720
12	5,240	2,720	3,670	2,720	4,040	5,460	10,200	25,000	32,600	7,480	2,860	2,860
13	5,460	3,160	3,670	2,720	5,240	4,820	10,200	25,000	31,600	7,000	2,860	2,860
14	5,460	3,010	3,490	2,720	5,680	4,620	10,500	24,600	29,300	6,560	3,160	3,010
15	5,460	3,670	3,160	3,490	6,120	4,820	10,800	24,200	28,000	6,340	2,720	3,010
16	5,240	3,670	3,010	3,490	5,680	4,820	11,100	28,900	26,300	6,120	2,720	3,010
17	5,240	3,670	2,720	3,490	4,820	5,030	11,400	29,800	24,600	5,680	2,860	3,160
18	5,030	4,040	2,720	3,320	4,040	7,000	11,700	30,700	23,400	5,460	2,720	3,320
19	5,030	4,620	3,490	3,490	4,040	8,200	12,000	31,600	22,200	5,240	2,860	3,490
20	4,820	5,030	3,490	3,490	4,040	8,700	11,400	36,000	22,600	5,030	2,860	3,320
21	4,820	5,240	3,320	3,850	4,040	7,960	12,300	40,100	18,000	4,820	3,010	3,320
22	4,820	5,030	3,160	3,320	4,230	7,480	11,400	41,200	17,300	4,820	2,860	3,320
23	4,620	5,030	3,010	3,010	4,040	6,780	12,900	40,600	16,600	4,620	2,860	3,490
24	4,620	4,820	3,010	3,010	4,040	6,780	13,500	40,600	14,200	4,420	2,720	3,490
25	4,420	4,620	3,010	3,010	4,420	7,000	13,200	39,600	17,000	4,230	2,720	3,490
26	4,620	4,420	3,160	3,010	4,230	7,000	12,600	40,100	17,300	3,850	2,720	3,320
27	4,420	4,620	3,160	3,160	4,820	6,780	12,000	41,200	14,500	4,230	2,590	3,490
28	4,420	4,620	3,160	3,160	4,620	6,340	11,100	41,800	14,800	4,230	2,590	3,320
29	4,420	4,420	3,320	3,160	-------	6,340	10,800	38,500	13,800	4,230	2,720	3,320
30	4,420	4,230	3,850	3,010	-------	6,340	10,200	36,000	12,900	4,040	2,590	3,490
31	4,420	-------	4,620	2,860	-------	6,340	-------	31,200	-------	3,850	2,460	-------

NOTE.—No gage readings reported Apr. 9-16; discharge ascertained by comparison with flow of Clark Fork near Plains. Discharge interpolated Sept. 4, on account of error in gage reading.

Monthly discharge of Clark Fork at St. Regis, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	5,900	4,420	4,980	306,000
November	5,240	2,720	4,150	247,000
December	4,620	2,720	3,510	216,000
January	4,420	2,720	3,480	214,000
February	6,120	2,590	3,940	219,000
March	8,700	4,620	6,100	375,000
April	13,500	6,560	10,600	631,000
May	41,800	10,200	28,200	1,730,000
June	38,000	12,900	26,000	1,550,000
July	13,200	3,850	6,800	418,000
August	3,670	2,460	2,970	183,000
September	3,490	2,340	3,030	180,000
The year	41,800	2,340	8,670	6,270,000

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, 1921.

GAGE.—Barrett & Lawrence water-stage recorder, installed November 28, 1911, on right bank, 50 feet below an overhanging chain gage, 150 feet below site of old ferry; datum same as that of chain gage which was read prior to installation of water-stage recorder. Recorder inspected by A. L. Steiner.

DISCHARGE MEASUREMENTS.—Made from cable installed April 26, 1917, at site of old ferry cable used prior to July 29, 1913. July 29, 1913, to April 25, 1917, measurements were made from highway bridge at Plains, 3 miles below.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 16.0 feet at 10 p. m. May 28 (discharge, 100,000 second-feet); minimum stage recorded, 4.3 feet February 11 and September 16–18 (discharge, 7,010 second-feet).

1910–1921: Maximum stage recorded, 17.9 feet June 5, 1913, and July 2, 1916 (discharge, 115,000 second-feet); minimum stage recorded, 3.7 feet several times during October and November, 1919 (discharge, 4,890 second-feet); lower flow probably occurred during winter of 1919–20.

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

DIVERSIONS.—Numerous diversions for irrigation from headwaters of Clark Fork and tributaries to Flathead river.

REGULATION.—Flathead Lake furnishes a natural but uncontrolled regulation for part of flow.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined below and fairly well defined above 60,000 second-feet. Mean daily gage height obtained from recorder graph by inspection. Daily discharge ascertained by applying mean daily gage height to rating table except for period June 12–19, when gage-height record was in error, for which it was ascertained by combining flow of Flathead River near Polson and Clark Fork at St. Regis. Records good.

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

Daily discharge, in second-feet, of Clark Fork near Plains, Mont., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	10,100	10,600	9,720	8,910	7,740	9,720	13,200	25,800	86,200	52,500	17,400	8,910
2	10,100	10,600	9,720	8,910	7,740	9,720	13,200	26,400	87,300	51,600	16,900	8,910
3	9,720	10,600	9,720	8,910	7,740	9,720	14,000	26,400	90,500	49,600	16,400	8,910
4	10,100	10,100	9,720	8,910	7,740	9,720	15,500	27,000	91,500	47,800	15,500	8,510
5	10,600	10,100	9,310	8,910	7,370	10,100	16,400	27,600	91,500	45,900	15,000	8,510
6	11,000	10,100	9,310	8,910	7,370	10,600	16,900	29,600	93,700	44,100	15,000	8,120
7	11,000	9,720	9,310	8,910	7,370	11,000	16,900	33,200	96,900	42,300	14,500	8,120
8	11,400	9,720	9,310	8,910	7,370	11,000	15,900	39,600	98,000	40,500	14,500	8,120
9	11,800	9,720	9,310	8,510	7,370	11,000	15,900	44,100	99,000	38,800	13,600	8,120
10	11,800	9,720	9,310	8,120	7,370	11,000	15,900	46,800	99,000	37,100	13,600	8,510
11	12,300	9,310	9,310	8,510	7,010	11,000	15,900	47,800	98,000	35,500	13,200	8,510
12	11,000	9,310	8,910	8,510	7,370	11,400	16,400	49,600	93,900	34,700	13,200	8,510
13	11,400	9,310	8,510	8,510	8,120	10,600	16,900	51,600	92,900	32,400	12,700	8,120
14	11,800	8,910	8,510	8,510	9,310	10,600	18,400	52,500	89,900	31,700	12,300	7,370
15	11,400	8,910	8,510	8,510	9,720	10,600	19,500	54,500	88,600	30,300	11,800	7,370
16	11,400	8,910	8,510	8,510	9,720	10,600	20,000	58,600	84,100	29,000	11,800	7,010
17	11,800	8,910	8,510	8,510	9,720	10,600	21,100	60,600	81,000	27,600	11,400	7,010
18	11,800	8,910	8,510	8,510	9,720	12,300	22,200	62,700	79,100	27,000	11,400	7,010
19	11,800	9,310	8,510	8,510	9,720	13,600	23,300	64,800	77,200	26,400	11,000	8,510
20	11,800	9,720	8,120	8,510	9,720	14,500	24,500	70,100	73,400	25,100	11,000	8,120
21	11,400	10,100	8,120	8,510	9,310	14,500	25,100	77,600	70,100	23,900	10,600	8,120
22	11,400	10,100	8,120	8,120	8,910	13,600	26,400	81,900	68,000	23,300	10,100	7,74
23	11,400	10,100	8,120	8,120	8,910	13,200	27,000	84,000	65,900	22,800	10,100	7,740
24	11,000	10,100	8,120	7,740	8,910	13,200	27,600	86,200	65,900	21,600	10,100	7,740
25	11,000	10,100	8,120	7,740	8,910	13,200	28,300	87,300	63,800	21,100	9,720	7,740
26	11,000	10,100	7,740	7,740	9,310	13,200	28,300	90,500	63,800	20,000	9,720	7,740
27	11,000	10,100	7,740	8,120	9,310	13,200	27,600	95,800	61,700	20,000	9,720	8,120
28	11,000	10,100	7,740	7,740	9,310	13,200	27,000	99,000	59,600	19,500	9,310	7,740
29	10,600	9,720	7,740	7,740	-------	13,200	26,400	98,000	57,500	18,900	9,310	7,740
30	11,000	9,720	7,740	7,740	-------	13,200	25,800	92,600	55,500	18,400	9,310	7,370
31	11,000	-------	8,120	7,740	-------	13,200	-------	87,300	-------	17,900	9,310	-------

Monthly discharge of Clark Fork near Plains, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	12,300	9,720	11,200	689,000
November	10,600	8,910	9,760	581,000
December	9,720	7,740	8,650	532,000
January	8,910	7,740	8,390	516,000
February	9,720	7,010	8,510	473,000
March	14,500	9,720	11,800	726,000
April	28,300	13,200	20,700	1,230,000
May	99,000	25,800	60,600	3,730,000
June	99,000	55,500	80,800	4,810,000
July	52,500	17,900	31,500	1,940,000
August	17,400	9,310	12,200	750,000
September	8,910	7,010	8,000	476,000
The year	99,000	7,010	22,700	16,500,000

PEND OREILLE LAKE AT SANDPOINT, IDAHO.

LOCATION.—In sec. 23, T. 57, N., R. 2 W. Boise meridian, on west side of lake, at municipal wharf at Sandpoint, Bonner County.

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

GAGE.—Vertical staff in two sections on pile at municipal wharf; read to tenths, occasionally to hundredths, 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, 22.9 feet June 11; minimum stage recorded, 5.7 feet September 30.

1914–1921: 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.

COOPERATION.—Record furnished by United States Forest Service.

84390—24†—wsp 532——7

Daily gage height, in feet, of Pend Oreille Lake at Sand Point, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1												
2	6.5						8.55					
3												6.3
4			6.5						22.3			
5						7.05						
6		6.6									9.2	
7								12.0				6.1
8												
9	6.5						8.85			15.5		
10												6.0
11			6.5						22.9			
12					6.0							
13		6.6									7.7	
14								14.7				5.9
15												
16	6.7						9.35			13.7		
17												5.8
18			6.5						21.5			
19					7.1	8.0						
20		6.5									7.2	
21								18.8				5.8
22				6.4								
23	6.8						11.3			11.0		
24											7.1	5.75
25									19.8			
26					7.1	8.6						
27		6.6										6.8
28								21.5				5.75
29				6.1								
30	6.6						11.5			9.9		5.7
31											6.6	

CLARK FORK AT NEWPORT, WASH.

LOCATION.—In SW. ¼ sec. 24, T. 56 N., R. 6 W. Boise meridian, in Bonner County, Idaho, one-eighth of a mile from Washington-Idaho State boundary at Newport, Pend Oreille County, Wash. Supplemental data obtained at Priest River, Idaho, and Metaline Falls, Wash.

DRAINAGE AREA.—24,200 square miles (area 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 sheet maps, scale, 1:126,720). Drainage area at Priest River, Idaho, practically same as at Newport; area at Metaline Falls, 25,100 square miles.

RECORDS AVAILABLE.—June 26, 1903, to September 30, 1921, as follows: Priest River, Idaho, June 26, 1903, to April 30, 1905; Newport, Wash., April 16, 1904, to September 30, 1921, except during most of the winter months; and Metaline Falls, Wash., November 4, 1908, to September 4, 1910, January 1 to November 28, 1911, and December 22, 1911, to September 30, 1921. During periods when records were obtained simultaneously, computed results at the different locations were compared, and those shown to be the most reliable were chosen. Daily discharge records given below cover the period June 26, 1903, to November 30, 1912, and supersede records previously published in Water-Supply Papers 135 (p. 40), 178 (p. 15), 252 (p. 85), 272 (p. 73), and 292 (p. 65). Monthly discharge only has been determined for the Newport station subsequent to November 30, 1912, but a continuous record of daily discharge is available for the Metaline Falls station.

GAGES.—At Priest River, Idaho: Wire gage, anchored to a platform on right side of river, 1,000 feet west of Great Northern Railway station. Zero of gage at elevation 2,005.39 feet.[4]

At Newport, Wash.: Vertical staff in four sections on left side of river, attached to middle one of three docks formerly operated by Pend Oreille River Navigation Co. Zero of gage at elevation 2,031.98 feet.[4] Since April 5, 1916, at ferry landing one-fourth of a mile upstream; datum 0.13 foot higher to make readings comparable to those made on old gage.

At Metaline Falls, Wash.: Vertical and inclined staff gages at different locations and with varying datum (see description, Water-Supply Paper 462, p. 70).

DISCHARGE MEASUREMENTS.—Made from ferries, boats, ice cover, or cable. Measurements at Metaline Falls reduced by estimated inflow between Newport and measuring section.

CHANNEL AND CONTROL.—At Priest River, Idaho: Low-water control composed of heavy angular boulders in a stretch of the channel extending some distance downstream from gage; high-water control formed by Albany Falls, 4½ miles below gage; both controls permanent.

At Newport, Wash.: Low-water control, 1,600 feet below gage, composed of sand and gravel in two channels separated by an island; rather unstable; permanent extreme high-water control formed by a narrow, rocky, and constricted channel at Box Canyon 53 miles below gage.

At Metaline Falls, Wash.: Permanent control for all stages formed by Metaline Falls the drop over which is 20 feet in a distance of 1,200 feet.

EXTREMES OF DISCHARGE.—Maximum discharge during year, 109,000 second-feet, June 14; minimum discharge, 9,060 second-feet, September 28 and 29.

1903–1921: Maximum discharge, 136,000 second-feet, June 15, 1913; minimum discharge, 2,200 second-feet, December 12, 1919.

Flood at Newport during June, 1894, reached a stage of 38.9 feet, as determined independently from three separate high-water marks (discharge, 217,000 second-feet, estimated by extending rating curve).

ICE.—Stage-discharge relation at Priest River and Newport affected by ice for short periods during severe winters; not affected by ice at Metaline Falls.

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

REGULATION.—Flathead, Pend Oreille, and Priest lakes furnish natural but uncontrolled regulation.

ACCURACY.—Stage-discharge relation permanent at Priest River, where records were obtained prior to April 30, 1905; no ice effect. Rating curve well defined throughout. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table.

For the periods May 1, 1905, to November 30, 1906, March 1 to October 7, 1907, March 1 to November 30, 1908, March 1 to April 30, 1909, August 1, 1910, to January 31, 1911, September 1–30, 1911, and December 1, 1911, to November 30, 1912, daily discharge was determined from gage-height record obtained and rating curves developed at Newport. Stage-discharge relation changed at high water on June 16, 1908, and may have changed several times for low and medium stages but such changes are indeterminate; affected by ice during January, 1912. Rating curve applicable prior to June 16, 1908, developed by means of a relationship curve between Priest River and Newport gages, is well defined; curve used subsequent to June 16, 1908, developed by correcting discharge at Metaline Falls for inflow, and referring the result to simultaneous gage reading at Newport, is well defined. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table, except for January, 1912, for which it was ascertained as explained below.

[4] Not referred to U. S. Coast and Geodetic Survey datum. Elevation of bench marks to which gages were referred, obtained from U. S. Geol. Survey Bulletin 567.

For the periods December 1, 1906, to February 28, 1907, October 8, 1907, to February 29, 1908, and January 1–31, 1912, for which gage-height records are not available or, if available, appear to be in error, mean discharge was determined as follows: Mean discharge of Columbia River at The Dalles, Oreg., for each month during the period August, 1904, to April, 1913, was reduced by the combined mean discharge for the corresponding month of Deschutes, John Day, Umatilla, Snake, Yakima, Wenatchee, Chelan, Methow, and Spokane rivers. Likewise, for the period May, 1913, to September, 1921, monthly mean discharge of Columbia River at Wenatchee or Vernita, Washington, was reduced by the combined mean discharge, for the corresponding month, of Wenatchee, Chelan, Methow, and Spokane rivers. The results for the entire period August, 1904, to September, 1921, determined by these two processes, will be referred to hereinafter as discharge of "Columbia less tributaries." Computed monthly discharge of Clark Fork at Newport and at Metaline Falls was compared with monthly discharge of "Columbia less tributaries" to determine ratios for as many months of the entire period as possible, from which an average ratio for each month of the year was derived. Then mean monthly discharge for the periods named at the beginning of this paragraph were obtained by multiplying the mean monthly discharge of "Columbia less tributaries" by the average ratio for the corresponding month.

For the periods November 1–30, 1908, March 1 to November 30, 1909, March 1 to August 31, 1910, January 1 to October 31, 1911, and October 1 to November 30, 1912, simultaneous discharge was computed for the Newport and Metaline Falls stations. During these periods of simultaneous discharge two sets of monthly ratios, based on discharge of "Columbia less tributaries," had been computed and used in deriving the average ratio for each month of the year, as explained in the preceding paragraph. Those ratios which more nearly agreed with the average ratio for the corresponding month were accepted as an index of the more accurate record. This comparison indicated that results at the Metaline Falls station were the more accurate for the periods May 1 to November 30, 1909, March 1 to July 31, 1910, February 1 to August 31, 1911, and October 1–31, 1911. Except for November 1–30, 1911, when the average of the simultaneous results was accepted as being correct, the discharge for the Newport station was judged to be the more accurate for the remaining months of the periods mentioned at the beginning of this paragraph.

For the period December 1, 1912, to September 30, 1921, except for winter months, simultaneous records are also available at Newport and Metaline Falls. The daily discharge, however, as previously published for Metaline Falls station is considered very reliable. The drainage area at Metaline Falls is only 3.7 per cent larger than at Newport and the difference in discharge is probably less than 3 per cent. Therefore, daily discharge at Newport is not published here, but monthly discharge tables appear below. The rating curve used for the above period, giving discharge at Newport but referred to gage heights at Metaline Falls, is well defined by numerous measurements made at Metaline Falls gaging station, the results of which have been published in previous water-supply papers. The discharge as published for these measurements was reduced, to correct for inflow, by three times the flow of Sullivan Creek and then plotted to Metaline Falls gage heights. The corrections for inflow, made in this manner, represent an average of 2.2 per cent of the flow at Newport.

Records excellent, 1903 to 1905 and 1913 to 1921; good, 1906 and 1912; and fair, 1907 to 1911.

COOPERATION.—Gage-height record at Newport furnished by United States Weather Bureau.

Discharge measurements of Clark Fork at Priest River, Idaho, and Newport, Wash., during the years ending Sept. 30, 1903–1915.

Date.	Made by—	Gage height.		Discharge.
		Priest River.	Newport.	
1903.		*Feet.*	*Feet.*	*Sec.-ft.*
June 26	Noble and Bliss	59.40		108,000
July 15	G. H. Bliss	53.85		73,500
Aug. 6	do	48.49		37,300
Sept. 3	do	45.15		17,300
Oct. 28	do	44.81		15,500
1904.				
Mar. 12	C. E. Hewitt	44.39		13,900
May 27	Steward and Hurlburt	56.00		85,100
July 20	do	49.92		45,500
Aug. 11	Steward and Laurgaard	46.33		22,100
1905.				
Jan. 19	Laurgaard and Casteel	42.52		8,030
Feb. 3	Calvin Casteel	41.85		5,420
1908.				
Oct. 23	H. L. Frazer		−.10	11,900
1914.				
Feb. 11	J. E. Stewart		−.67	9,880
June 11	Parker and Brown		13.00	65,900
1915.				
Mar. 13	C. O. Brown		−.94	8,800
14	do		−.90	8,650

NOTE.—All measurements made during period June 26, 1903, to Jan. 19, 1905, inclusive, were recomputed from the original notes. Measurements during 1908 and 1914 were made at Metaline Falls above Sullivan Creek; measured discharge was reduced by two times the flow of Sullivan Creek to give approximat flow at Newport.

Daily discharge, in second-feet, of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1913.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1903.					1903.				
1		102,000	44,200	18,500	16		70,300	27,100	14,900
2		99,600	43,500	18,000	17		68,300	25,900	14,900
3		97,600	41,600	17,500	18		66,400	25,900	14,900
4		95,600	39,700	17,500	19		64,400	24,800	14,500
5		92,900	38,400	17,500	20		62,400	23,700	14,500
6		90,900	36,500	16,600	21		61,100	23,100	14,500
7		88,800	35,200	16,600	22		58,400	22,600	14,500
8		86,800	34,600	16,600	23		57,200	22,600	14,500
9		84,800	33,300	15,700	24		55,200	22,000	14,100
10		82,900	32,000	15,700	25		53,900	21,500	14,100
11		80,200	30,800	15,700	26	108,000	52,000	21,000	14,100
12		78,900	30,800	16,200	27	107,000	51,300	20,500	14,100
13		77,600	30,100	15,700	28	106,000	48,700	20,000	14,100
14		76,300	29,500	15,300	29	105,000	47,400	19,500	14,100
15		71,000	27,700	15,300	30	103,000	46,800	19,500	14,100
					31		44,800	19,000	

Daily discharge, in second-feet, of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1903–4.												
1	14,100	15,700	15,300	14,500	11,000	10,700	13,700	60,400	87,500	68,300	31,400	14,100
2	14,100	15,300	15,300	14,100	11,000	10,700	13,700	62,400	88,200	67,700	30,800	14,100
3	14,100	15,300	16,200	14,100	11,400	10,700	14,100	63,700	87,500	66,400	29,500	14,100
4	14,100	15,300	16,600	14,100	11,700	10,700	13,300	65,000	88,200	65,000	28,900	13,700
5	14,100	15,300	16,600	14,100	11,400	10,700	14,100	67,000	88,200	63,100	28,300	13,700
6	14,100	15,700	16,600	13,700	11,400	10,700	14,100	69,000	87,500	62,400	27,100	13,300
7	14,500	15,700	16,600	13,700	11,400	11,000	14,500	69,000	88,200	61,100	25,900	13,300
8	14,900	15,700	16,600	13,700	11,400	11,400	15,300	69,700	88,200	60,400	25,400	12,900
9	14,900	16,600	16,600	12,900	11,000	11,700	15,700	70,300	88,200	58,400	24,200	12,500
10	14,500	15,700	16,600	13,700	11,400	12,900	16,200	69,700	86,800	57,200	23,700	12,500
11	14,500	17,100	16,600	13,700	11,000	13,300	16,600	69,700	86,800	55,800	23,100	12,500
12	14,900	16,200	16,600	13,300	10,700	14,100	18,500	69,700	86,800	54,600	22,600	12,100
13	14,900	16,600	16,600	12,900	10,700	14,500	21,000	69,700	85,500	53,900	21,500	12,100
14	14,900	16,400	16,600	12,900	11,000	14,900	23,700	70,300	84,200	52,000	21,000	11,700
15	15,300	16,200	16,600	12,900	11,000	14,500	27,100	69,000	83,500	50,600	20,500	11,700
16	15,300	16,200	16,600	12,900	11,000	14,900	30,800	69,700	81,500	50,000	20,000	11,700
17	15,700	16,200	16,600	13,300	10,700	14,900	34,600	69,700	80,900	48,700	19,500	11,700
18	15,700	16,600	16,200	12,500	11,000	14,500	37,100	70,300	79,600	47,400	18,500	11,700
19	15,700	15,300	16,600	12,900	10,700	14,500	39,700	71,000	80,200	46,100	18,500	11,400
20	15,700	15,300	16,200	12,900	10,700	14,500	41,600	71,000	80,200	46,100	18,000	11,400
21	15,700	15,300	16,200	12,900	10,700	14,500	42,900	73,000	79,600	43,500	17,500	10,700
22	16,200	15,300	16,200	12,500	10,300	14,900	44,800	74,300	78,900	42,300	17,100	10,700
23	16,200	15,300	15,700	12,500	10,300	14,900	46,800	77,600	76,900	40,300	16,600	10,300
24	16,200	15,300	15,700	12,100	10,700	14,900	48,700	79,600	76,900	40,300	16,600	10,300
25	16,200	15,300	15,700	12,500	10,700	14,100	50,000	82,200	76,300	38,400	16,200	10,300
26	15,700	15,300	15,700	12,500	10,700	14,100	51,300	84,200	75,600	37,800	15,700	10,000
27	15,700	14,900	15,300	12,500	10,700	14,100	52,000	85,500	74,300	35,900	15,700	10,000
28	15,700	14,900	15,300	11,700	10,700	14,100	53,200	86,200	73,000	35,900	15,300	10,000
29	15,300	15,300	15,300	11,700	10,300	14,100	55,200	86,800	71,000	34,600	14,900	10,000
30	15,300	15,300	14,900	11,700	-------	13,300	58,400	86,800	69,700	32,700	14,900	9,700
31	15,700	-------	14,900	11,700	-------	13,300	-------	87,500	-------	32,000	14,100	-------
1904–5.												
1	9,700	8,510	8,510	8,220	6,870	8,220	11,700	16,100	30,200	42,800	19,400	10,300
2	9,700	8,510	8,510	8,220	4,690	8,510	11,700	16,400	31,100	42,200	19,000	10,300
3	9,400	8,510	8,510	8,220	5,840	8,510	11,400	16,800	32,700	41,700	18,600	10,100
4	9,700	8,510	8,510	8,220	6,870	8,800	11,700	16,400	34,300	41,200	17,900	10,100
5	9,400	8,220	8,510	8,220	7,130	8,800	11,700	16,400	35,900	40,100	17,100	9,820
6	9,400	8,510	8,220	8,220	7,400	8,800	11,400	16,800	38,500	39,000	16,800	9,580
7	9,400	8,510	8,220	8,510	7,670	9,100	11,400	17,100	40,600	38,000	16,400	9,580
8	9,100	8,220	8,510	8,220	7,400	9,100	11,400	17,500	42,800	36,900	16,100	9,340
9	9,400	8,220	8,220	7,940	7,670	9,400	11,700	17,900	44,900	35,900	15,700	9,340
10	9,400	8,510	7,940	7,940	8,510	9,700	11,400	17,900	44,900	35,300	15,400	9,340
11	9,400	8,510	8,220	7,670	5,600	10,300	11,400	18,200	46,000	34,300	15,100	9,340
12	9,100	8,220	7,940	5,370	6,350	10,300	11,700	19,000	47,000	31,600	14,800	9,100
13	9,100	8,220	8,220	4,260	6,610	10,000	12,100	19,400	48,100	31,100	14,500	9,100
14	9,100	8,220	7,940	4,470	7,130	9,700	11,700	20,200	49,200	31,100	14,200	9,100
15	9,100	7,940	7,940	6,350	7,130	9,700	11,700	20,900	50,300	31,100	13,900	9,100
16	9,100	7,940	8,220	7,130	7,130	9,700	12,100	21,300	50,300	29,700	13,600	8,860
17	9,100	7,940	7,940	7,400	7,130	9,700	12,100	21,300	50,800	28,700	13,300	8,860
18	8,800	7,940	8,220	7,670	7,130	10,000	12,100	21,700	50,300	27,800	13,000	8,860
19	8,800	7,940	7,940	7,670	7,130	10,000	12,100	22,500	50,300	27,300	12,400	8,620
20	8,800	8,220	8,220	7,940	7,130	10,000	12,100	22,900	50,300	26,400	11,800	8,160
21	8,800	8,800	7,940	7,940	7,400	10,300	12,500	23,800	49,200	25,500	11,600	8,390
22	8,800	8,800	7,940	7,940	7,400	10,300	12,500	24,200	48,600	24,600	11,300	8,390
23	8,800	8,800	8,220	7,940	7,670	10,700	12,900	25,000	48,600	24,200	11,300	8,390
24	8,800	9,100	7,940	7,940	7,670	10,700	13,300	25,900	48,100	23,300	11,300	8,390
25	8,800	8,800	7,940	7,940	7,940	11,000	14,100	26,800	47,000	22,900	11,300	8,390
26	8,510	8,510	7,940	7,940	7,940	11,000	13,700	27,300	46,000	22,100	11,300	8,390
27	8,510	8,800	7,940	8,220	7,940	11,000	14,900	28,200	45,400	21,700	11,300	8,390
28	8,510	8,510	7,940	8,220	8,220	11,400	15,700	28,200	44,900	21,700	10,600	8,390
29	8,510	8,510	7,940	8,220	-------	11,400	16,200	28,200	44,300	21,700	10,600	8,390
30	8,510	8,800	7,940	8,220	-------	11,400	16,600	29,200	43,300	20,500	10,600	8,390
31	8,510	-------	8,220	8,510	-------	11,700	-------	29,700	-------	19,400	10,300	-------

Daily discharge, in second-feet, of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1905–6.												
1	8,390	9,820	9,340	7,940	8,160	10,100	10,600	28,700	42,200	36,900	18,600	11,800
2	8,390	9,820	9,100	7,940	8,160	9,820	11,300	29,700	42,800	36,900	18,200	11,600
3	8,620	9,820	8,860	7,720	8,160	9,820	11,600	30,200	42,800	36,900	17,900	11,300
4	8,860	9,820	8,860	7,720	8,160	9,820	11,800	30,600	42,800	36,400	17,100	11,000
5	9,100	9,820	8,860	7,500	8,160	9,820	12,400	31,100	43,300	35,900	16,800	11,000
6	9,340	9,820	9,100	7,500	8,160	9,820	13,300	31,600	43,300	35,300	16,400	11,000
7	9,580	9,820	9,100	7,500	7,940	9,820	13,600	32,200	43,300	34,800	16,100	11,000
8	9,580	9,820	9,100	7,500	7,940	9,820	13,900	33,200	43,300	34,300	15,700	10,800
9	9,580	9,820	9,100	7,500	7,720	9,820	14,200	33,700	43,800	33,700	15,400	10,800
10	9,580	9,820	9,100	7,500	7,720	9,100	14,500	33,700	43,800	32,700	15,100	10,600
11	9,580	9,820	8,860	7,500	7,720	7,940	14,800	34,800	43,800	32,200	14,500	10,300
12	9,580	9,820	8,620	7,500	7,720	6,870	15,100	34,800	43,800	31,600	14,200	10,300
13	9,580	9,820	8,620	7,500	7,720	7,610	15,400	35,900	43,300	31,100	13,900	10,300
14	9,580	9,580	8,620	7,500	7,720	8,340	16,100	36,900	43,300	30,600	13,600	10,300
15	9,580	9,580	8,860	7,720	7,940	9,080	16,400	37,400	43,300	30,200	13,300	10,600
16	9,580	9,580	8,620	7,720	8,160	9,820	16,400	38,500	43,300	29,700	13,000	10,300
17	9,820	9,340	8,620	7,720	8,160	9,820	16,400	39,000	43,300	28,700	12,700	10,100
18	10,100	9,340	8,620	7,720	8,160	9,820	16,800	39,600	43,300	27,300	12,100	10,100
19	9,820	9,340	8,620	7,720	7,940	9,580	17,100	40,100	43,300	26,400	12,100	10,100
20	9,580	9,340	8,620	7,500	7,940	9,340	17,900	40,100	43,300	25,500	12,100	9,820
21	9,580	9,580	8,620	7,290	8,160	9,340	18,600	40,100	42,800	25,000	12,100	9,820
22	9,580	9,580	8,620	7,290	9,100	9,340	19,800	40,100	42,200	24,600	12,100	9,820
23	9,580	9,820	8,620	7,720	9,340	9,340	20,500	40,100	42,200	23,800	12,100	9,820
24	9,580	9,340	8,620	7,720	9,580	9,340	21,300	40,100	41,200	23,300	12,100	9,580
25	9,580	9,580	8,390	7,940	9,820	9,340	23,800	40,100	40,600	22,500	12,100	9,340
26	9,820	9,580	8,390	7,940	10,100	9,580	24,600	40,100	40,100	21,700	11,800	9,340
27	9,820	9,580	8,390	7,940	10,100	9,580	25,500	40,600	39,000	20,900	11,800	9,340
28	9,820	9,580	8,620	7,940	10,100	9,820	26,400	40,600	38,500	20,500	11,800	9,340
29	9,820	9,340	8,390	8,160	------	9,820	27,300	40,600	38,000	20,200	11,800	9,340
30	9,820	9,340	8,160	8,160	------	10,100	28,200	41,200	36,900	19,800	11,800	9,100
31	9,820	------	7,940	8,160	------	10,600	------	41,200	------	19,000	11,800	------
1906–7.												
1	9,100	8,620	------	------	------	17,100	19,000	38,500	83,200	89,500	52,000	30,200
2	9,100	8,860	------	------	------	17,100	18,600	38,500	83,800	90,100	54,700	28,200
3	9,100	9,340	------	------	------	17,100	18,600	38,000	84,400	90,100	54,200	26,800
4	8,860	9,580	------	------	------	17,100	19,000	38,000	85,500	90,100	53,600	26,400
5	8,860	10,100	------	------	------	17,100	19,400	38,000	87,200	89,500	53,600	25,500
6	8,860	10,100	------	------	------	17,100	19,800	38,000	87,800	89,500	52,500	25,000
7	8,860	10,300	------	------	------	17,100	20,500	38,000	89,500	88,900	52,000	24,600
8	8,860	10,600	------	------	------	17,100	20,900	38,500	90,100	87,800	51,400	24,200
9	8,860	10,800	------	------	------	17,100	21,300	39,600	91,200	86,600	51,400	23,800
10	8,860	11,000	------	------	------	16,800	21,700	40,600	92,300	85,500	50,800	23,300
11	8,860	11,000	------	------	------	16,800	22,500	43,800	94,000	84,400	50,300	22,900
12	8,860	11,300	------	------	------	16,400	22,500	45,400	94,600	82,700	49,200	22,500
13	8,620	11,600	------	------	------	16,100	22,900	46,500	94,600	81,000	48,600	22,100
14	8,620	12,100	------	------	------	15,700	25,900	47,600	94,600	78,800	48,100	22,100
15	8,620	13,000	------	------	------	15,700	26,400	49,200	95,200	77,100	47,000	22,100
16	8,620	14,500	------	------	------	15,400	28,200	50,800	92,900	76,000	46,000	22,100
17	8,620	16,800	------	------	------	15,400	30,200	53,600	94,600	73,700	45,400	21,300
18	8,860	17,900	------	------	------	15,400	31,600	55,800	94,000	72,000	44,300	21,300
19	8,860	19,000	------	------	------	15,100	33,200	59,700	92,900	70,400	43,300	21,300
20	8,860	19,800	------	------	------	15,100	34,300	64,200	91,200	68,700	42,200	21,300
21	8,860	20,500	------	------	------	15,400	34,800	68,700	90,100	67,000	41,200	20,900
22	8,860	21,700	------	------	------	15,700	35,300	72,600	89,500	65,300	41,200	20,500
23	8,860	22,100	------	------	------	16,800	36,900	76,000	88,900	63,100	40,600	20,200
24	8,860	21,700	------	------	------	17,900	37,400	78,200	88,900	62,000	40,100	19,400
25	8,620	21,700	------	------	------	18,600	38,500	80,400	88,900	60,300	38,500	19,000
26	8,620	21,700	------	------	------	19,000	38,500	82,100	88,900	57,500	38,000	18,200
27	8,860	21,700	------	------	------	19,000	39,000	82,700	89,500	55,800	36,900	17,100
28	8,860	21,700	------	------	------	19,000	38,500	82,700	88,900	53,600	35,900	16,400
29	8,860	21,700	------	------	------	19,000	38,500	83,200	89,500	51,400	34,300	15,700
30	8,620	21,700	------	------	------	19,000	38,500	83,200	89,500	49,200	32,700	15,400
31	8,620	------	------	------	------	19,000	------	83,200	------	48,100	31,600	------

Daily discharge, in second-feet, of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1907–8.												
1	15,400					9,340	13,900	44,900	69,200	94,500	40,200	16,500
2	15,100					9,580	13,900	45,400	69,200	89,000	39,400	16,500
3	15,100					9,580	13,900	46,000	71,500	85,800	38,400	16,100
4	14,800					9,820	13,900	46,500	73,200	80,900	36,200	15,300
5	14,800					10,100	13,900	47,000	74,800	78,200	35,300	14,900
6	14,500					10,100	13,900	48,600	79,300	78,200	34,000	14,900
7	14,500					10,300	13,900	49,800	83,200	77,100	32,600	14,500
8						10,300	13,900	52,000	86,600	75,000	31,700	14,500
9						10,300	13,900	54,200	93,500	72,800	30,800	14,500
10						10,300	13,900	56,400	99,200	70,100	29,000	14,500
11						10,600	14,200	57,500	105,000	67,400	27,700	14,100
12						10,600	14,200	58,000	108,000	64,700	26,800	13,700
13						10,600	14,500	59,700	114,000	62,000	26,400	13,700
14						10,800	14,800	60,800	117,000	59,800	25,000	13,700
15						10,800	15,100	63,100	121,000	57,100	24,600	13,700
16						10,800	15,700	62,500	124,000	54,500	23,700	13,400
17						11,000	17,100	63,100	120,000	53,500	23,300	13,400
18						11,300	18,200	63,600	120,000	52,500	22,900	13,000
19						11,600	20,500	64,200	120,000	51,600	22,400	12,600
20						11,800	22,100	64,200	119,000	51,100	22,400	12,000
21						12,400	24,600	65,300	118,000	51,100	22,000	11,600
22						12,700	27,800	65,300	116,000	51,100	21,200	11,600
23						12,700	30,200	65,900	116,000	49,200	20,300	11,600
24						13,300	32,700	65,900	116,000	47,900	19,400	11,600
25						13,000	35,900	65,900	114,000	46,600	19,000	11,300
26						13,300	38,500	66,400	111,000	44,300	19,000	11,300
27						13,600	40,100	67,000	108,000	43,000	18,200	11,300
28						13,600	42,200	67,600	106,000	42,500	17,700	11,000
29						13,600	43,300	68,100	103,000	42,500	16,900	11,000
30						13,600	44,300	68,700	100,000	42,000	16,500	10,600
31						13,900		68,700		41,200	16,500	
1908–9.												
1	10,600	13,000	11,000	9,660	15,400	12,000	13,700	21,000	57,400	97,100	41,100	17,900
2	11,000	13,000	11,000	8,400	15,400	12,000	14,100	21,500	60,800	94,900	39,900	17,500
3	10,600	13,000	11,000	6,260	15,000	12,000	14,900	21,900	63,600	92,800	40,500	17,000
4	10,600	13,000	10,600	6,520	14,700	11,600	14,900	22,900	67,200	90,700	41,100	17,000
5	10,300	13,000	10,600	8,400	14,300	11,600	15,300	21,900	69,500	87,800	37,000	16,600
6	10,000	13,000	10,300	7,830	13,900	12,300	15,700	22,900	73,700	86,800	35,400	16,200
7	9,710	12,600	9,980	6,520	13,900	12,300	15,700	24,200	78,400	84,900	35,400	15,800
8	9,710	12,600	10,300	5,760	13,500	12,000	16,100	25,700	83,100	82,100	34,300	15,000
9	9,710	12,600	10,300	5,760	12,800	11,600	16,100	26,600	89,700	78,400	33,200	15,000
10	9,710	12,600	9,980	6,520	12,800	12,000	16,500	27,600	89,700	77,400	32,600	14,700
11	10,000	12,600	10,300	6,260	12,000	12,000	16,500	28,100	92,800	76,500	31,600	14,700
12	10,000	12,600	10,300	7,040	11,300	11,600	16,100	28,600	94,900	71,800	31,100	14,700
13	10,300	12,600	9,980	7,830	10,600	11,600	15,700	29,600	96,000	68,700	30,000	14,300
14	10,600	12,300	9,980	7,560	10,600	11,600	16,500	29,600	97,100	68,700	29,600	13,900
15	11,000	12,300	9,980	8,400	10,300	11,600	16,500	30,000	98,200	68,000	28,600	13,900
16	11,300	12,000	10,300	8,400	10,300	11,300	16,500	30,600	98,200	66,500	27,600	13,500
17	11,300	12,000	9,980	8,700	11,300	11,300	17,300	31,600	99,300	60,800	26,600	13,500
18	11,600	12,000	9,980	9,020	11,000	11,300	17,300	32,100	99,300	62,200	26,100	13,100
19	11,600	12,000	9,660	9,340	11,300	11,300	17,700	32,600	100,000	60,800	25,700	13,100
20	12,000	11,600	9,660	9,660	11,000	11,600	18,200	33,200	100,000	58,700	25,200	13,100
21	12,000	11,600	9,020	9,660	10,600	12,000	18,200	34,300	102,000	56,700	24,200	13,100
22	12,000	11,600	9,020	10,600	10,600	11,600	18,200	34,800	103,000	55,300	23,300	12,800
23	12,000	12,000	9,020	9,340	9,980	12,000	18,600	35,900	104,000	54,000	22,900	12,800
24	12,600	12,000	9,020	11,700	10,600	12,000	18,600	37,000	104,000	52,100	22,400	12,800
25	12,600	12,300	8,700	12,400	11,000	11,600	19,000	38,200	104,000	50,200	21,500	12,400
26	12,600	12,300	9,020	14,700	10,600	12,300	19,000	39,900	104,000	48,900	20,600	12,400
27	12,600	12,300	8,700	15,000	11,000	12,300	20,300	41,700	104,000	47,100	20,100	12,000
28	12,600	12,600	8,700	14,700	11,000	12,600	20,700	44,700	103,000	45,900	19,200	12,000
29	12,600	12,300	8,700	14,700		13,400	22,000	47,700	100,000	44,700	18,800	12,400
30	13,000	12,300	8,700	15,000		13,400	22,000	50,200	97,100	43,500	18,800	12,400
31	13,000		9,020	15,400		13,700		53,400		42,300	18,300	

Daily discharge, in second-feet, of Clark Fork at Newport, Wash., for the years ending Sept 30, 1903–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909–10.												
1	12,000	10,600	24,700	20,600	13,500	12,400	41,100	68,700	71,000	44,700	22,000	11,000
2	12,000	10,600	25,200	19,700	11,300	13,500	40,500	71,000	71,000	44,100	21,600	10,600
3	12,000	10,600	25,700	16,600	11,300	13,500	39,900	71,800	71,000	43,500	21,200	10,300
4	12,000	11,000	26,100	14,700	11,300	13,900	39,900	73,700	71,000	42,300	20,700	10,300
5	12,000	11,000	26,600	15,800	13,100	14,700	39,300	73,700	70,200	41,100	20,300	10,300
6	12,000	12,000	26,600	18,300	12,800	16,600	38,800	73,700	69,500	39,900	20,300	10,300
7	11,700	12,400	26,100	17,000	12,800	17,900	38,800	73,700	68,700	39,300	19,900	10,600
8	11,700	12,800	26,100	16,600	11,000	20,600	39,300	74,600	67,200	37,600	19,000	11,000
9	11,700	13,100	25,200	17,500	9,980	24,200	39,300	74,600	66,500	37,000	18,600	11,000
10	11,300	13,500	23,800	17,900	9,660	25,200	39,900	74,600	65,800	35,900	17,700	10,600
11	11,300	13,900	23,800	18,300	9,980	25,200	39,900	74,600	65,100	35,400	17,300	10,600
12	11,300	13,900	23,800	17,900	9,660	25,200	40,500	74,600	63,600	34,800	16,900	10,600
13	11,300	14,700	23,300	17,500	9,660	25,200	40,500	73,700	62,200	33,700	16,500	10,600
14	11,300	14,300	23,300	17,500	9,660	25,200	41,100	74,600	61,500	32,600	16,100	10,300
15	11,000	13,900	22,900	18,300	9,340	25,700	42,900	75,500	60,800	31,600	15,700	10,300
16	11,000	14,300	22,400	18,800	9,340	25,700	44,100	73,700	59,400	30,600	15,300	10,000
17	11,000	14,300	22,400	18,800	9,340	26,600	45,900	73,700	58,700	30,600	15,300	10,000
18	11,000	14,300	21,900	18,300	9,660	27,600	46,500	72,800	56,700	28,600	14,900	10,000
19	11,000	14,700	22,400	17,900	9,660	27,600	47,100	72,800	54,700	28,100	14,500	10,000
20	11,000	14,700	21,900	17,500	9,980	29,000	48,900	71,800	55,300	27,600	14,100	10,300
21	10,600	14,700	21,500	18,300	9,980	30,000	49,600	71,800	54,700	27,100	13,700	10,300
22	10,600	15,400	21,000	19,200	9,980	31,600	50,800	71,000	53,400	24,200	13,400	10,300
23	10,600	16,200	20,100	19,200	9,660	34,300	52,100	71,000	52,700	23,800	13,000	10,300
24	10,600	16,600	18,300	19,200	9,340	35,400	54,700	71,000	51,400	25,200	12,600	10,600
25	10,600	17,500	18,300	19,700	9,020	37,000	56,000	71,000	50,800	24,700	12,300	11,000
26	10,600	18,800	17,900	18,800	8,400	39,300	58,700	71,000	50,200	23,800	12,300	10,600
27	10,600	20,600	19,200	16,600	10,600	40,500	60,100	71,000	49,600	23,300	12,000	10,600
28	10,600	21,500	21,000	14,700	12,400	41,100	62,900	71,000	47,700	22,900	11,600	10,300
29	10,600	23,300	21,900	13,500	-------	41,100	64,300	71,000	48,300	21,900	11,600	10,000
30	10,300	24,700	21,900	13,900	-------	41,100	66,500	71,000	45,900	21,500	11,600	10,000
31	10,600	-------	22,400	13,900	-------	41,100	-------	71,000	-------	20,600	11,300	-------
1910–11.												
1	10,000	9,110	21,200	15,300	11,500	9,020	16,200	30,600	54,700	73,700	32,600	16,000
2	10,000	9,110	21,200	14,900	11,700	8,700	16,200	31,600	54,700	71,800	31,600	16,100
3	10,000	9,110	21,200	14,500	11,300	8,700	16,200	33,200	54,700	71,000	31,600	16,100
4	10,300	9,410	21,200	14,100	11,000	8,400	17,000	36,500	56,000	70,200	31,100	16,100
5	10,600	9,710	21,200	13,700	11,000	8,700	17,500	38,800	56,700	68,700	31,100	15,700
6	11,300	9,710	21,200	13,000	11,000	8,700	18,300	39,900	59,400	68,700	30,600	15,700
7	11,300	9,710	21,200	12,300	10,600	8,700	18,300	40,500	62,900	67,200	29,600	15,700
8	11,600	10,000	21,200	12,300	10,600	9,020	18,300	44,100	63,600	65,800	27,600	15,300
9	11,600	10,600	21,200	12,300	10,600	9,020	18,800	44,100	63,600	65,100	27,100	15,300
10	11,600	11,300	21,200	12,300	10,600	9,020	17,000	45,900	64,300	63,600	26,600	14,900
11	11,600	11,600	20,700	12,600	10,600	8,700	18,800	47,100	65,800	59,400	26,600	14,900
12	11,600	12,000	20,700	12,600	10,600	9,020	18,800	47,700	67,200	57,400	26,100	14,500
13	12,000	13,000	20,300	12,600	10,300	9,340	18,800	50,200	68,700	58,700	25,700	14,500
14	12,000	13,400	19,900	12,600	10,300	10,300	19,200	50,200	70,200	57,400	24,200	14,100
15	12,000	13,700	19,400	12,300	9,980	9,980	19,200	50,200	71,000	60,100	23,800	13,700
16	12,000	14,100	19,000	11,600	9,980	10,300	19,700	51,400	72,800	54,700	23,300	13,700
17	11,600	14,900	18,600	11,600	9,980	10,600	19,700	52,700	73,700	52,700	22,900	13,400
18	11,300	15,300	18,600	11,600	10,300	10,600	19,200	52,700	74,600	51,400	21,900	13,400
19	11,000	16,100	18,600	11,600	10,300	9,340	19,700	54,700	75,500	50,200	21,500	13,000
20	10,600	19,400	18,200	11,300	10,300	9,340	19,200	56,000	76,500	48,300	21,000	13,000
21	10,300	21,200	17,700	11,300	10,300	11,300	19,700	56,700	77,400	47,100	20,100	13,000
22	10,300	21,600	16,900	11,300	10,300	11,700	20,600	57,400	76,500	45,300	20,100	12,600
23	10,000	21,600	16,900	11,300	9,980	11,300	21,900	58,000	75,500	44,100	19,700	12,600
24	9,710	21,600	16,500	11,300	9,980	11,000	21,900	58,700	75,500	41,100	19,200	12,600
25	9,410	22,000	16,500	11,300	9,980	13,100	22,400	58,700	76,500	41,700	18,300	12,300
26	9,110	22,000	16,500	11,300	9,660	13,100	25,200	58,700	76,500	40,500	17,900	12,300
27	9,110	22,400	16,500	11,000	9,340	13,900	25,200	58,000	76,500	37,000	17,500	12,300
28	9,110	22,400	16,100	11,000	9,340	14,300	25,700	54,700	75,500	37,600	17,000	12,300
29	9,110	22,000	15,700	11,000	-------	14,700	27,600	50,800	74,600	35,900	16,600	12,300
30	9,110	21,600	15,700	11,300	-------	15,400	29,000	57,400	74,600	35,400	16,600	12,300
31	9,110	-------	15,700	11,300	-------	15,400	-------	60,100	-------	33,700	15,800	-------

Daily discharge, in second-feet, of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911–12.												
1	12,000	10,500	11,200		10,300	11,000	10,000	33,000	85,800	70,600	33,000	18,200
2	12,400	10,200	11,600		10,300	11,000	10,600	33,500	87,400	70,100	32,600	18,200
3	12,000	10,200	11,600		10,300	10,600	11,000	34,000	87,400	69,000	32,200	18,200
4	11,700	10,000	11,600		10,300	10,300	11,300	34,800	86,800	67,400	31,200	17,700
5	11,000	9,860	11,300		10,300	10,000	12,000	35,300	86,800	65,800	30,800	17,700
6	9,980	9,860	11,300		10,000	10,000	13,400	35,800	87,400	64,200	29,900	17,700
7	10,300	9,560	11,000		10,000	10,000	14,100	36,200	87,900	62,500	29,000	17,300
8	9,980	9,560	11,000		10,000	10,000	14,900	36,600	87,900	60,400	28,100	17,300
9	10,300	9,560	10,600		10,000	9,710	15,300	37,600	87,900	58,200	27,700	17,300
10	9,980	8,760	10,600		10,000	9,410	16,100	38,900	87,900	51,600	27,200	17,300
11	9,660	8,890	10,600		10,000	9,110	16,900	39,800	87,900	52,500	26,800	16,900
12	9,660	9,280	10,300		10,000	8,820	18,600	41,200	87,900	54,000	26,400	16,900
13	9,660	8,780	10,300		10,000	8,820	19,000	43,000	88,500	52,000	25,500	16,900
14	9,660	8,780	10,300		10,000	8,820	19,900	44,800	89,000	50,600	24,600	16,500
15	9,340	8,930	10,300		10,000	8,540	21,600	46,600	89,000	49,700	24,200	16,500
16	9,340	8,930	10,300		10,300	8,540	22,400	48,800	89,000	48,400	23,700	16,500
17	9,660	8,930	10,300		10,600	8,280	22,900	51,100	89,000	47,000	23,300	16,100
18	9,660	9,260	10,000		10,600	8,280	24,200	52,000	88,500	45,600	22,900	16,100
19	9,660	9,130	10,000		10,600	8,280	25,500	53,000	87,400	44,300	22,400	16,100
20	9,340	10,100	9,710		11,000	8,280	26,400	57,700	85,200	43,400	22,400	16,100
21	9,660	10,100	9,710		11,000	8,280	27,200	60,900	82,500	42,000	22,400	16,100
22	9,340	10,200	9,410		11,000	8,280	27,700	62,500	80,400	41,200	22,000	15,700
23	9,340	10,200	9,410		11,300	8,280	28,600	67,400	79,300	40,700	21,600	15,700
24	9,660	10,200	9,410		11,300	8,280	29,000	71,700	78,200	39,800	21,200	15,300
25	9,660	10,200	9,410		11,300	8,280	29,400	74,400	77,100	38,900	20,700	15,300
26	9,340	10,400	9,410		11,000	8,280	29,900	76,000	76,000	38,900	20,300	15,300
27	9,340	10,400	9,110		11,000	8,540	30,800	78,200	75,000	38,900	19,900	15,300
28	9,340	10,400	8,820		11,000	8,540	31,200	79,800	74,400	38,900	19,400	15,300
29	9,400	10,600	7,820		11,000	8,820	31,700	80,900	73,900	38,400	19,000	15,300
30	9,700	10,900	6,800			9,110	32,200	82,500	71,700	38,400	18,600	15,300
31	10,100		6,700			9,410		83,600		33,500	18,200	

Day.	Oct.	Nov.	Day.	Oct.	Nov.	Day.	Oct.	Nov.
1912.			1912.			1912.		
1	15,300	13,400	11	14,100	15,300	21	13,000	17,300
2	15,300	13,000	12	14,100	15,700	22	13,000	17,300
3	15,300	13,000	13	14,100	16,100	23	13,400	17,300
4	15,300	13,000	14	14,100	16,500	24	13,700	17,300
5	14,900	13,000	15	13,700	17,300	25	13,700	17,300
6	14,900	13,000	16	13,400	17,700	26	13,400	17,300
7	14,900	13,000	17	13,000	17,700	27	13,400	17,300
8	14,500	13,400	18	12,600	17,700	28	13,400	17,300
9	14,500	14,100	19	12,600	17,300	29	13,400	17,300
10	14,100	14,900	20	12,600	17,300	30	13,400	17,300
						31	13,400	

NOTE.—Discharge interpolated on account of lack of gage readings, Mar. 13–15, 1906, and Mar. 2–8, 1907. Otherwise daily discharge was ascertained as explained under "Accuracy" in the station description.

Monthly discharge of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1921.

[Drainage area, 24,200 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1903.						
July	102,000	44,800	71,400	2.95	3.40	4,390,000
August	44,200	19,000	28,600	1.18	1.36	1,760,000
September	18,500	14,100	15,500	.640	.71	922,000
The period						7,070,000
1903–4.						
October	16,200	14,100	15,200	.628	.72	935,000
November	17,100	14,900	15,700	.649	.72	934,000
December	16,600	14,900	16,100	.665	.77	990,000
January	14,500	11,700	13,000	.537	.62	799,000
February	11,700	10,300	10,900	.450	.49	627,000
March	14,900	10,700	13,300	.550	.63	818,000
April	58,400	13,300	31,300	1.29	1.44	1,860,000
May	87,500	60,400	73,200	3.02	3.48	4,500,000
June	88,200	69,700	82,000	3.39	3.78	4,880,000
July	68,300	32,000	50,000	2.07	2.39	3,070,000
August	31,400	14,100	21,100	.872	1.01	1,300,000
September	14,100	9,700	11,800	.488	.54	702,000
The year	88,200	9,700	29,500	1.22	16.59	21,400,000
1904–5.						
October	9,700	8,510	9,030	.373	.43	555,000
November	9,100	7,940	8,420	.348	.39	501,000
December	8,510	7,940	8,140	.336	.39	501,000
January	8,510	4,260	7,640	.316	.36	470,000
February	8,510	4,690	7,170	.296	.31	398,000
March	11,700	8,220	9,980	.412	.48	614,000
April	16,600	11,400	12,600	.521	.58	750,000
May	29,700	16,100	21,700	.897	1.03	1,330,000
June	50,800	30,200	44,500	1.84	2.05	2,650,000
July	42,800	19,400	30,300	1.25	1.44	1,860,000
August	19,400	10,300	13,900	.574	.66	855,000
September	10,300	8,160	9,030	.373	.42	537,000
The year	50,800	4,260	15,200	.628	8.54	11,000,000
1905–6.						
October	10,100	8,390	9,500	0.393	0.45	584,000
November	9,820	9,340	9,640	.398	.44	574,000
December	9,340	7,940	8,710	.360	.42	536,000
January	8,160	7,500	7,700	.318	.37	473,000
February	10,100	7,720	8,420	.348	.36	468,000
March	10,600	6,870	9,430	.390	.45	580,000
April	28,200	10,600	17,500	.723	.81	1,040,000
May	41,200	28,700	36,700	1.52	1.75	2,260,000
June	43,800	36,900	42,200	1.74	1.94	2,510,000
July	36,900	19,000	28,700	1.19	1.37	1,760,000
August	18,600	11,800	13,900	.574	.66	855,000
September	11,800	9,100	10,300	.426	.48	613,000
The year	43,800	6,870	16,900	.698	9.50	12,300,000
1906–7.						
October	9,100	8,620	8,810	.364	.42	542,000
November	22,100	8,620	15,400	.636	.71	916,000
December			18,900	.781	.90	1,160,000
January			16,300	.674	.78	1,000,000
February			14,500	.599	.62	805,000
March	19,000	15,100	17,000	.702	.81	1,050,000
April	39,000	18,600	28,400	1.17	1.30	1,690,000
May	83,200	38,000	57,300	2.37	2.73	3,520,000
June	95,200	83,200	90,200	3.73	4.16	5,370,000
July	90,100	48,100	73,700	3.05	3.52	4,530,000
August	54,700	31,600	45,200	1.87	2.16	2,780,000
September	30,200	15,400	22,000	.909	1.01	1,310,000
The year	95,200	8,620	34,100	1.41	19.12	24,700,000

Monthly discharge of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1921—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1907–8.						
October			14,200	0.587	0.68	873,000
November			12,800	.529	.59	762,000
December			13,200	.545	.63	812,000
January			10,800	.446	.51	664,000
February			9,600	.397	.43	552,000
March	13,900	9,340	11,500	.475	.55	707,000
April	44,300	13,900	22,200	.917	1.02	1,320,000
May	68,700	44,900	59,400	2.45	2.82	3,650,000
June	124,000	69,200	103,000	4.26	4.75	6,130,000
July	94,500	41,200	60,600	2.50	2.88	3,730,000
August	40,200	16,500	25,800	1.07	1.23	1,590,000
September	16,500	10,600	13,300	.550	.61	791,000
The year	124,000		29,700	1.23	16.70	21,600,000
1908–9.						
October	13,000	9,710	11,300	.467	.54	695,000
November	13,000	11,600	12,400	.512	.57	738,000
December	11,000	8,700	9,770	.404	.47	601,000
January	15,400	5,760	9,580	.396	.46	589,000
February	15,400	9,980	12,000	.496	.52	666,000
March	13,700	11,300	12,000	.496	.57	738,000
April	22,000	13,700	17,300	.715	.80	1,030,000
May	53,400	21,000	32,300	1.33	1.53	1,990,000
June	104,000	57,400	91,100	3.76	4.20	5,420,000
July	97,100	42,300	67,000	2.77	3.19	4,120,000
August	41,100	18,300	28,500	1.18	1.36	1,750,000
September	17,900	12,000	14,200	.587	.65	845,000
The year	104,000	5,760	26,500	1.10	14.86	19,200,000
1909–10.						
October	12,000	10,300	11,200	.463	.53	689,000
November	24,700	10,600	15,000	.620	.69	893,000
December	26,600	17,900	22,800	.942	1.09	1,400,000
January	20,600	13,500	17,500	.723	.83	1,080,000
February	13,500	8,400	10,400	.430	.45	578,000
March	41,100	12,400	27,400	1.13	1.30	1,680,000
April	66,500	38,800	47,000	1.94	2.16	2,800,000
May	75,500	68,700	72,600	3.00	3.46	4,460,000
June	71,000	45,900	59,800	2.47	2.76	3,560,000
July	44,700	20,600	31,500	1.30	1.50	1,940,000
August	22,000	11,300	15,900	.657	.76	978,000
September	11,000	10,000	10,400	.430	.48	619,000
The year	75,500	8,400	28,600	1.18	16.01	20,700,000
1910–11.						
October	12,000	9,110	10,600	.438	.50	652,000
November	22,400	9,110	15,300	.632	.71	910,000
December	21,200	15,700	18,900	.781	.90	1,160,000
January	15,300	11,000	12,200	.504	.58	750,000
February	11,700	9,340	10,400	.430	.45	578,000
March	15,400	8,400	10,700	.442	.51	658,000
April	29,000	16,200	20,200	.835	.93	1,200,000
May	60,100	30,600	49,300	2.04	2.35	3,030,000
June	77,400	54,700	68,900	2.85	3.18	4,100,000
July	73,700	33,700	54,000	2.23	2.57	3,320,000
August	32,600	15,800	23,700	.979	1.13	1,460,000
September	16,100	12,300	14,000	.579	.65	833,000
The year	77,400	8,400	25,800	1.07	14.46	18,700,000
1911–12.						
October	12,400	9,340	10,000	.413	.48	615,000
November	10,900	8,760	9,760	.403	.45	581,000
December	12,000	6,700	10,000	.413	.48	615,000
January			8,200	.339	.39	504,000
February	11,300	10,000	10,500	.434	.47	604,000
March	11,000	8,280	9,090	.376	.43	559,000
April	32,200	10,000	21,500	.888	.99	1,280,000
May	83,600	33,000	53,300	2.20	2.54	3,280,000
June	89,000	71,700	84,100	3.48	3.88	5,000,000
July	70,600	33,500	50,200	2.07	2.39	3,090,000
August	33,000	18,200	24,700	1.02	1.18	1,520,000
September	18,200	15,300	16,500	.682	.76	982,000
The year	89,000		25,700	1.06	14.44	18,600,000

Monthly discharge of Clark Fork at Newport, Wash., for the years ending Sept. 30, 1903–1921—Continued.

Month.	Discharge in second-feet.				Run off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches	Acre-feet.
1912–13.						
October	15,300	12,600	13,900	0.574	0.66	855,000
November	17,700	13,000	15,800	.653	.73	940,000
December	17,500	----------	15,500	.640	.74	953,000
January	----------	----------	10,700	.442	.51	658,000
February	13,600	7,430	10,800	.446	.46	600,000
March	13,600	11,400	12,500	.517	.60	769,000
April	45,500	13,200	25,900	1.07	1.19	1,540,000
May	87,000	45,700	58,300	2.41	2.78	3,580,000
June	136,000	91,700	122,000	5.04	5.62	7,260,000
July	108,000	42,400	70,900	2.93	3.38	4,360,000
August	41,600	20,900	29,000	1.20	1.38	1,780,000
September	20,700	12,800	15,900	.657	.73	946,000
The year	136,000	----------	33,500	1.38	18.78	24,200,000
1913–14.						
October	12,600	11,400	11,800	.488	.56	726,000
November	14,300	11,600	13,000	.537	.60	774,000
December	14,300	9,390	11,800	.488	.56	726,000
January	12,500	9,920	11,800	.488	.56	726,000
February	11,600	7,600	10,200	.421	.44	566,000
March	18,200	11,600	14,700	.607	.70	904,000
April	38,800	18,400	27,000	1.12	1.25	1,610,000
May	67,400	39,200	52,900	2.19	2.52	3,250,000
June	67,300	53,000	62,100	2.57	2.87	3,700,000
July	52,600	26,700	39,200	1.62	1.87	2,410,000
August	26,200	12,500	18,000	.744	.86	1,110,000
September	12,500	10,000	10,700	.442	.49	637,000
The year	67,400	7,600	23,700	.979	13.28	17,100,000
1914–15.						
October	18,000	10,400	12,200	.504	.58	750,000
November	21,400	14,900	19,200	.793	.88	1,140,000
December	20,900	12,200	16,000	.661	.76	984,000
January	13,400	8,570	11,000	.455	.52	676,000
February	9,950	9,080	9,410	.389	.41	523,000
March	13,100	9,220	10,600	.438	.50	652,000
April	29,900	13,400	19,800	.818	.91	1,180,000
May	42,500	30,000	35,900	1.48	1.71	2,210,000
June	42,500	40,300	41,900	1.73	1.93	2,490,000
July	40,000	29,900	35,300	1.46	1.68	2,170,000
August	29,500	16,400	22,900	.946	1.09	1,410,000
September	15,900	11,900	13,100	.541	.60	780,000
The year	42,500	8,570	20,700	.855	11.57	15,000,000
1915–16.						
October	11,800	11,200	11,500	0.475	0.55	707,000
November	12,200	10,900	11,500	.475	.53	684,000
December	12,200	10,500	11,700	.483	.56	719,000
January	9,730	6,760	8,290	.343	.40	510,000
February	14,000	7,180	10,800	.446	.48	621,000
March	36,500	13,600	22,100	.913	1.05	1,360,000
April	47,600	36,500	41,400	1.71	1.91	2,460,000
May	70,500	50,100	64,800	2.68	3.09	3,980,000
June	119,000	65,500	86,000	3.55	3.96	5,120,000
July	131,000	71,600	113,000	4.67	5.38	6,950,000
August	70,300	29,000	45,000	1.86	2.14	2,770,000
September	28,100	19,800	23,200	9.59	1.07	1,380,000
The year	131,000	6,760	37,500	1.55	21.12	27,300,000
1916–17.						
October	19,800	13,600	16,500	.682	.79	1,010,000
November	13,600	11,500	12,900	.533	.59	768,000
December	12,300	5,730	10,500	.434	.50	646,000
January	10,400	8,030	9,260	.383	.44	569,000
February	9,940	8,010	9,390	.388	.40	521,000
March	9,420	8,010	8,630	.357	.41	531,000
April	27,700	9,570	17,800	.736	.82	1,060,000
May	101,000	28,200	54,300	2.24	2.58	3,340,000
June	119,000	104,000	112,000	4.63	5.17	6,660,000
July	115,000	49,200	83,700	3.46	3.99	5,150,000
August	47,200	18,400	29,700	1.23	1.42	1,830,000
September	18,000	11,600	14,200	.587	.65	845,000
The year	119,000	5,730	31,700	1.31	17.76	22,900,000

Monthly discharge of Clark Fork at Newport, Wash., for the years ending Sept 30, 1903–1921—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet
1917–18.						
October	11,400	9,310	10,400	0.430	0.50	640,000
November	9,630	8,690	9,140	.378	.42	544,000
December	21,100	8,700	11,300	.467	.54	695,000
January	38,100	24,300	31,000	1.28	1.48	1,910,000
February	22,900	15,200	18,900	.781	.81	1,050,000
March	20,600	14,600	16,000	.661	.76	984,000
April	40,700	21,000	29,800	1.23	1.37	1,770,000
May	74,800	41,400	63,900	2.64	3.04	3,930,000
June	98,200	59,500	79,200	3.27	3.65	4,710,000
July	87,600	29,500	52,500	2.17	2.50	3,230,000
August	28,500	16,500	20,800	.860	.99	1,280,000
September	16,500	10,800	12,900	.533	.59	768,000
The year	98,200	8,690	29,700	1.23	16.65	21,500,000
1918–19.						
October	10,600	9,560	10,100	.417	.48	621,000
November	10,900	9,210	10,200	.421	.47	607,000
December	10,200	8,700	9,550	.395	.46	587,000
January	15,700	7,220	10,000	.413	.48	615,000
February	15,000	11,400	12,900	.533	.56	716,000
March	14,300	10,400	11,600	.479	.55	713,000
April	34,000	14,700	23,000	.950	1.06	1,370,000
May	68,900	36,500	48,800	2.02	2.33	3,000,000
June	76,900	49,300	65,800	2.72	3.04	3,920,000
July	47,900	18,600	31,100	1.29	1.49	1,910,000
August	18,100	9,490	13,300	.550	.63	818,000
September	9,480	6,870	7,990	.330	.37	475,000
The year	76,900	6,870	21,200	.876	11.92	15,400,000
1919–20.						
October	6,830	6,150	6,470	.267	.31	398,000
November	7,210	6,450	6,730	.278	.31	400,000
December	7,110	2,200	5,160	.213	.25	317,000
January	8,400	4,780	6,460	.267	.31	397,000
February	8,940	7,490	8,330	.344	.37	479,000
March	9,600	6,780	8,010	.331	.38	493,000
April	17,700	8,800	12,400	.512	.57	738,000
May	64,200	18,400	40,800	1.69	1.95	2,510,000
June	81,800	60,800	69,200	2.86	3.19	4,120,000
July	75,300	34,800	54,600	2.26	2.61	3,360,000
August	33,500	14,200	21,600	.893	1.03	1,330,000
September			13,000	.537	.60	774,000
The year	81,800	2,200	21,100	.872	11.88	15,300,000
1920–21.						
October	14,900	12,300	13,900	.574	.66	855,000
November	14,800	12,300	13,400	.554	.62	797,000
December	15,000	11,700	13,300	.550	.63	818,000
January	15,300	12,100	13,900	.574	.66	855,000
February	18,100	11,400	14,300	.591	.62	794,000
March	24,900	16,600	19,900	.822	.95	1,220,000
April	38,100	23,400	28,000	1.16	1.29	1,670,000
May	101,000	38,400	62,300	2.57	2.96	3,830,000
June	109,000	85,300	101,000	4.17	4.65	6,010,000
July	80,300	30,000	52,000	2.15	2.48	3,200,000
August	28,800	13,700	19,800	.818	.94	1,220,000
September	13,300	9,060	10,900	.450	.50	649,000
The year	109,000	9,060	30,300	1.25	16.96	21,900,000

NOTE.—See under "Accuracy" in the station description.

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, 1921.

GAGE.—Vertical and inclined staff, in five sections, graduated from 0 to 55 feet, on right bank, three-eighths of a mile above the falls; installed December 10, 1916; read by C. N. West. For history of previous gages see Water-Supply Paper 462.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths of a mile above the falls. Flow of Sullivan Creek added to flow measured at cable.

CHANNEL AND CONTROL.—Banks high and not subject to overflow. Sensitive and practically permanent control formed by Metaline Falls 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, 34.0 feet June 14 (discharge, 111,000 second-feet); minimum stage recorded, 3.43 feet September 28 and 29 (discharge, 9,290 second-feet).

1912–1921: 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. Gage read to half-tenths once daily. 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, Department of the Interior, Canada. Gage-height record furnished by Hugh L. Cooper Co.

Discharge measurements of Clark Fork at Metaline Falls, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 3	D. J. F. Calkins	5.32	12,600	Sept. 21	R. B. Kilgore	3.99	10,400
July 6	John McCombs	25.42	70,300	22	do.	3.95	10,800

Daily discharge, in second-feet, of Clark Fork at Metaline Falls, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	13,200	14,400	15,200	12,400	12,800	18,000	25,100	39,200	103,000	81,700	29,200	13,600
2	13,000	14,200	15,400	12,800	12,800	17,600	24,900	39,800	104,000	78,900	28,300	13,200
3	12,600	14,000	15,200	13,200	12,400	17,200	24,400	40,000	105,000	77,100	27,200	12,800
4	13,000	14,000	14,800	13,600	12,400	17,000	23,900	40,900	106,000	75,800	25,800	12,800
5	13,200	13,800	14,800	14,000	12,000	17,000	23,900	40,300	106,000	73,500	24,900	12,600
6	13,400	13,800	14,400	14,400	12,000	17,200	23,900	40,300	107,000	71,300	24,600	12,400
7	13,600	13,600	14,400	14,800	11,700	17,200	23,900	40,900	108,000	69,100	24,200	12,200
8	13,200	14,000	14,400	15,200	11,700	17,400	23,900	42,400	109,000	66,900	23,500	12,000
9	13,600	14,000	14,400	15,600	11,700	17,600	23,900	43,900	109,000	64,300	23,200	12,000
10	13,600	14,000	14,400	15,600	11,700	17,800	24,400	45,200	109,000	62,600	23,000	12,000
11	14,000	14,000	14,400	15,400	12,000	18,000	24,900	50,900	110,000	60,600	22,200	11,900
12	14,000	14,000	14,000	15,400	12,200	18,000	25,300	54,000	109,000	58,500	21,500	11,900
13	14,400	14,200	14,000	15,000	12,400	18,400	25,600	52,400	110,000	56,400	20,800	11,700
14	14,200	13,600	14,000	14,800	12,800	18,800	25,800	54,000	111,000	54,800	20,200	11,700
15	14,200	13,000	14,000	14,400	13,800	19,000	25,800	56,900	110,000	52,400	20,000	11,500
16	14,400	12,800	13,800	14,400	14,800	19,200	25,800	59,700	110,000	50,200	19,600	11,300
17	14,800	12,800	13,600	14,400	16,000	19,200	26,700	63,900	110,000	48,000	19,000	10,800
18	14,800	12,800	13,600	14,400	16,400	19,600	27,400	66,000	109,000	47,000	18,400	10,600
19	15,000	13,200	13,400	14,600	16,800	19,800	28,500	68,600	106,000	45,200	18,000	10,200
20	15,000	13,200	13,200	14,800	17,600	20,600	29,500	71,300	105,000	43,600	17,800	10,100
21	15,200	13,200	13,200	14,800	17,600	21,300	30,200	73,500	103,000	41,800	17,600	10,200
22	15,200	13,400	13,200	14,000	17,600	22,200	31,400	77,100	102,000	40,300	17,000	10,100
23	14,800	13,600	13,000	13,800	17,800	23,000	32,900	80,300	99,400	39,200	16,800	10,100
24	14,800	13,600	12,800	13,600	18,000	23,700	34,400	84,000	97,500	37,800	16,400	10,100
25	14,600	14,000	12,600	13,600	18,200	24,400	35,700	87,200	94,700	37,000	16,200	10,100
26	14,600	14,200	12,400	13,600	18,200	24,600	36,500	89,600	91,400	35,700	16,000	9,930
27	14,600	14,800	12,200	14,000	18,400	24,900	37,300	92,800	88,600	34,900	16,000	9,610
28	14,600	14,800	12,000	14,400	18,200	24,900	38,100	95,200	87,200	33,900	15,200	9,290
29	14,400	15,000	12,000	13,600	-------	25,100	38,900	98,500	85,400	32,600	14,800	9,290
30	14,400	15,200	12,000	13,200	-------	25,300	38,400	100,000	84,400	31,600	14,600	9,450
31	14,400	-------	12,000	12,800	-------	25,300	-------	103,000	-------	30,400	14,000	-------

Monthly discharge of Clark Fork at Metaline Falls, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 25,100 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	15,200	12,600	14,200	0.566	0.65	873,000
November	15,200	12,800	13,800	.550	.61	821,000
December	15,400	12,000	13,600	.542	.62	836,000
January	15,600	12,400	14,200	.566	.65	873,000
February	18,400	11,700	14,600	.582	.61	811,000
March	25,300	17,000	20,300	.809	.93	1,250,000
April	38,900	23,900	28,700	1.14	1.27	1,710,000
May	103,000	39,200	64,300	2.56	2.95	3,960,000
June	111,000	84,400	103,000	4.10	4.57	6,130,000
July	81,700	30,400	52,700	2.10	2.42	3,240,000
August	29,200	14,000	20,200	.805	.93	1,240,000
September	13,600	9,290	11,200	.446	.50	666,000
The year	111,000	9,290	30,900	1.23	16.71	22,400,000

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.—Not measured.

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

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, 5.50 feet June 9 (discharge, 6,290 second-feet); minimum stage, 1.15 feet September 9 and 10 (discharge, 487 second-feet).

ICE.—No information.

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during period of record. Rating curve well defined between 500 and 6,500 second-feet. Gage read to half-tenths once daily except on Sundays. Daily discharge ascertained by applying daily gage height to rating table except for days of missing gage heights for which it was interpolated. Records good.

Discharge measurements of Blackfoot River at Clearwater, Mont., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 9	G. H. Ellis	5.50	6,290	July 15	W. A. Lamb	2.06	1,200
July 9	W. A. Lamb	2.34	1,510	Sept. 7	....do	1.23	520

Daily discharge, in second-feet, of Blackfoot River at Clearwater, Mont., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	------	2,200	812	514	16	4,570	1,180	667	572
2	------	2,060	812	514	17	4,330	1,160	634	572
3	------	2,000	812	514	18	4,170	1,130	634	558
4	------	1,930	772	514	19	3,780	1,130	634	543
5	------	1,800	772	514	20	3,380	1,080	634	514
6	------	1,680	736	514	21	3,300	1,080	618	514
7	------	1,560	736	514	22	3,230	1,030	603	514
8	------	1,500	736	514	23	3,160	1,030	603	514
9	6,290	1,440	736	487	24	3,080	1,010	603	514
10	5,950	1,380	700	487	25	3,000	984	572	514
11	5,610	1,330	700	500	26	2,890	984	572	514
12	5,210	1,330	700	514	27	2,780	937	572	514
13	4,810	1,230	700	514	28	2,630	894	558	514
14	4,810	1,230	684	543	29	2,480	851	543	514
15	4,730	1,180	667	543	30	2,270	851	543	514
					31	------	832	543	------

Monthly discharge of Blackfoot River at Clearwater, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 9–30	6,290	2,270	3,930	171,000
July	2,200	832	1,290	79,300
August	812	543	665	40,900
September	572	487	520	30,900
The period	----------	----------	----------	322,000

NORTH FORK OF BLACKFOOT RIVER NEAR OVANDO, MONT.

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

DRAINAGE AREA.—Not measured.

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

GAGE.—Overhanging wire gage on left bank 400 feet north of observer's house; read 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 likely to shift. Left bank high and timbered. Right bank covered with heavy brush and timber; subject to overflow at gage height about 9 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 7.05 feet at 5 p. m. June 8 (discharge, 2,400 second-feet); minimum stage, 2.62 feet September 28–30 (discharge, 38 second-feet).

ICE.—No information.

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during period of record. Rating curve well defined between 40 and 2,600 second-feet. Gage read to hundredths twice daily except during period July 2–8, when no readings were obtained. Daily discharge ascertained by applying mean daily gage height to rating table except for period of no gage readings for which it was interpolated. Records excellent.

Discharge measurements of North Fork of Blackfoot River near Ovando, Mont. during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 8	G. H. Ellis	7.05	2,410
July 9	W. A. Lamb	4.20	339
Sept. 7	Lamb and Ellis	2.79	50

Daily discharge, in second-feet, of North Fork of Blackfoot River near Ovando, Mont., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		604	136	56	16	1,550	229	83	45
2		560	128	53	17	1,320	216	78	45
3		528	119	52	18	1,180	208	78	44
4		497	112	53	19	1,070	188	77	44
5		465	110	53	20	1,020	188	74	44
6		434	110	50	21	1,020	184	72	44
7		402	100	50	22	1,020	177	69	44
8	2,400	371	93	50	23	1,010	175	67	43
9	2,160	339	93	50	24	972	168	66	43
10	2,040	312	94	50	25	1,010	163	65	41
11	2,040	299	91	50	26	879	182	63	41
12	1,840	280	88	50	27	787	168	62	40
13	1,750	265	84	48	28	735	157	61	38
14	1,820	248	84	47	29	685	144	59	38
15	1,670	237	84	47	30	644	140	58	38
					31		140	57	

Monthly discharge of North Fork of Blackfoot River near Ovando, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 8–30	2,400	644	1,330	60,700
July	604	140	280	17,200
August	136	57	84.4	5,190
September	56	38	46.4	2,760
The period				85,800

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.—Not measured.

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

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

DISCHARGE MEASUREMENTS.—Made by wading at gage or from highway 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. Right bank high. Left bank may be overflowed for a distance of about 15 feet. Both banks brush covered.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 2.8 feet June 9 (discharge, 1,360 second-feet); minimum stage, 0.80 foot September 9 and 10 (discharge, 45 second-feet).

ICE.—No information.

DIVERSIONS.—Some water 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 during year. Rating curve well defined between 45 and 2,400 second-feet. Gage read to half-tenths once daily except on Sundays. Daily discharge ascertained by applying daily gage height to rating table except for days of missing gage heights for which it was interpolated. Records good.

Discharge measurements of Clearwater River at Clearwater, Mont., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 9	G. H. Ellis	2.80	1,360
July 9	W. A. Lamb	1.42	248
Sept. 7	Lamb and Ellis	.83	51

Daily discharge, in second-feet, of Clearwater River at Clearwater, Mont., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	------	375	105	55	16	818	195	78	59
2	------	345	105	55	17	695	185	78	55
3	------	332	105	55	18	615	175	78	55
4	------	318	105	55	19	615	175	78	55
5	------	290	105	55	20	615	155	78	55
6	------	265	105	55	21	540	155	72	55
7	------	265	105	55	22	470	155	65	55
8	------	240	105	55	23	470	155	65	55
9	1,310	240	105	45	24	470	146	65	55
10	1,130	229	90	45	25	438	138	65	56
11	1,040	218	90	50	26	422	138	65	55
12	1,020	218	90	55	27	405	138	65	55
13	995	195	90	55	28	405	120	60	55
14	995	195	84	55	29	375	120	55	55
15	905	195	78	55	30	375	120	55	55
					31	------	112	55	------

Monthly discharge of Clearwater River at Clearwater, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 9–30	1,310	375	687	30,000
July	375	112	203	12,500
August	105	55	82.1	5,050
September	55	45	54.2	3,230
The period	------	------	------	50,800

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, 1921.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 3.60 feet at 7.30 p. m. June 7, 1921 (discharge, 950 second-feet); minimum stage, 1.30 feet April 21–25, 1920, and March 1–4, 6, 8, and 9, 1921 (discharge, 27 second-feet).

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

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Stage-discharge relation permanent during period of record except as affected by ice. 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 except for periods of ice effect as noted in footnote to tables of daily discharge. Records good.

Discharge measurements of Skalkaho Creek near Hamilton, Mont., during the year ending Sept. 30, 1921.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 6	1.95	123
June 3	2.90	548
July 10	2.05	130

Daily discharge, in second-feet, of Skalkaho Creek near Hamilton, Mont., for the years ending Sept. 30, 1920 and 1921.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1920.							1920.						
1		32	166	437	78	47	16		120	509	166	54	45
2		30	152	387	78	45	17		138	474	158	54	42
3		31	158	387	74	45	18		147	492	152	47	42
4		31	195	341	69	45	19		147	453	147	47	37
5		31	243	319	64	45	20	30	147	453	130	47	37
6		34	243	279	64	39	21	27	147	463	125	47	37
7		37	311	250	60	37	22	27	152	520	120	47	37
8		48	363	243	60	37	23	27	166	492	112	47	37
9		57	373	226	60	37	24	27	166	453	112	45	42
10		105	373	210	69	37	25	27	166	363	112	42	42
11		105	401	210	69	37	26	28	166	341	105	45	42
12		100	411	210	69	37	27	30	166	341	96	54	42
13		96	453	204	64	50	28	30	195	341	89	57	42
14		105	492	186	57	78	29	32	195	363	89	57	42
15		105	474	174	54	50	30	31	195	387	78	57	42
							31		180		78	50	

Day.	Oct.	Nov.	Dec.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920-21.										
1	42	34	36	27	28	50	595	210	74	47
2	47	36	34	27	31	50	595	195	74	47
3	47	37	32	27	33	50	563	180	74	47
4	47	34	32	27	33	57	733	180	74	45
5	47	37	32	28	34	78	808	166	64	42
6	47	60	32	27	34	108	854	166	64	42
7	60	47	32	28	34	130	886	158	64	42
8	50		32	27	36	147	870	158	64	42
9	47			27	36	138	755	152	64	60
10	47			28	36	152	755	144	64	47
11	47			30	36	174	718	147	64	47
12	47			30	39	174	683	130	57	45
13	47	35		30	39	186	683	130	57	42
14	47			30	39	204	648	130	57	42
15	47			30	39	243	582	120	60	47
16	45			30	39	272	520	120	60	47
17	42			30	39	287	463	120	54	47
18	42	42		30	45	311	411	105	54	47
19	37	45		30	45	532	363	105	54	47
20	37	42		31	47	532	354	105	54	47
21	37	37		30	47	532	341	96	54	47
22	37	34		30	47	595	319	96	47	47
23	36	34		30	47	582	319	82	47	47
24	37	34		30	47	615	319	82	47	45
25	37	34		30	42	704	299	82	47	42
26	37	34		30	42	755	279	82	47	42
27	37	34		30	42	755	261	82	47	42
28	37	34		30	42	648	261	82	47	42
29	37	34		28	42	551	243	74	47	37
30	37	34		28	42	492	226	74	47	37
31	36			28		492		74	47	

NOTE.—Records in the above table for the period Apr. 20 to Sept. 30, 1920, supersede those published in Water-Supply Paper 512, p. 121. Stage-discharge relation affected by ice Nov. 8–17 and Dec. 6–8, 1920, and Mar. 14, 15, 1921; discharge estimated except for Mar. 14 and 15, 1921, for which it was interpolated. Gage not read Dec. 9, 1920, to Feb. 28, 1921; discharge not determined. Braced figure shows mean discharge for period included.

Monthly discharge of Skalkaho Creek near Hamilton, Mont., for the years ending Sept. 30, 1920 and 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
1920.				
April 20-30	32	27	28.7	626
May	195	30	114	7,010
June	520	152	375	22,300
July	437	78	191	11,700
August	78	42	57.6	3,540
September	78	37	42.5	2,530
The period				47,700
1920-21.				
October	60	36	42.7	2,630
November	60	34	36.9	2,200
December 1-8	36	32	32.8	520
March	31	27	29.0	1,780
April	47	28	39.4	2,340
May	755	50	342	21,000
June	886	226	524	31,200
July	210	74	123	7,560
August	74	47	57.3	3,520
September	60	37	44.9	2,670

NOTE.—Determinations of monthly discharge shown above for the period Apr. 20 to Sept. 30, 1920, supersede those published in Water-Supply Paper 512, p. 121.

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, 1921.

GAGE.—Vertical staff, with enamel face, 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 composed of boulders and cobblestones; shifting. One channel at all stages. Banks not subject to overflow. Control not well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.04 feet at 5 p. m. June 9 (discharge, 114 second-feet); minimum stage, 0.60 foot during periods in March and April (discharge, 5.7 second-feet).

1920–21: Maximum and minimum stages same as given above.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year; affected by ice November 10–15 and probably during period of no record December 1 to February 28. Rating curve well defined between 7 and 80 second-feet. Gage read to hundredths twice daily except during period December 1 to February 28 when observations were discontinued. Daily discharge ascertained by applying mean daily gage height to rating table except as noted in footnote to table of daily discharge. Records good.

Discharge measurements of Willow Creek near Corvallis, Mont., during the year ending Sept. 30, 1921.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 6	0.90	21.0
June 3	1.55	67
July 10	.95	21.9

Daily discharge, in second-feet, of Willow Creek near Corvallis, Mont., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	8.6	8.6	5.7	5.7	10	72	36	10	6.4
2	8.9	8.6	5.7	5.7	11	68	34	10	6.4
3	8.6	8.6	5.7	5.7	15	72	33	10	6.4
4	8.6	8.6	5.7	6.4	16	74	30	10	6.4
5	8.6	8.6	5.7	5.7	18	88	28	10	6.4
6	8.6	8.6	5.7	5.7	21	96	27	9.3	6.4
7	8.6	8.6	5.7	5.7	22	109	26	9.3	6.8
8	8.6	8.6	5.7	5.7	22	110	24	9.3	6.4
9	8.6	8.6	5.7	5.7	24	112	24	9.3	6.4
10	8.6	8.6	5.7	5.7	25	110	24	9.3	6.4
11	8.6	8.6	5.7	6.4	26	105	24	9.3	6.4
12	8.6	8.6	5.7	8.6	26	89	23	9.3	6.4
13	8.6	8.6	5.7	9.3	28	93	23	9.3	7.1
14	8.6	8.6	5.7	8.6	30	92	21	9.3	7.5
15	8.6	8.6	5.7	7.1	33	83	21	9.3	7.9
16	8.6	12	5.7	7.1	39	71	20	9.3	7.5
17	8.6	9.3	6.4	7.1	40	64	19	9.3	7.1
18	8.6	8.6	6.4	10	48	58	18	8.9	7.1
19	8.6	8.6	5.7	11	64	56	17	8.9	7.1
20	8.6	8.6	5.7	10	59	54	16	8.9	7.1
21	8.6	7.9	5.7	10	59	52	15	8.6	7.1
22	8.6	7.9	5.7	10	61	50	14	8.6	7.1
23	8.6	7.5	6.4	10	59	48	13	8.6	7.1
24	8.6	7.5	5.7	10	63	48	12	8.6	7.1
25	8.6	7.5	5.7	10	59	47	13	8.2	7.1
26	8.6	7.1	5.7	10	60	45	13	8.2	7.1
27	8.6	7.1	5.7	10	61	44	13	8.2	7.1
28	8.6	7.1	5.7	10	63	42	13	7.9	7.1
29	8.6	7.1	5.7	10	61	40	11	7.1	7.1
30	8.6	7.1	5.7	11	60	37	11	7.1	7.1
31	8.6	------	5.7	------	71	------	11	6.8	------

NOTE.—Stage-discharge relation affected by an ice jam Nov. 10-15; discharge estimated. Gage not read Oct. 9; discharge interpolated. Observations discontinued Dec. 1 to Feb. 28; discharge not determined.

Monthly discharge of Willow Creek near Corvallis, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	8.9	8.6	8.61	529
November	12.0	7.1	8.33	496
March	6.4	5.7	5.77	355
April	11	5.7	8.13	484
May	71	10	40.5	2,490
June	112	37	71.0	4,220
July	36	11	20.2	1,240
August	10	6.8	8.94	550
September	7.9	6.4	6.89	410

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, 1921 (fragmentary).

GAGE.—Staff gage, with enamel face graduated from 9 to 3.3 feet, on downstream end of left abutment of highway bridge; read by Mrs. John Buck and Oscar Smith.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading below gage.

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 year, 2.00 feet June 3 (discharge, 365 second-feet, by current-meter measurement); minimum stage, 0.66 foot August 6 (discharge, 30 second-feet).

1920–21: Maximum discharge recorded June 3, 1921; minimum stage, 0.58 foot August 16, 1920 (discharge, 25 second-feet).

ICE.—Station not operated during winter.

DIVERSIONS.—One or two small diversions above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent for range in stage occurring during periods of record. Rating curve well defined between 30 and 200 second-feet. Gage read to hundredths twice daily October 1 to November 30 and July 17 to August 6; observations discontinued during remainder of year. Daily discharge for periods of record ascertained by applying mean daily gage height to rating table; discharge not determined for remainder of year. Records good.

Discharge measurements of Burnt Fork Creek near Stevensville, Mont., during the year ending Sept. 30, 1921.

[Made by W. A. Lamb.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 6	1.51	159
June 3	2.00	365
July 10	.90	49.2

Daily discharge, in second-feet, of Burnt Fork Creek near Stevensville, Mont., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	July.	Aug.	Day.	Oct.	Nov.	July.	Aug.
1	40	47		35	16	44	48		
2	44	48		34	17	44	44	38	
3	44	49		32	18	43	40	38	
4	42	49		32	19	42	40	40	
5	42	49		31	20	40	40	40	
6	40	50		30	21	40	38	38	
7	57	49			22	42	35	35	
8	54	47			23	40	34	35	
9	46	47			24	40	34	37	
10	45	47			25	40	34	37	
11	45	47			26	40	32	45	
12	46	47			27	40	32	35	
13	47	47			28	40	32	35	
14	45	49			29	45	32	40	
15	45	49			30	47	32	38	
					31	47		35	

NOTE.—Gage not read July 30; discharge interpolated.

Monthly discharge of Burnt Fork Creek near Stevensville, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	57	40	43.7	2,690
November	50	32	42.3	2,520
July 17-31	45	35	37.7	1,120
August 1-6	35	30	32.3	384

FLATHEAD LAKE AT POLSON, MONT.

LOCATION.—In SE. ¼ sec. 4, T. 22 N., R. 20 W., at steamboat dock at south end of lake at Polson, Flathead County.

RECORDS AVAILABLE.—August 23, 1908, to September 30, 1921.

GAGE.—Vertical staff attached to a pile at end of pier; datum 2,803 feet above sea level. Prior to 1917 this datum was given as 2,800 feet.

EXTREMES OF STAGE.—Maximum stage recorded during year, 90.7 feet June 10–12; minimum stage, 79.5 feet February 9–13.

1908–1921: Maximum stage recorded, 92.7 feet July 1, 2, and 4, 1916; minimum stage, 78.5 feet February 16–22, 1913.

COOPERATION.—Records furnished by United States Bureau of Reclamation.

Daily gage height, in feet, of Flathead Lake at Polson, Mont., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	80.1	80.4	80.0	79.6	79.6	79.9	80.6	83.0	89.7	87.3	82.5	80.4
2	80.1	80.4	80.0	79.6	79.6	79.9	80.6	83.0	89.7	87.2	82.4	80.4
3	80.15	80.4	80.0	79.6	79.6	80.0	80.7	83.1	89.7	87.0	82.3	80.3
4	80.2	80.4	80.0	79.7	79.6	80.0	80.8	83.1	89.7	86.9	82.2	80.3
5	80.25	80.3	80.0	79.7	79.6	80.0	80.9	83.1	89.8	86.7	82.1	80.3
6	80.3	80.3	80.0	79.7	79.6	80.0	81.0	83.2	90.0	86.5	82.0	80.2
7	80.35	80.3	79.9	79.8	79.6	80.1	81.1	83.3	90.2	86.3	81.9	80.2
8	80.4	80.2	79.9	79.8	79.6	80.1	81.2	83.6	90.3	86.1	81.8	80.2
9	80.45	80.2	79.9	79.8	79.5	80.1	81.3	83.9	90.5	85.9	81.7	80.1
10	80.55	80.2	79.9	79.8	79.5	80.1	81.3	84.2	90.7	85.7	81.6	80.1
11	80.6	80.1	79.9	79.8	79.5	80.1	81.3	84.4	90.7	85.5	81.5	80.1
12	80.6	80.1	79.9	79.8	79.5	80.1	81.4	85.0	90.7	85.3	81.4	80.0
13	80.6	80.1	79.9	79.8	79.5	80.2	81.4	85.2	90.6	85.1	81.3	80.0
14	80.6	80.0	79.9	79.8	79.6	80.2	81.5	85.4	90.6	84.9	81.2	80.0
15	80.6	80.0	79.9	79.8	79.6	80.2	81.5	85.5	90.5	84.7	81.1	79.9
16	80.6	80.0	79.9	79.8	79.7	80.3	81.6	85.7	90.4	84.5	81.1	79.9
17	80.55	80.0	79.8	79.8	79.7	80.3	81.7	85.8	90.2	84.3	81.0	79.9
18	80.55	80.0	79.8	79.8	79.8	80.3	81.9	86.0	89.9	84.1	81.0	79.8
19	80.55	80.0	79.8	79.7	79.8	80.4	82.1	86.2	89.7	84.0	80.9	79.8
20	80.5	80.0	79.8	79.7	79.8	80.4	82.3	86.6	89.4	83.8	80.9	79.8
21	80.5	80.0	79.8	79.7	79.8	80.4	82.5	87.0	89.2	83.7	80.8	79.7
22	80.5	80.0	79.8	79.7	79.8	80.5	82.7	87.4	89.0	83.5	80.8	79.7
23	80.5	80.0	79.8	79.7	79.8	80.5	82.9	87.8	88.8	83.4	80.8	79.7
24	80.5	80.0	79.8	79.7	79.8	80.5	83.0	88.2	88.6	83.3	80.7	79.7
25	80.5	80.0	79.7	79.7	79.8	80.6	83.0	88.5	88.4	83.2	80.7	79.7
26	80.5	80.0	79.7	79.7	79.8	80.6	83.0	88.8	88.2	83.1	80.7	79.6
27	80.5	80.0	79.7	79.7	79.8	80.6	83.0	89.3	88.0	83.0	80.7	79.6
28	80.5	80.0	79.7	79.7	79.8	80.6	83.0	89.7	87.8	82.9	80.6	79.6
29	80.5	80.0	79.7	79.7	-------	80.6	83.0	89.9	87.6	82.8	80.6	79.6
30	80.5	80.0	79.7	79.6	-------	80.6	83.0	89.9	87.4	82.7	80.5	79.6
31	80.4	-------	79.7	79.6	-------	80.6	-------	89.8	-------	82.6	80.5	-------

FLATHEAD RIVER NEAR POLSON, MONT.

LOCATION.—In sec. 19, T. 22 N., R. 21 W., at new highway bridge at site of Mischell's ferry at Norrisvale, 5 miles below Newell tunnel, 15 miles northwest of Ronan, and 12 miles below Polson, Flathead County.

DRAINAGE AREA.—7,010 square miles.

RECORDS AVAILABLE.—July 23, 1907, to September 30, 1921.

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

DISCHARGE MEASUREMENTS.—Made from highway bridge to which gage is attached.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 14.3 feet June 11 (discharge, 62,000 second-feet); minimum stage, 2.1 feet February 11 and 12 (discharge, 3,010 second-feet).

1907–1921: Maximum stage recorded, 16.4 feet June 12, 1913 (discharge, 75,400 second-feet); minimum stage, −0.1 foot December 9–14, 1919, and March 14, 1920 (discharge, 1,360 second-feet).

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

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

REGULATION.—Natural regulation in Flathead Lake.

ACCURACY.—Stage-discharge relation changed slightly when gage was moved on March 10. Two rating curves well defined. Gage read to tenths once daily, occasionally to half-tenths. Daily discharge ascertained by applying daily gage height to rating table. Records good.

COOPERATION.—Gage-height record furnished by United States Bureau of Reclamation; determination of flow by United States Geological Survey.

The following discharge measurement was made by W. A. Lamb:
July 14: Gage height, 8.75 feet; discharge, 26,500 second-feet.

Daily discharge, in second-feet, of Flathead River near Polson, Mont., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,020	4,850	4,330	3,350	3,290	3,350	6,780	17,300	55,000	40,600	14,600	6,120
2	4,330	4,850	4,330	3,470	3,290	3,600	6,780	16,400	55,000	39,400	13,700	5,910
3	4,170	3,880	4,250	3,600	3,230	3,880	7,250	16,800	55,000	38,100	13,300	5,700
4	4,330	4,020	4,250	3,740	3,230	3,880	7,490	17,300	55,700	37,500	12,500	5,500
5	4,330	4,170	4,330	3,600	3,180	4,170	8,270	17,300	55,700	36,900	12,500	5,300
6	4,330	4,330	4,330	3,600	3,180	4,670	8,270	17,800	56,400	35,100	12,500	5,110
7	4,500	4,670	4,330	3,600	3,180	4,500	8,550	18,800	57,800	33,900	11,700	5,500
8	4,670	4,500	4,330	3,600	3,180	4,500	9,120	22,000	58,500	32,700	11,700	5,700
9	5,040	4,500	4,170	3,600	3,180	4,670	9,410	23,000	59,900	31,500	11,400	5,910
10	5,040	4,500	4,170	3,600	3,120	5,040	9,410	24,700	61,300	30,900	11,000	5,700
11	5,430	4,670	4,020	3,600	3,010	6,340	9,410	25,800	62,600	29,700	11,000	5,500
12	5,330	4,500	3,950	3,600	3,010	5,910	9,410	27,400	61,300	28,600	10,700	5,110
13	5,330	4,170	3,600	3,470	3,120	6,120	9,410	28,000	61,300	28,000	10,000	5,110
14	5,430	4,170	3,880	3,470	3,120	6,120	10,000	29,200	60,600	26,900	9,710	4,930
15	5,430	4,170	3,880	3,230	3,120	6,120	10,700	30,300	60,600	25,800	9,710	4,930
16	5,630	4,170	3,880	3,470	3,120	6,120	11,000	30,900	57,800	24,100	9,120	4,750
17	5,630	4,170	3,880	3,470	3,120	6,120	11,700	32,100	56,400	23,600	8,830	4,840
18	5,840	4,170	3,810	3,470	3,350	6,120	12,100	33,900	55,700	22,500	8,830	4,930
19	5,840	4,170	3,740	3,540	3,350	6,340	12,900	35,700	55,000	22,000	8,270	3,650
20	5,740	4,100	3,740	3,600	3,470	6,340	14,600	38,100	53,000	21,400	8,270	3,800
21	5,630	4,250	3,740	3,600	3,470	6,780	15,000	39,400	51,700	19,800	8,000	3,950
22	5,630	4,250	3,600	3,470	3,470	6,780	15,400	40,600	51,000	19,300	7,740	4,260
23	5,430	4,330	3,600	3,470	3,410	6,780	16,400	43,200	49,000	18,800	7,740	4,420
24	5,430	4,330	3,600	3,410	3,410	6,780	16,800	45,800	48,400	18,800	7,740	4,750
25	5,330	4,020	3,600	3,350	3,350	6,780	16,800	48,400	47,700	17,800	7,740	3,950
26	5,230	4,020	3,600	3,350	3,350	7,010	17,300	50,400	46,400	17,300	7,490	3,800
27	5,040	4,420	3,350	3,350	3,350	7,010	17,300	52,300	44,400	17,300	7,250	3,650
28	5,230	4,330	3,350	3,350	3,350	7,010	17,300	55,000	43,200	16,800	7,010	3,800
29	5,230	4,330	3,350	3,350	-------	7,010	17,300	55,700	42,500	15,900	6,780	3,950
30	5,140	4,330	3,350	3,350	-------	7,010	17,300	56,400	41,300	15,400	6,560	3,650
31	5,040	-------	3,350	3,290	-------	7,010	-------	55,000	-------	15,000	6,340	-------

NOTE.—Gage not read Sept. 17; discharge interpolated.

Monthly discharge of Flathead River near Polson, Mont., for the year ending Sept. 30, 1921.

[Drainage area, 7,010 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	5,840	4,020	5,120	0.730	0.84	315,000
November	4,850	3,880	4,310	.615	.69	256,000
December	4,330	3,350	3,860	.551	.64	237,000
January	3,740	3,230	3,480	.496	.57	214,000
February	3,470	3,010	3,250	.464	.48	180,000
March	7,010	3,350	5,800	.827	.95	357,000
April	17,300	6,780	12,000	1.71	1.91	714,000
May	56,400	16,400	33,700	4.81	5.54	2,070,000
June	62,000	41,300	54,000	7.70	8.59	3,210,000
July	40,600	15,000	25,900	3.69	4.25	1,590,000
August	14,600	6,340	9,670	1.38	1.59	595,000
September	6,120	3,650	4,810	.686	.77	286,000
The year	62,000	3,010	13,900	1.98	26.82	10,000,000

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, 1921.

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, 12.6 feet May 27 (discharge, 21,500 second-feet); minimum stage recorded, 1.4 feet February 8–12 and 17–23 (discharge, 260 second-feet).

1910–1921: Maximum stage recorded, 20.0 feet at 9 a. m. June 21, 1916 (discharge, determined by extension of rating curve, 49,000 second-feet); minimum stage recorded, 1.3 feet March 29–30, 1912 (discharge, 182 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined between 325 and 20,000 second-feet. Gage read to half-tenths once daily. 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, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,390	1,010	880	452	430	1,270	1,390	2,510	12,000	10,000	1,430	700
2	1,390	1,010	880	452	430	1,230	1,390	2,510	12,600	10,000	1,390	700
3	1,390	1,010	880	452	410	1,190	1,390	2,510	13,600	9,540	1,310	700
4	1,430	1,010	880	452	390	1,190	1,390	4,450	14,200	10,000	1,310	700
5	1,430	1,010	880	452	320	1,080	1,430	6,400	13,900	9,060	1,310	700
6	1,470	1,010	880	452	320	1,080	1,430	8,140	13,500	7,690	1,230	700
7	1,470	1,010	880	452	320	1,080	1,430	9,540	12,600	6,820	1,230	700
8	1,550	1,010	880	452	260	1,080	1,550	10,000	14,200	6,190	1,230	670
9	1,550	1,010	880	452	260	1,080	1,550	11,000	13,600	5,380	1,230	580
10	1,550	1,010	880	452	260	940	1,600	11,000	13,600	4,810	1,160	580
11	1,470	1,010	880	430	260	760	1,640	13,600	13,400	4,120	1,160	580
12	1,470	1,010	880	430	260	475	1,910	8,600	13,400	3,610	1,160	552
13	1,430	1,010	880	430	390	475	2,090	8,600	13,100	3,000	1,160	525
14	1,430	1,010	880	430	475	475	2,870	7,470	13,100	2,740	1,160	475
15	1,430	1,010	820	430	430	475	4,120	6,400	12,700	2,510	1,160	475
16	1,430	1,010	820	430	320	475	4,810	8,140	12,700	2,190	1,010	475
17	1,390	1,010	820	430	260	1,230	5,190	9,060	12,700	2,090	940	475
18	1,390	1,010	820	390	260	1,550	5,980	10,300	12,600	2,090	940	475
19	1,350	1,010	820	320	260	1,550	6,610	11,200	12,600	2,090	940	475
20	1,310	1,010	700	320	260	1,550	6,400	12,600	12,400	2,090	940	475
21	1,310	1,010	475	320	260	1,550	6,400	13,600	12,000	2,090	940	475
22	1,310	940	475	320	260	1,550	5,980	14,800	11,500	2,000	940	475
23	1,230	940	452	320	260	1,550	5,780	16,200	11,000	1,820	940	475
24	1,080	940	452	320	320	1,390	5,780	16,500	10,800	1,680	940	475
25	1,080	940	452	372	475	1,390	5,580	18,000	10,800	1,550	880	475
26	1,230	940	452	410	760	1,390	5,190	20,200	10,500	1,550	880	475
27	1,230	940	430	410	1,230	1,390	5,190	21,500	10,500	1,550	880	475
28	1,080	940	430	410	1,230	1,390	4,810	14,200	10,100	1,510	880	525
29	1,010	880	430	452	-------	1,390	2,870	9,540	10,000	1,470	880	580
30	1,010	880	430	452	-------	1,310	2,510	9,540	10,000	1,430	820	580
31	1,010	-------	452	452	-------	1,310	-------	10,500	-------	1,430	760	-------

Monthly discharge of Middle Fork of Flathead River at Belton, Mont., for the year ending Sept. 30, 1921.

[Drainage area, 900 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1,550	1,010	1,330	1.48	1.71	81,800
November	1,010	880	985	1.09	1.22	58,600
December	880	430	711	.790	.91	43,700
January	452	320	413	.459	.53	25,400
February	1,230	260	406	.451	.47	22,500
March	1,550	475	1,160	1.29	1.49	71,300
April	6,610	1,390	3,540	3.93	4.38	211,000
May	21,500	2,510	10,600	11.8	13.60	652,000
June	14,200	10,000	12,300	13.7	15.29	732,000
July	10,000	1,430	4,000	4.44	5.12	246,000
August	1,430	760	1,070	1.19	1.37	65,800
September	700	475	557	.619	.69	33,100
The year	21,500	260	3,100	3.44	46.78	2,240,000

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, 1921.

GAGE.—Stevens eight-day water-stage recorder on left bank, used since June 14, 1917; prior to that date temporary gage on left bank 200 feet below. Recorder inspected by employees of Mission Range Power Co.

DISCHARGE MEASUREMENTS.—Made from foot log just below gage or by wading.

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.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 1.88 feet at 11.30 a. m. June 7 (discharge, 23.3 second-feet); minimum discharge, 1.6 second-feet April 17.

1917–1921: Maximum stage recorded, 2.4 feet **June** 9, 1917 (discharge, from extension of rating curve, 104 second-feet); **min**imum 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, especially during low water.

ACCURACY.—Stage-discharge relation permanent except as affected by ice. Rating curve well defined between 2 and 30 second-feet. Mean daily gage heights for periods during which recorder was operating, determined by straight-line method from recorder graph. Daily discharge for periods during which recorder was operating, ascertained by applying mean daily gage height to rating table. Flow of Polson–A canal is added to flow passing gage for days when canal was operated. Discharge for part of year determined from kilowatt output at plant as shown in footnote to table of daily discharge. Records fair.

Discharge measurements of Big Creek near Polson, Mont., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 22	G. K. Lorbeski[a]	1.38	5.2	July 14	W. A. Lamb	1.33	3.8
June 15	do	1.30	3.2	Aug. 12	G. K. Lorbeski	1.35	4.3

[a] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of Big Creek near Polson, Mont., for the year ending Sept. 30, 1921.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.0	-------	2.1	13.4	5.8	2.4	4.9
2	3.6	-------	2.2	13.4	4.8	4.7	4.4
3	3.2	-------	2.2	14.9	5.2	4.8	4.0
4	4.0	-------	2.3	14.9	5.4	4.8	3.2
5	3.2	-------	2.2	14.1	5.4	4.4	4.0
6	3.2	-------	2.7	18.5	5.4	3.1	4.0
7	3.2	-------	4.2	17.2	5.4	3.3	4.2
8	3.6	-------	4.4	11.3	5.4	4.0	4.0
9	4.0	-------	4.4	8.2	5.4	3.0	4.2
10	2.8	-------	3.4	10.0	4.0	4.0	4.7
11	4.0	-------	3.0	8.5	5.9	4.7	3.6
12	4.0	-------	4.4	5.4	6.6	5.4	4.4
13	4.0	-------	3.0	3.5	5.9	5.4	4.4
14	4.0	-------	1.9	4.0	5.5	4.5	4.4
15	3.2	1.9	3.0	3.7	5.7	5.4	4.4
16	4.0	2.0	5.1	5.4	4.9	4.7	4.8
17	3.0	1.6	5.4	10.6	4.0	5.2	4.4
18	6.2	2.0	5.4	10.7	4.6	5.2	3.2
19	5.4	1.9	5.4	7.2	4.2	5.2	4.0
20	5.4	2.0	5.4	9.1	4.2	5.2	4.4
21	5.4	2.3	5.6	8.9	4.5	4.0	4.4
22	5.4	2.4	6.4	8.9	4.8	5.2	4.6
23	4.8	2.7	7.2	8.9	4.6	4.8	4.8
24	2.6	2.2	7.9	7.5	4.0	5.5	4.8
25	3.2	2.3	8.7	8.4	3.8	4.9	3.6
26	3.2	2.4	9.5	6.4	4.0	5.2	4.8
27	3.2	2.3	10.3	5.5	3.9	5.3	4.8
28	3.2	2.2	11.1	6.6	3.8	4.1	4.8
29	3.6	2.2	11.8	5.4	4.7	5.2	4.8
30	3.6	2.3	12.6	5.4	4.2	4.9	4.8
31	1.8	-------	13.4	-------	2.0	5.2	-------

NOTE.—Water-stage recorder operated Oct. 1–31, Apr. 3 to May 21, and May 31 to Sept. 30. Polson–A canal was operated Oct. 1–30, Apr. 15 to May 21, and May 31 to Sept. 30; flow of canal during these periods added to flow passing gage. Mean discharge for part of year determined from kilowatt output at power plant, as follows: November, 5.44 second-feet; December, 5.69 second-feet; January, 5.16 second-feet; February, 4.60 second-feet; March, 4.73 second-feet; and Apr. 1–14, 3.8 second-feet. No gage-height record May 22–30; discharge interpolated.

Monthly discharge of Big Creek near Polson, Mont., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	6.2	1.8	3.81	234
November	-------	-------	5.44	324
December	-------	-------	5.69	350
January	-------	-------	5.16	317
February	-------	-------	4.60	255
March	-------	-------	4.73	291
April	-------	1.6	2.93	174
May	13.4	1.9	5.70	350
June	18.5	3.5	9.20	547
July	6.6	2.0	4.77	293
August	5.5	2.4	4.64	285
September	4.9	3.2	4.33	258
The year	18.5	1.6	5.08	3,680

NOTE.—See footnote to table of daily discharge.

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 Pries Lake, 2 miles northwest of Coolin, Bonner County.

DRAINAGE AREA.—572 square miles.

RECORDS AVAILABLE.—June 18, 1911, to September 30, 1921; fragmentary.

GAGE.—Stevens water-stage recorder on right bank 600 feet below outlet; installed November 24, 1914; inspected by J. K. Ward, T. F. King, 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, made from a cable about 300 feet above or by wading.

CHANNEL AND CONTROL.—Bed rough. Banks high. Control fairly permanent. Many large boulders and angular rocks at control catch logs which cause backwater.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 6.3 feet May 27 (discharge, 6,440 second-feet); minimum stage, from recorder, 0.49 foot at 3 p. m. September 18 (discharge, 251 second-feet).

1911–1921: Maximum stage 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); lower discharge may have occurred during some period of no record or period of backwater from logs on control.

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 except as affected by logs March 18 to April 19. Rating curve 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 from recorder graph by inspection except as noted in footnote to table of daily discharge. Records excellent except those estimated.

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, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
July 2	John McCombs	3.63	2,610
Sept. 19	R. B. Kilgore	.56	283

Daily discharge, in second-feet, of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	686	703	950	814	726	910		2,820	5,650	2,760	788	399
2	686	714	950	827	720	910		2,760	5,650	2,700	751	395
3	697	703	950	840	714	910		2,760	5,800	2,580	720	378
4	726	691	990	834	708	910		2,700	5,800	2,460	703	366
5	751	686	990	875	691	910	1,770	2,700	5,800	2,290	680	358
6	763	686	950	875	668	875		2,700	5,800	2,180	663	350
7	763	664	950		674	910		2,760	5,800	2,080	641	346
8	763	642	910		668	875		2,960	5,960	1,980	636	346
9	757	620	910		674	875		3,080	5,800	1,880	620	338
10	763	615	950	840	680	910		3,280	5,650	1,780	604	330
11	757	609	950		680	910		3,540	5,500	1,680	594	319
12	775	573	950		691	814	2,100	3,670	5,500	1,590	589	300
13	801	563	950		732	814		3,800	5,350	1,500	589	288
14	820	558	910		808	814		3,930	5,050	1,410	578	285
15	820	558	910		840	820		4,060	4,900	1,320	563	281
16	820	573	910		875	808		4,340	4,760	1,230	568	277
17	820	594	875	820	875	875		4,480	4,620	1,190	563	266
18	827	630	875		910			4,620	4,340	1,150	558	259
19	820	714	875		910			4,900	4,200	1,110	553	270
20	814	775	840		910			5,200	4,130	1,070	548	281
21	794	820	834	801	910	1,040	3,090	5,350	4,060	1,030	514	288
22	794	840		788	950			5,650	3,930	1,030	504	288
23	788	875		769	950			5,800	3,800	990	495	292
24	763	910	810	769	910			5,960	3,800	990	490	292
25	763	910		763	950		3,410	6,120	3,410	950	480	285
26	744	950		757	910		3,280	6,280	3,280	910	480	270
27	744	950		744	910	1,490	3,220	6,440	3,150	910	466	277
28	738	990		744	910		3,080	6,280	3,020	875	457	270
29	732	990	780	738	-------		3,020	6,120	2,960	840	448	270
30	732	990		744	-------		2,960	5,800	2,820	827	434	274
31	720	-------		732	-------		-------	5,650	-------	801	421	-------

NOTE.—Water-stage recorder not operating Nov. 7-8, Dec. 22-31, Jan. 7-20, and June 20; discharge Dec. 22-31 and Jan. 7-20 estimated by comparison with flow of Flathead River near Polson, and Clark Fork near Plains; interpolated for remaining periods. Discharge Mar. 18 to Apr. 19, when stage-discharge relation was affected by logs, determined from estimated gage-height graph and from gage-height drop noted by observer when jam washed out Apr. 20. Braced figures show mean discharge for periods included.

Monthly discharge of Priest River at outlet of Priest Lake, near Coolin, Idaho, for the year ending Sept. 30, 1921.

[Drainage area, 572 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	827	686	766	1.34	1.54	47,100
November	990	558	737	1.29	1.44	43,900
December	990	-------	882	1.54	1.78	54,200
January	875	732	808	1.41	1.63	49,700
February	950	668	806	1.41	1.47	44,800
March	-------	808	1,050	1.84	2.12	64,600
April	-------	-------	2,490	4.35	4.85	148,000
May	6,440	2,700	4,400	7.69	8.87	271,000
June	5,960	2,820	4,680	8.18	9.13	278,000
July	2,760	801	1,490	2.60	3.00	91,600
August	788	421	571	1.00	1.15	35,100
September	399	259	308	.54	.60	18,300
The year	6,440	259	1,580	2.76	37.58	1,150,000

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, 1921.

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, 26.4 feet June 7 and 8; minimum stage recorded, 15.2 feet April 10.

1912–1921: 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 the surplus flow of Sullivan Creek is diverted into the lake. Sufficient water is stored in the lake to afford a continuous flow of about 60 second-feet in flume of Inland Portland Cement Co. Zero of gage at elevation of gate sills; crest of log chute is 22 feet, and crest of spillway 25 feet above gate sills.

COOPERATION.—Gage height furnished by Inland Portland Cement Co.

Daily gage height, in feet, of Sullivan Lake near Metaline Falls, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	19.70	20.10	19.70	18.60	17.35	16.65	15.45	-------	26.30	25.00	23.30	21.00
2	19.85	20.05	19.70	18.55	17.30	16.70	15.40	16.35	26.30	25.00	23.20	20.80
3	20.10	20.00	19.80	18.55	17.30	-------	15.40	16.50	26.30	24.80	23.10	20.70
4	-------	19.95	19.80	18.50	17.25	-------	15.40	16.55	26.30	24.60	23.00	20.60
5	-------	19.90	19.80	18.55	17.25	-------	15.40	16.65	26.35	24.50	22.90	20.50
6	-------	19.90	19.80	18.55	17.20	-------	15.40	16.70	26.35	24.40	22.80	20.40
7	-------	19.90	19.80	18.50	17.15	16.35	15.40	16.75	26.40	24.30	22.70	20.30
8	20.20	19.90	19.80	18.40	17.10	16.20	15.30	16.85	26.40	24.30	22.60	20.10
9	20.20	19.85	19.80	18.40	17.05	16.05	15.25	16.95	26.30	24.30	22.50	19.90
10	20.10	19.85	19.80	18.30	17.00	15.80	15.20	17.05	26.25	24.30	22.40	19.80
11	20.15	19.70	19.80	18.20	17.00	15.70	15.25	17.20	26.15	24.30	22.30	19.70
12	20.15	19.60	19.70	18.20	16.95	15.60	15.25	17.25	25.90	24.30	22.20	19.70
13	20.10	19.55	19.60	18.10	16.95	15.55	15.30	17.30	25.80	24.30	22.00	19.60
14	20.10	19.50	19.50	18.05	16.95	15.50	15.30	17.50	25.75	24.30	21.95	19.60
15	20.10	19.50	19.30	18.00	16.90	15.50	15.30	18.60	25.70	24.30	21.90	19.60
16	20.10	19.45	19.10	17.95	16.90	15.45	15.30	19.45	25.70	24.30	21.85	19.50
17	20.10	19.45	19.00	17.95	16.90	15.40	15.30	20.30	25.70	24.30	21.80	19.50
18	20.10	19.45	18.90	17.90	16.80	15.30	15.35	21.90	25.70	24.20	21.75	19.50
19	20.20	19.45	18.90	17.90	16.70	15.25	15.35	22.80	25.70	24.10	21.70	19.50
20	20.20	19.45	18.90	17.90	16.75	15.25	15.35	23.75	25.70	24.00	21.70	19.50
21	20.20	19.45	18.90	17.80	16.70	15.30	15.45	24.15	25.60	24.00	21.65	19.40
22	20.20	19.45	18.90	17.80	16.65	15.35	15.60	24.50	25.50	23.95	21.60	-------
23	20.20	19.45	18.90	17.75	16.60	15.40	15.65	25.25	25.30	23.90	21.55	19.10
24	20.20	19.45	18.90	17.70	16.50	15.50	15.70	25.60	25.20	23.90	21.50	18.90
25	20.20	19.45	18.90	17.65	16.50	15.60	15.75	25.80	25.15	23.90	21.45	18.90
26	20.20	19.45	18.90	17.60	16.45	15.60	15.80	26.30	25.05	23.80	21.40	18.70
27	20.20	19.45	18.85	17.55	16.50	15.60	15.85	26.35	25.00	23.75	21.40	18.70
28	20.20	19.40	18.85	17.50	16.60	15.65	15.95	26.30	25.00	23.70	21.35	18.70
29	20.15	19.50	18.80	17.45	-------	15.65	16.00	26.30	25.00	23.65	21.30	18.50
30	20.15	19.60	18.60	17.40	-------	15.65	16.20	-------	25.00	23.60	21.20	18.50
31	20.15	-------	18.65	17.40	-------	15.50	-------	26.30	-------	23.40	21.10	-------

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 1921.

GAGE.—Vertical staff in four sections on left bank; installed September 21, 1917. Lower sections of gage destroyed May 17, 1919, and a temporary gage was installed May 25 at same location; readings from temporary gage referred to datum of previous gage. Gage read by A. J. McDougall. Prior to September 21, 1917, vertical staff on right bank directly opposite present gage and at same datum.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 40 feet below gage.

CHANNEL AND CONTROL.—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, 3.75 feet June 8 (discharge, 1,540 second-feet); minimum stage recorded, 1.11 feet September 29 and 30 (discharge, 77 second-feet).

1912–1921: Maximum stage recorded, 4.2 feet June 2, 1913 (discharge, 1,650 second-feet); minimum stage recorded, 1.10 feet on March 25, 1919 (discharge, 46 second-feet).

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

DIVERSIONS.—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 for medium and high stages changed June 8; not affected by ice. Rating curve used prior to change fairly well defined below 1,000 second-feet; curve used after change fairly well defined below 1,500 second-feet. Gage read to hundredths once daily; difficult to read gage accurately owing to surge. Daily discharge ascertained by applying daily gage height to rating table. Records 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 2	D. J. F. Calkins	1.27	100	July 7	John McCombs	1.68	239
2	do	1.27	105	Sept. 23	R. B. Kilgore	1.17	86.7
July 5	John McCombs	1.73	253	23	do	1.17	90.9
5	do	1.72	258				

84390—24†—WSP 532——9

Daily discharge, in second-feet, of Sullivan Creek near Metaline Falls, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	113	111	126	102	90	126	142	272	750	488	142	102
2	107	111	126	102	90	126	148	284	950	516	139	102
3	109	111	126	102	90	127	145	306	950	857	139	102
4	109	111	123	102	90	127	145	327	1,000	273	139	113
5	109	109	121	102	90	128	151	350	1,050	257	139	113
6	109	109	121	102	89	128	158	327	1 100	265	139	113
7	109	109	113	102	90	129	158	327	1,150	236	131	113
8	109	109	113	102	90	129	158	417	1,540	257	123	113
9	107	109	113	98	92	131	161	532	1,260	261	123	113
10	107	113	113	89	96	126	161	555	1,050	224	118	113
11	109	113	113	82	98	121	164	555	980	224	118	109
12	111	116	113	78	100	121	164	508	915	205	118	109
13	105	116	113	87	100	134	213	508	850	213	113	109
14	105	116	109	96	107	134	220	532	850	198	113	109
15	102	118	109	105	107	136	224	555	786	188	113	109
16	100	118	116	100	90	136	224	750	786	188	113	107
17	100	118	118	98	87	136	243	750	724	188	113	107
18	100	164	118	100	92	158	284	800	693	188	111	107
19	113	180	113	98	98	170	327	850	602	188	113	107
20	116	188	116	98	113	145	350	1,000	488	180	113	107
21	116	170	116	96	116	145	327	900	516	174	109	107
22	113	170	116	96	116	139	327	950	488	174	109	97
23	113	170	116	89	111	142	327	950	488	170	109	87
24	113	164	113	92	107	136	350	950	516	164	109	84
25	113	148	113	92	111	134	227	1,000	544	164	109	85
26	113	136	102	92	105	134	306	1,000	434	164	109	82
27	113	136	102	92	102	131	284	950	408	164	109	80
28	109	131	102	90	102	134	268	950	382	161	109	78
29	109	131	102	90	-------	139	251	850	382	154	109	77
30	109	131	105	90	-------	136	259	800	382	154	109	77
31	109	-------	100	90	-------	139	-------	750	-------	148	102	-------

NOTE.—Gage not read October 4–7, March 3–6, May 1 and 30, and Sept. 22; discharge interpolated.

Monthly discharge of Sullivan Creek near Metaline Falls, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	116	100	109	6,700
November	188	109	131	7,800
December	126	100	114	7,010
January	105	78	95.3	5,860
February	116	87	98.9	5,490
March	170	121	135	8,300
April	350	142	232	13,800
May	1,000	272	663	40,800
June	1,540	382	767	45,600
July	516	148	222	13,600
August	142	102	118	7,260
September	113	77	101	6,010
The year	1,540	77	232	168,000

KETTLE RIVER BASIN.

CURLEW CREEK NEAR CURLEW, WASH.

LOCATION.—In sec. 21, T. 38 N., R. 33 E., 400 feet below mouth of Lambert Creek, half a mile below outlet of Curlew Lake, and 9 miles above Curlew, Ferry County.

DRAINAGE AREA.—93 square miles (measured on topographic and Forest Service maps; uncertain because divide between Curlew Creek and Sanpoil River can not be determined accurately).

RECORDS AVAILABLE.—May 4, 1917, to June 30, 1921, when station was discontinued.

GAGE.—Vertical staff on right bank attached to upstream wing wall of railroad culvert; read by Mrs. P. G. Kuehne. Gage was lowered 0.30 foot on August 25, 1920.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Sensitive control formed by wooden culvert under railroad, having a free fall of 1 foot. Banks above gage fairly high; not subject to overflow. Channel below culvert crooked; subject to overflow at high stages. Stage of zero flow, according to levels run October 8, 1918, gage height −0.12 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 3.23 feet May 25 (discharge, 61 second-feet); minimum discharge, 0.1 second-foot October 1–7, 14–21, and 25–29.

1917–1921: Maximum stage recorded, 3.08 feet May 30, June 2 and 6, 1917 (discharge, 65 second-feet); no flow December 12 and 13, 1919, and September 22–26 and 29–30, 1920.

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

DIVERSIONS.—Water diverted above station for irrigation.

REGULATION.—Natural storage in Curlew Lake.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records excellent except those for extremely low stages which are fair.

Discharge measurements of Curlew Creek near Curlew, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 21	2.17	29.2	May 25	3.23	60.0
21	2.16	28.4	25	3.23	62.4

NOTE.—Gage heights of previous measurements at datum 0.30 foot higher.

Daily discharge, in second-feet, of Curlew Creek near Curlew, Wash., for the period Oct. 1, 1920, to June 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	0.1	0.2	0.6	1.1	1.6	3.5	8.1	36	47
2	.1	.2	.6	1.0	1.6	4.6	8.1	38	47
3	.1	.2	.6	1.0	1.6	4.6	8.1	38	47
4	.1	.2	.7	1.0	1.4	4.9	8.1	38	47
5	.1	.2	.7	1.0	1.4	5.7	8.1	38	53
6	.1	.2	.7	.8	1.6	5.7	8.1	38	53
7	.1	.2	.7	.8	1.7	4.9	9.1	41	47
8	.2	.2	.6	1.0	1.6	5.7	9.1	41	50
9	.3	.2	.6	1.0	1.9	5.9	9.1	44	44
10	.3	.2	.6	1.0	3.2	5.7	9.5	47	44
11	.3	.2	.6	1.0	15.5	3.9	9.5	47	41
12	.2	.2	.6	1.0	4.1	3.9	9.5	50	38
13	.2	.3	.6	.7	3.9	4.4	11.6	50	35
14	.1	.3	.5	1.1	3.9	4.4	15.5	50	34
15	.1	.3	.6	1.1	3.5	6.2	19.5	53	34
16	.1	.4	.7	1.1	3.0	7.5	19.5	53	33
17	.1	.5	.7	1.1	3.4	7.1	22	56	32
18	.1	.6	.8	1.1	3.5	6.2	24	56	30
19	.1	.6	.8	1.0	3.2	6.2	28	56	28
20	.1	.7	.8	1.0	3.2	5.9	30	60	28
21	.1	.7	.8	1.0	3.9	5.9	30	60	28
22	.2	.6	.8	1.0	3.5	6.2	32	60	28
23	.2	.6	.8	1.1	3.2	6.2	33	60	28
24	.2	.6	.8	1.1	2.8	6.2	34	60	28
25	.1	.7	1.0	1.0	2.8	7.1	35	60	28
26	.1	.7	1.0	1.3	2.8	7.1	35	60	28
27	.1	.7	1.0	1.3	2.8	7.8	35	56	28
28	.1	.7	1.0	1.4	3.7	7.8	35	56	14.5
29	.1	.6	1.0	1.6	-------	7.8	36	53	13.5
30	.2	.5	1.0	1.6	-------	7.8	36	50	13.5
31	.2	-------	1.1	1.4	-------	8.1	-------	47	-------

Monthly discharge of Curlew Creek near Curlew, Wash., for the period Oct. 1, 1920, to June 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	0.3	0.1	0.14	8.6
November	.7	.2	.42	25.0
December	1.1	.5	.75	46.1
January	1.6	.7	1.09	67.0
February	15.5	1.4	3.22	179
March	8.1	3.5	5.96	366
April	36	8.1	20.5	1,220
May	60	36	50.1	3,080
June	53	13.5	35.0	2,080
The period				7,070

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, 1921.

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 during year, from water-stage recorder, 3.67 feet at 9 a. m. May 11 (discharge, 577 second-feet); minimum stage, from recorder, 1.41 feet October 1–3 (discharge, 13 second-feet).

1912–1921: Maximum stage recorded, 3.10 feet at 6.20 a. m. April 16, 1914 (discharge, 965 second-feet); minimum discharge, estimated 4 second-feet January 1, 1919, when stage-discharge relation was affected by ice.

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

DIVERSIONS.—Water is diverted for use in Gwen mine power plant but is returned above gage.

REGULATION.—Effect of operation of power plant negligible.

ACCURACY.—Stage-discharge relation permanent except as affected by ice. 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 from recorder graph by inspection. Records good except for periods when recorder was not operating or stage-discharge relation was affected by ice.

Discharge measurements of Hall Creek at Inchelium, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 1	John McCombs	3.14	321	Sept. 27	R. B. Kilgore	1.53	18.6
1	do	3.14	328	27	do	1.53	18.3

Daily discharge, in second-feet, of Hall Creek at Inchelium, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	13	18	39	35		56	180	324	244	72	22	16
2	13	18	40	44		59	202	339	230	70	21	16
3	14	18	40	41		60	225	358	220	68	20	17
4	16	18	42	36		65	225	366	212	64	20	17
5	18	17	40	33		69	214	374	225	61	20	18
6	16	15	35			70	207	386	207	59	20	17
7	15	15	38			73	202	422	192	56	19	17
8	15	15	36	30		76	202	471	183	53	18	17
9	15	18	36			82	204	503	171	50	18	17
10	15	15	33			92	217	520	162	48	18	17
11	15	15	36			95	255	548	159	47	17	17
12	22	14	31			82	307	492	150	46	17	17
13	26	15	26		40	80	395	466	143	44	17	17
14	22	18				85	446	466	136	41	17	19
15	21	18		25		82	441	486	127	39	17	18
16	20	19				80	426	514	125	37	17	18
17	20	29				90	422	514	129	36	17	17
18	20	52				129	422	498	132	36	17	17
19	20	65				145	431	503	120	35	18	20
20	20	63				134	456	503	116	33	17	23
21	20	52	22			136	466	476	106	32	17	21
22	20	36				143	466	441	101	32	17	20
23	20	44				148	466	413	95	31	17	20
24	20	41				152	441	382	88	28	17	20
25	20	41				159	408	370	85	28	17	18
26	19	44		30	52	155	366	358	84	27	17	18
27	19	44			53	155	342	342	79	26	17	18
28	19	39			54	155	332	324	76	26	17	18
29	19	39	30		-------	159	324	297	72	23	16	18
30	19	36	35		-------	159	324	275	72	22	16	18
31	18	-------	39		-------	166	-------	255	-------	22	15	-------

NOTE.—Water-stage recorder not operating Dec. 27–28 and Jan. 10 to Feb. 25. Stage-discharge relation affected by ice Dec. 14–28 and Jan. 6–10. Discharge for periods of ice effect ascertained by means of gage height and temperature records. For periods of no gage-height record, discharge estimated by comparison with flow 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, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	26	13	18.4	1,130
November	65	14	29.7	1,770
December	42	----------	29.2	1,800
January	44	----------	29.6	1,820
February	54	----------	41.4	2,300
March	166	56	109	6,700
April	466	180	334	19,900
May	548	255	419	25,800
June	244	72	141	8,390
July	72	22	41.7	2,560
August	22	15	17.7	1,090
September	23	16	18.0	1,070
The year	548	13	103	74,300

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, 1921.

GAGE.—Vertical staff on right bank 15 feet downstream from bridge; read by E. J. Sparling.

DISCHARGE MEASUREMENTS.—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, and September 28, 1921, gage height zero.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.85 feet April 19–20 (discharge, 140 second-feet); minimum stage recorded, 0.14 foot November 10–13 (discharge, 0.9 second-foot).

1916–1921: Maximum stage recorded, 2.0 feet May 15–19, 1917, April 7–12, and April 20 to May 3, 1919 (discharge, 164 second-feet); probably no flow on December 12, 1919, when creek was frozen almost solid.

ICE.—Stage-discharge relation affected by ice for short periods.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by ice December 14–22. Rating curve well defined. Gage read twice daily to hundredths, with the exception that no readings were made on Saturday afternoons; readings discontinued during January and February. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent, except for period when stage-discharge relation was affected by ice.

Discharge measurements of Stranger Creek at Meteor, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date	Made by—	Gage height.	Discharge.
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 30	John McCombs	1.63	107	Sept. 28	R. B. Kilgore	0.20	1.5
May 2	do	1.56	102	28	do	.20	1.6

Daily discharge, in second-feet, of Stranger Creek at Meteor, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.1	1.3	5.6	12.0	61	105	52	18.4	7.6	2.0
2	1.0	1.3	6.2	12.4	62	99	50	18.4	6.9	2.0
3	1.1	1.1	6.6	12.4	67	93	48	18.4	6.2	2.0
4	1.6	1.1	6.9	12.4	72	93	46	17.4	6.2	2.0
5	1.3	1.1	6.2	12.4	72	93	45	17.4	5.6	2.0
6	1.3	1.1	6.2	12.4	77	93	43	16.3	5.6	2.0
7	1.3	1.3	5.6	12.9	77	93	41	15.3	5.6	2.0
8	1.2	1.1	5.6	13.3	77	93	40	14.2	5.2	2.0
9	1.2	1.0	5.6	13.3	77	99	38	14.2	4.9	1.8
10	1.4	.9	5.9	14.2	77	99	36	14.2	4.9	1.8
11	2.1	.9	5.9	15.3	82	105	35	13.8	4.9	1.8
12	1.8	.9	5.6	15.3	82	105	33	13.3	4.4	1.7
13	1.7	.9	5.6	15.8	93	105	31	12.4	4.4	1.7
14	1.8	1.1		16.3	105	105	30	12.4	4.4	1.7
15	1.7	1.3		16.3	118	105	29	12.4	3.8	1.7
16	1.7	1.8		17.4	118	105	27	12.0	3.8	1.7
17	1.6	3.1		19.5	125	99	28	11.6	3.8	1.7
18	1.6	5.2	6	21	132	99	28	11.6	3.5	1.6
19	1.4	5.6		22	140	99	28	10.7	3.5	1.6
20	1.4	4.4		23	140	99	26	10.7	3.5	1.7
21	1.4	3.8		26	132	93	25	10.7	3.3	1.7
22	1.6	4.4		30	125	93	23	9.9	2.9	1.7
23	1.6	4.4	6.2	33	125	93	23	9.9	2.9	1.7
24	1.4	4.9	6.6	39	125	88	23	9.9	2.9	1.7
25	1.3	4.9	6.6	43	118	82	22	9.1	2.9	1.7
26	1.3	4.9	6.9	46	118	77	21	9.1	2.9	1.7
27	1.4	5.2	6.9	48	118	72	21	8.4	2.7	1.7
28	1.4	5.2	6.9	51	112	67	20	8.4	2.5	1.7
29	1.4	5.2	6.9	55	112	62	19.5	8.4	2.1	1.7
30	1.3	5.6	6.9	58	112	58	19.0	8.0	2.1	1.7
31	1.3		6.9	59		55		7.6	2.0	

NOTE.—Stage-discharge relation affected by ice December 14–22; discharge ascertained by means of gage-height and weather records. Braced figure shows mean discharge for period indicated.

Monthly discharge of Stranger Creek at Meteor, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	2.1	1.0	1.44	88.5
November	5.6	.9	2.83	168
December	6.9		6.20	381
January			6.00	369
February			10.0	555
March	59	12.0	25.7	1,580
April	140	61	102	6,070
May	105	55	91.2	5,610
June	52	19.0	31.7	1,890
July	18.4	7.6	12.4	762
August	7.6	2.0	4.13	254
September	2.0	1.6	1.78	106
The year	140	.9	24.6	17,800

NOTE.—Mean flow for January and February estimated by comparison with flow of Nespelem River at Nespelem, Wash.

SPOKANE RIVER BASIN.

COEUR D'ALENE LAKE AT COEUR D'ALENE, IDAHO.

LOCATION.—In SW. ¼ sec. 13, T. 50 N., R. 4 W., at Johnson's Wharf, 800 feet southeast of railroad station at Coeur d'Alene, Kootenai County.

DRAINAGE AREA.—3,750 square miles (measured by engineers of Washington Water Power Co. on map compiled from best information available).

RECORDS AVAILABLE.—February 11, 1905, to September 30, 1921. 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 and datum; read by Henry Kloppenburg. Gage datum 2,100 feet above mean sea level.

EXTREMES OF STAGE.—Maximum stage during year, from water-stage recorder, 31.93 feet on May 21; minimum stage, from old staff gage, 23,14 feet on February 9 and 10.

1903–1921: Maximum stage recorded, 36.00 feet at 6.15 p. m. January 3, 1918; minimum stage recorded, 19.9 feet October 10–12, 1904, September 24–25, 1905, and October 14 to November 3, 1906.

DIVERSIONS.—None.

REGULATION.—Considerable storage is used by Washington Water Power Co. Regulation is affected by Taintor gates and bear-trap dam at Post Falls.

ACCURACY.—Gage read to hundredths once or twice daily prior to March 24; thereafter mean gage heights were determined by inspection from recorder graph. Records excellent.

COOPERATION.—Gage-height record furnished by Washington Water Power Co.

Daily gage height, in feet, Coeur d'Alene Lake at Coeur d'Alene, Idaho, for the year ending Sept. 30, 1921.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	25.72	25.41	24.66	26.16	23.92	25.97	28.79	29.55	30.07	26.44	26.34	25.43
2	25.76	25.41	24.54	26.74	23.82	26.12	28.70	29.45	29.80	26.40	26.35	25.36
3	25.80	25.40	24.39	27.14	23.74	26.32	28.68	29.41	29.59	26.38	26.33	25.34
4	25.90	25.38	24.30	27.43	23.62	26.44	28.71	29.46	29.41	26.37	26.29	25.31
5	25.96	25.38	24.14	27.56	23.52	26.65	28.69	29.48	29.24	26.40	26.16	25.27
6	26.01	25.36	24.02	27.56	23.42	26.88	28.60	29.51	29.07	26.42	26.12	25.25
7	26.04	25.36	24.02	27.48	23.34	27.02	28.46	29.68	28.88	26.43	26.12	25.23
8	26.01	25.38	24.04	27.34	23.22	27.09	28.24	29.96	28.67	26.45	26.09	25.22
9	25.99	25.40	24.08	27.12	23.15	27.04	28.00	30.35	28.49	26.47	26.06	25.17
10	26.01	25.42	24.12	26.89	23.16	26.98	27.81	30.69	28.23	26.48	26.02	25.13
11	26.01	25.36	24.04	26.61	23.52	26.92	27.68	30.92	27.99	26.48	25.98	25.10
12	25.87	25.34	23.95	26.36	24.23	26.85	27.63	31.07	27.73	26.47	25.93	25.09
13	25.84	25.32	23.84	26.10	25.26	26.74	27.75	31.13	27.50	26.47	25.89	25.05
14	25.77	25.34	23.70	25.91	26.30	26.68	28.00	31.10	27.25	26.45	25.88	25.02
15	25.71	25.34	23.57	25.73	27.07	26.53	28.25	31.14	26.99	26.47	25.89	24.97
16	25.64	25.41	23.57	25.57	27.51	26.46	28.36	31.28	26.73	26.47	25.87	24.94
17	25.57	25.44	23.63	25.43	27.68	26.73	28.39	31.48	26.47	26.45	25.87	24.92
18	25.49	25.47	23.59	25.36	27.66	27.63	28.44	31.67	26.23	26.45	25.88	24.89
19	25.48	25.52	23.52	25.37	27.60	28.76	28.57	31.80	26.02	26.47	25.86	24.91
20	25.46	25.58	23.51	25.31	27.46	29.50	28.76	31.91	25.92	26.50	25.83	24.91
21	25.46	25.67	23.51	25.22	27.27	29.80	29.00	31.93	25.99	26.48	25.82	24.91
22	25.44	25.71	23.47	25.09	27.04	29.81	29.33	31.86	26.10	26.47	25.79	24.91
23	25.43	25.62	23.39	24.94	26.81	29.68	29.69	31.78	26.21	26.48	25.72	24.92
24	25.39	25.54	23.39	24.81	26.59	29.58	30.08	31.65	26.32	26.45	25.70	24.84
25	25.37	25.44	23.42	24.67	26.39	29.58	30.34	31.54	26.39	26.45	25.65	24.84
26	25.39	25.32	23.43	24.53	26.20	29.55	30.40	31.43	26.43	26.45	25.59	24.84
27	25.36	25.22	23.46	24.42	26.03	29.49	30.28	31.32	26.45	26.40	25.59	24.83
28	25.39	25.12	23.47	24.33	25.92	29.34	30.07	31.17	26.44	26.40	25.56	24.79
29	25.43	24.96	23.52	24.15	-------	29.16	29.92	30.93	26.43	26.40	25.52	24.79
30	25.41	24.81	23.97	24.08	-------	29.02	29.73	30.62	26.47	26.39	25.51	24.72
31	25.40	-------	25.21	23.98	-------	28.89	-------	30.33	-------	26.37	25.47	-------

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 maps compiled from best information available).

RECORDS AVAILABLE.—January 1, 1913, to September 30, 1921.

GAGE.—Stevens continuous water-stage recorder since November 22, 1920; inspected by employees of Washington Water Power Co. Previous gage vertical staff in three sections on left bank; read by Nils Lindberg and Grant Merrill. Elevation of zero of gage, 2,000 feet above sea level.

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

CHANNEL AND CONTROL.—Bed composed of coarse gravel and boulders; shifts during floods. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 74.30 feet, probably on May 21 (discharge, 25,900 second-feet); minimum stage, from recorder, 65.80 feet at 5.20 a. m. September 12 (discharge, 820 second-feet).

1911–1921: Maximum stage recorded, 79.20 feet at 7.30 a. m. May 18, 1917 (discharge, 39,800 second-feet); minimum stage recorded on September 12, 1921.

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

DIVERSIONS.—Spokane Valley Land & Water Co.'s canal diverts water above gage for irrigation. Mean diversion during 1921, 68 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. Flow partly regulated by storage in Coeur d'Alene Lake.

ACCURACY.—Stage-discharge relation changed with change of gages on November 22. Two rating curves well defined. Staff gage read to hundredths once daily until November 21; thereafter water-stage recorder operated satisfactorily except as noted in footnote to table of daily discharge. When discharge is less than 5,000 second-feet, stage is variable owing to changing load at power plant, and one gage reading daily may not indicate true mean stage. Daily discharge prior to November 22, ascertained by applying daily gage height to rating table; after November 21, by applying to rating table mean daily gage height determined from recorder graph by inspection or, for discharge below 10,000 second-feet, by use of discharge integrator. Records good prior to November 21; excellent thereafter.

COOPERATION.—Gage-height record furnished by Washington Water Power Co.

Discharge measurements of Spokane River at Post Falls, Idaho, during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.		Discharge.
		Referred to old staff gage.	Referred to recording gage.	
		Feet.	*Feet.*	*Sec.-ft.*
Oct. 7	Calkins and Becker	67.90	----------	2,550
Nov. 29	Lee and Logan	70.68	69.82	7,500
May 20	Collins and Ford	75.97	74.30	25,700
25	----do----	75.65	73.98	24,400
June 14	Collins and McCombs	72.50	71.28	12,300
July 20	E. H. Collins	66.30	66.08	924
Sept. 3	Kilgore and Collins	66.53	66.31	1,060

Daily discharge, in second-feet, of Spokane River at Post Falls, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,020	2,110	7,110	10,000	5,880	9,560	16,100	18,300	19,200	4,240	1,100	1,130
2	960	2,250	6,960	11,400	5,850	9,800	16,100	17,800	18,800	3,520	1,020	1,100
3	960	2,250	6,700	12,500	5,740	10,200	16,100	17,400	17,800	2,460	1,140	1,040
4	960	1,850	6,440	12,900	5,550	10,400	16,100	17,400	17,400	2,080	1,220	1,020
5	1,330	1,730	5,980	13,700	5,340	11,100	16,100	17,800	17,000	1,460	1,300	980
6	1,520	1,620	4,220	13,300	5,140	11,800	16,100	17,800	16,500	1,270	1,280	1,080
7	1,850	1,420	3,230	13,300	4,960	12,200	15,700	18,300	16,100	1,260	1,280	1,060
8	2,530	1,420	3,240	12,900	4,780	12,200	15,300	18,800	15,700	1,300	1,320	1,050
9	2,250	1,420	3,370	12,500	4,630	12,200	14,900	20,200	15,300	1,350	1,300	1,020
10	1,730	1,520	4,800	12,200	4,420	12,200	14,500	21,300	14,500	1,360	1,290	1,000
11	2,110	1,520	5,900	11,400	5,190	11,800	14,100	22,300	14,100	1,430	1,300	940
12	4,310	1,420	5,750	10,900	6,310	11,800	14,100	22,800	13,300	1,480	1,220	1,020
13	4,310	1,420	5,620	10,200	8,020	11,800	14,100	22,800	12,500	1,460	1,200	1,100
14	4,310	1,160	4,880	9,850	9,820	11,400	14,500	22,800	12,200	1,460	1,240	1,140
15	4,310	1,090	3,030	9,420	11,800	11,100	14,900	23,300	11,800	1,270	1,110	1,130
16	4,310	1,160	1,850	9,060	12,900	11,100	15,300	23,300	11,200	1,300	1,110	1,120
17	4,310	2,110	2,780	8,880	13,300	11,800	15,300	24,300	10,500	1,150	1,110	1,160
18	4,130	2,390	3,840	8,780	13,300	13,700	15,700	24,900	9,700	1,040	1,180	1,140
19	2,970	3,610	3,500	8,720	12,900	16,100	15,700	25,400	8,400	970	1,040	1,150
20	2,670	4,690	2,520	8,596	12,500	17,800	16,100	25,200	5,880	940	1,040	960
21	2,670	6,020	2,960	8,430	12,500	18,800	16,500	25,000	2,310	940	1,040	1,020
22	2,820	8,050	3,060	8,160	11,800	18,800	17,400	24,700	1,840	1,000	1,060	1,040
23	2,820	8,380	3,120	7,900	11,400	18,300	18,300	24,500	1,860	1,040	1,120	1,030
24	2,390	8,240	2,580	7,680	10,800	18,300	19,200	24,300	1,850	1,080	1,040	1,040
25	1,980	8,140	1,920	7,440	10,300	17,800	20,200	24,000	2,430	1,020	1,060	1,080
26	1,420	8,000	1,740	7,160	10,000	17,400	20,200	23,800	2,640	1,080	1,120	1,010
27	2,390	7,980	1,650	6,940	9,720	17,400	20,200	23,300	2,790	1,000	1,170	990
28	1,850	7,730	2,580	6,750	9,440	17,400	19,700	22,800	2,830	1,020	1,050	1,000
29	1,850	7,520	4,800	6,480	--------	16,500	19,200	22,300	2,740	1,080	1,060	1,050
30	2,390	7,340	6,300	6,330	--------	16,500	18,300	21,300	3,660	1,040	1,120	1,030
31	2,110	-------	8,280	6,160	--------	16,100	--------	20,200	--------	1,180	1,140	-------

NOTE.—Water-stage recorder not operating May 20-25; discharge interpolated.

84390—24†—WSP. 532——10

Monthly discharge of Spokane River and Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the year ending Sept. 30, 1921.

[Drainage area, 3,880 square miles.]

Month.	Discharge in second-feet.						Combined run-off.	
	River.			Canal (mean).	Combined.			
	Maximum.	Minimum.	Mean.		Mean.	Per square mile.	Inches.	Acre-feet.
October	4,310	960	2,500	41.9	2,540			156,000
November	8,380	1,090	3,850	38.5	3,850			231,000
December	8,280	1,650	4,210	31.3	4,240			261,000
January	13,700	6,160	9,680	32.9	9,710			597,000
February	13,300	4,420	8,720	28.9	8,750			486,000
March	18,800	9,560	14,000	27.1	14,000			861,000
April	20,200	14,100	16,500	34.5	16,500			982,000
May	25,400	17,400	21,900	60.5	22,000			1,350,000
June	19,200	1,840	10,100	149	10,200			607,000
July	4,240	940	1,430	143	1,570			96,500
August	1,320	1,020	1,150	133	1,280			78,700
September	1,160	940	1,050	89.9	1,140			67,800
The year	25,400	940	7,920	67.7	7,990	2.06	27.96	5,770,000

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 (measured by engineers of Washington Water Power Co. on maps compiled from best information available).

RECORDS AVAILABLE.—April 1, 1891, to September 30, 1921.

GAGE.—Stevens continuous water-stage recorder, referred to mean sea level as a datum, on right bank at Cochrane Street about 1 mile below Monroe Street bridge; installed May 9, 1921, and used since July 1, 1921. 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; at different datum but set to read same as previous gage. March 31, 1904, to March 1, 1907, vertical staff at 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, 4.0 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, referred to mean sea level as a datum, at same location near Washington Water Power Co.'s steam plant. At time of each relocation simultaneous readings were obtained between old and new gages so that the relation of stage at the different sites was established.

DISCHARGE MEASUREMENTS.—Made from cable at gage. Measurements, 1896 to 1900, republished in this report were made from Oregon Railroad & Navigation Co.'s bridge, 2.9 miles upstream.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. One channel at all stages. Control is well-defined riffle a quarter 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 during year ending September 30, 1921, from water-stage recorder near steam plant, 79.8 feet May 21 and 22 (discharge, 26,200 second-feet); minimum stage, from recorder at Cochrane Street, 17.64 feet at 7 a. m. July 21 (discharge, 1,310 second-feet).

1891–1921: Maximum stage recorded, 12.42 feet (on gage at dam above Spokane Falls) May 31, 1894 (discharge, 49,000 [5] second-feet); minimum stage recorded, 1.3 feet (Martha Street gage) September 28–30, 1905 (discharge, 1,240 second-feet).

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

DIVERSIONS.—Water is diverted above station for irrigation by Spokane Valley Land & Water Co.

REGULATION.—Flow partly regulated by storage in Coeur d'Alene Lake since July, 1906.

ACCURACY.—During the year ending September 30, 1921, stage-discharge relation changed with change of gages, June 30 to July 1. Rating curve used prior to change well defined; curve used after change fairly well defined. Operation of water-stage recorder satisfactory at both locations. Daily discharge October 1 to March 18 and for a few days in June ascertained by means of the discharge integrator; for remainder of year by applying to rating table mean daily gage height determined from recorder graph by inspection. Records excellent to June 30; good thereafter.

Discharge April 1, 1891, to March 31, 1904, revised in this report, owing to (1) an error made in original computations covering the period prior to October 25, 1896, (2) rating curve used originally did not average low-water measurements, and (3) soundings of the early measurements were inconsistent. Stage-discharge relation fairly permanent during period. Rating curves fairly well defined. Daily discharge ascertained by applying mean daily gage height to rating table. Prior to October 25, 1896, gage readings during the low-water season were corrected for regulation of gates at either end of dam and for operation of flashboards. The corrections applied are of doubtful accuracy, and publication of daily discharge is not considered justifiable. Records prior to October 25, 1896, poor; thereafter, good.

Discharge measurements of Spokane River at Spokane, Wash., during the period Aug. 27, 1896, to June 14, 1900, and during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1896.		*Feet.*	*Sec.-ft.*	1920.		*Feet.*	*Sec.-ft.*
Aug. 27	C. C. Babb	2.00	2,930	Oct. 6	Calkins and Becker	69.41	2,050
Oct. 17	Babb, Huber, and Wetzel	1.46	1,890	Nov. 24	Lee and Logan	73.12	8,250
1897.				1921.			
May 20	C. C. Babb	10.80	28,800	May 17	Logan and Collins	79.24	23,700
June 29	do	5.16	9,020	19	Collins and Ford	79.58	26,400
July 21	John Wetzel	4.05	7,350	24	do	79.51	25,000
Sept. 11	Babb and Arnold	1.92	2,540	June 6	John McCombs	77.10	17,900
Oct. 20	Sydney Arnold	1.50	1,910	13	McCombs and Collins		14,000
1898.				13	do	75.60	14,000
Sept. 6	do	1.74	2,310	20	Collins and Ford		6,870
Oct. 8	C. C. Babb	1.75	2,180	29	McCombs and Collins		3,590
1899.				July 19	Collins and Godfrey		1,900
June 23	Sydney Arnold	9.30	23,100	19	E. H. Collins	69.15	1,800
1900.				Sept. 10	R. B. Kilgore		1,580
May 17	do	6.50	13,300	10	E. H. Collins	69.01	1,560
June 14	do	4.10	7,350	12	R. B. Kilgore	68.98	1,530
				12	E. H. Collins		1,460
				30	do	69.15	1,730
				30	R. B. Kilgore		1,750

NOTE.—Original discharge computations for measurements made during the period 1896 to 1900, revised owing to inconsistencies in soundings; in recomputing these measurements all soundings were corrected to a standard cross section. Gage heights shown for measurements made during period Oct. 6, 1920, to Sept. 30, 1921, were read on gage at steam plant; for several of the measurements the gage at Cochrane Street was read, as follows: May 17, 24.98 feet; May 19, 25.20 feet; May 24, 25.11 feet; June 6, 23.63 feet; June 13, 22.62 feet (first measurement) and 22.58 feet (second measurement); June 20, 20.43 feet; June 29, 19.00 feet; July 19, 17.96 feet (first measurement); Sept. 10, 17.76 feet (first measurement); Sept. 12, 17.74 feet (second measurement); Sept. 30, 17.87 feet (second measurement).

[5] Revised in this report.

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for the period Oct. 1, 1896, to Mar. 31, 1904, and for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1896–97.												
1	1,730	1,780	8,590	10,700	6,860	5,070	8,850	30,400	20,400	9,370	5,070	2,580
2	1,730	1,930	8,330	10,400	6,860	5,070	8,850	29,400	19,700	9,370	4,860	2,580
3	1,610	1,930	8,330	10,200	6,860	5,070	9,110	27,600	19,000	9,370	4,650	2,580
4	1,610	1,930	8,590	9,890	6,860	5,070	9,110	27,600	17,600	9,370	4,650	2,410
5	1,610	2,010	9,890	9,890	6,630	5,070	9,370	27,200	17,000	9,370	4,650	2,410
6	1,610	2,010	10,700	9,370	6,400	5,070	9,890	27,200	15,400	9,370	4,650	2,410
7	1,610	2,090	11,000	9,370	6,400	5,070	10,200	28,000	14,200	9,370	4,240	2,410
8	1,610	2,090	11,600	8,850	6,400	5,070	10,400	29,400	13,600	9,370	4,240	2,580
9	1,500	2,090	12,400	8,850	6,170	5,070	10,700	30,900	13,000	9,370	4,040	2,750
10	1,500	2,090	13,000	8,590	6,170	4,860	11,300	30,900	12,800	9,370	3,840	2,750
11	1,500	2,250	13,600	8,330	5,950	4,860	12,400	29,400	12,800	9,110	3,840	2,580
12	1,500	2,410	14,000	8,080	5,950	4,860	14,200	28,000	12,200	9,110	3,840	2,580
13	1,500	2,410	14,800	7,830	5,950	4,650	15,200	27,200	11,900	8,850	3,650	2,580
14	1,500	2,410	15,800	7,580	5,950	4,650	16,100	26,800	11,300	8,590	3,650	2,580
15	1,500	2,920	16,700	7,340	5,950	4,440	17,000	26,400	10,700	8,330	3,460	2,580
16	1,500	4,860	17,000	7,340	5,950	4,440	18,300	26,800	10,400	8,080	3,460	2,410
17	1,500	7,830	17,000	7,340	5,950	4,440	20,000	27,600	10,400	7,830	3,460	2,410
18	1,500	10,200	16,700	6,860	5,950	4,440	21,400	28,400	10,200	7,580	3,280	2,410
19	1,500	12,200	10,400	6,860	5,730	4,440	23,300	28,900	10,400	7,340	3,100	2,410
20	1,500	13,000	15,800	6,630	5,730	4,440	26,400	29,900	10,400	7,340	3,100	2,410
21	1,500	13,000	15,400	6,400	5,730	4,240	29,900	29,900	10,400	6,860	3,100	2,410
22	1,500	13,400	15,200	6,630	5,730	4,240	32,900	28,900	10,400	6,860	3,100	2,410
23	1,500	13,400	14,200	6,400	5,730	4,440	33,900	28,400	10,400	6,630	3,100	2,410
24	1,500	12,800	14,000	6,400	5,510	4,440	33,900	27,600	10,400	6,400	2,920	2,410
25	1,780	12,800	14,000	6,860	5,290	4,440	32,900	26,800	10,400	6,170	2,750	2,250
26	1,860	12,200	12,800	6,860	5,070	5,070	31,900	26,000	10,400	5,950	2,750	2,250
27	1,860	11,000	12,400	6,860	5,070	5,950	30,900	24,800	10,200	5,730	2,750	2,250
28	1,780	10,700	12,200	6,630	5,070	7,100	31,400	23,600	10,200	5,510	2,750	2,250
29	1,780	9,890	11,600	6,860	-------	7,830	31,400	22,500	9,890	5,510	2,750	2,250
30	1,780	9,370	11,000	6,860	-------	8,330	31,400	21,800	9,630	5,070	2,750	2,250
31	1,780	-------	10,700	6,860	-------	8,330	-------	21,100	-------	5,070	2,580	-------
1897–98.												
1	2,250	1,860	9,370	11,000	4,650	14,200	7,830	27,200	25,200	11,600	4,650	2,750
2	2,250	1,860	9,110	11,300	4,650	14,000	7,580	27,200	24,800	11,300	4,440	2,750
3	2,090	1,860	8,850	11,300	4,440	13,600	7,340	27,200	24,800	10,700	4,240	2,750
4	2,090	1,860	8,330	11,000	4,440	13,400	7,340	26,400	24,000	10,400	4,240	2,580
5	2,090	1,860	8,080	11,000	4,650	13,400	7,340	26,000	23,300	9,890	4,240	2,580
6	2,090	1,860	8,330	10,400	4,650	14,000	7,580	26,000	22,500	9,630	4,040	2,410
7	2,090	1,860	8,590	10,400	4,650	14,000	7,830	25,600	22,200	9,370	4,040	2,410
8	2,090	1,860	9,370	9,890	5,070	14,000	8,330	25,200	21,800	8,850	3,840	2,410
9	2,010	1,930	10,400	9,630	5,730	14,200	8,850	24,800	21,100	8,590	3,840	2,410
10	2,010	1,930	11,300	9,370	6,630	14,200	9,110	24,000	21,100	8,330	3,840	2,410
11	1,930	1,930	11,900	9,110	7,100	14,200	9,630	23,300	21,100	7,830	3,650	2,410
12	1,930	2,090	12,200	8,590	7,580	14,000	10,200	23,300	20,400	7,830	3,650	2,410
13	1,930	2,410	12,200	8,330	8,080	14,000	10,700	23,300	20,400	7,580	3,460	2,410
14	1,930	3,460	12,200	8,080	8,330	13,600	11,300	24,000	20,000	7,340	3,460	2,410
15	1,930	4,240	12,200	7,830	10,400	13,400	12,400	24,000	19,700	7,340	3,460	2,410
16	1,930	4,650	12,200	7,580	13,400	13,000	13,600	24,400	19,700	6,860	3,460	2,410
17	1,930	4,650	11,900	7,340	15,400	12,400	15,400	24,800	19,000	6,630	3,280	2,410
18	1,930	5,070	11,600	7,100	17,600	12,200	16,700	25,600	18,300	6,400	3,280	2,410
19	1,930	5,510	11,300	6,860	19,000	11,900	17,300	26,000	18,000	6,400	3,100	2,410
20	1,930	6,630	10,700	6,860	19,000	11,600	18,000	26,400	17,600	6,170	3,100	2,410
21	1,930	9,110	10,400	6,630	18,600	10,700	18,600	26,000	17,000	5,950	3,100	2,410
22	1,930	10,400	9,890	6,400	18,600	10,700	19,000	25,600	16,400	5,950	3,100	2,410
23	1,930	11,000	9,370	6,170	17,600	10,400	19,700	24,800	15,800	5,730	3,100	2,410
24	1,860	11,300	9,110	5,950	17,000	9,890	20,400	24,000	15,200	5,510	3,100	2,410
25	1,860	11,300	8,850	5,730	16,700	9,630	21,100	23,300	15,200	5,290	3,100	2,410
26	1,860	11,000	8,590	5,510	16,100	9,370	21,100	22,500	14,600	5,290	2,920	2,410
27	1,860	11,000	8,330	5,510	15,400	9,110	22,500	22,500	14,000	5,070	2,920	2,410
28	1,860	10,400	8,330	5,290	14,600	8,850	24,000	22,500	13,400	5,070	2,750	2,410
29	1,860	9,890	8,330	5,070	-------	8,330	26,400	22,900	12,800	4,860	2,750	2,410
30	1,860	9,630	9,370	5,070	-------	8,080	26,800	24,000	12,200	4,650	2,750	2,410
31	1,860	-------	10,400	4,650	-------	7,830	-------	24,800	-------	4,650	2,750	-------

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for the period Oct. 1, 1896, to Mar. 31, 1904, and for the year ending Sept. 30, 1921—Con.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1898–99.												
1	2,410	2,750	3,100	3,460	10,700	6,400	5,950	20,400	28,000	19,300	6,400	3,460
2	2,410	2,750	3,100	3,650	10,400	6,400	6,170	20,000	28,000	19,000	6,400	3,460
3	2,410	2,750	3,100	3,840	9,890	6,400	6,400	19,700	27,200	18,300	6,400	3,460
4	2,410	2,750	3,100	3,840	9,630	6,170	6,400	19,000	27,200	17,600	6,170	3,460
5	2,410	2,920	3,100	3,840	9,370	5,950	6,630	18,300	28,000	17,000	6,170	3,460
6	2,410	2,920	3,100	3,840	8,850	5,950	6,860	18,000	28,400	16,400	5,950	3,460
7	2,410	3,100	2,920	3,840	8,590	5,950	7,100	17,300	28,000	15,800	5,730	3,460
8	2,410	3,100	2,920	3,650	8,330	5,950	7,830	17,600	27,600	15,200	5,510	3,460
9	2,410	3,100	2,920	3,650	8,080	5,950	7,830	18,300	27,200	14,600	5,290	3,460
10	2,410	3,100	2,750	3,650	7,830	6,170	8,850	20,400	26,000	14,200	5,290	3,460
11	2,410	3,100	2,750	3,650	7,580	6,400	9,370	21,800	25,600	13,600	5,070	3,460
12	2,410	3,100	2,750	3,650	7,340	6,400	10,400	23,300	24,800	13,400	4,860	3,280
13	2,410	3,100	2,750	3,650	7,100	6,400	12,800	25,200	25,200	13,000	4,650	3,280
14	2,410	3,100	2,750	3,650	6,860	6,400	14,800	26,400	24,800	12,800	4,650	3,280
15	2,410	3,100	2,750	3,840	6,860	6,400	16,400	27,200	24,800	12,400	4,440	3,280
16	2,410	3,100	2,750	3,840	6,630	6,400	16,700	27,200	24,800	11,600	4,240	3,280
17	2,410	3,100	2,580	3,840	6,630	6,400	17,600	26,400	24,000	11,300	4,240	3,280
18	2,410	3,100	2,580	3,840	6,400	6,400	18,300	26,000	24,000	11,000	4,240	3,280
19	2,410	3,100	2,580	3,840	6,400	6,170	19,000	25,600	24,400	9,890	4,240	3,100
20	2,410	3,100	2,580	4,240	6,630	5,950	19,300	24,800	24,400	9,370	4,240	3,100
21	2,580	3,100	2,580	4,650	6,860	5,950	19,300	24,400	24,400	9,110	4,240	3,100
22	2,580	3,100	2,750	4,950	6,860	6,170	19,000	23,600	24,000	8,850	4,240	3,100
23	2,580	3,100	2,580	8,330	6,630	6,170	19,000	23,600	23,600	8,330	4,240	3,100
24	2,580	3,100	2,580	9,890	6,630	6,170	19,000	23,600	23,300	8,080	3,840	3,100
25	2,580	3,100	2,580	11,000	6,630	6,170	19,000	24,400	22,900	7,830	3,840	2,920
26	2,580	3,100	2,580	11,000	6,630	6,170	19,000	25,600	22,500	7,580	3,840	2,920
27	2,580	3,100	2,580	11,000	6,400	5,950	19,700	26,400	21,100	7,340	3,840	2,920
28	2,580	3,100	2,580	11,000	6,400	5,950	20,400	28,000	20,400	6,860	3,840	2,920
29	2,750	3,100	2,750	11,000	-------	5,950	20,700	28,900	20,000	6,630	3,840	2,750
30	2,750	3,100	2,750	11,000	-------	5,950	20,700	28,900	19,700	6,400	3,650	2,750
31	2,750	-------	3,460	11,000	-------	5,950	-------	28,900	-------	6,400	3,460	-------
1899–1900.												
1	2,750	3,460	6,860	8,590	10,700	6,860	15,800	13,400	10,400	5,510	2,750	2,250
2	2,750	3,460	8,080	8,590	10,400	6,630	15,400	13,400	9,890	5,290	2,750	2,250
3	2,750	3,460	9,370	8,590	9,890	6,630	15,400	13,400	9,890	5,070	2,750	2,250
4	2,750	3,460	10,200	8,330	9,370	6,860	15,400	13,400	9,370	5,070	2,750	2,250
5	2,750	3,460	10,400	8,330	9,370	6,860	15,800	13,000	9,110	5,070	2,750	2,250
6	2,580	3,460	10,400	8,590	8,850	6,860	15,800	13,000	8,850	4,860	2,580	2,250
7	2,580	3,460	10,400	8,590	8,590	7,340	16,400	13,400	8,850	4,650	2,580	2,090
8	2,750	3,460	9,890	8,850	8,330	8,080	16,700	13,400	8,330	4,650	2,580	2,090
9	2,750	3,460	9,890	8,850	7,830	9,370	17,000	13,400	8,330	4,650	2,410	2,090
10	2,580	3,460	9,630	8,850	7,830	10,700	17,000	13,400	8,080	4,440	2,410	2,090
11	2,580	3,460	9,110	9,370	7,580	11,600	17,000	13,400	7,830	4,240	2,410	2,090
12	2,580	3,280	8,850	9,630	7,340	12,400	17,000	13,400	7,580	4,240	2,410	2,090
13	2,580	3,280	8,850	10,200	7,340	13,400	17,000	13,400	7,340	4,240	2,410	2,090
14	2,580	3,280	8,590	12,400	7,100	14,000	16,400	13,600	7,100	4,040	2,410	2,090
15	2,580	3,280	8,330	14,600	6,860	14,600	16,400	13,600	6,860	3,840	2,410	2,090
16	2,580	3,280	8,330	15,400	6,630	14,800	16,400	13,600	6,630	3,840	2,410	2,090
17	2,580	3,280	7,830	15,800	6,400	15,200	15,800	13,600	6,630	3,840	2,410	2,010
18	2,580	3,280	7,340	15,800	6,170	15,200	15,800	13,600	6,400	3,650	2,250	2,010
19	2,580	3,650	7,100	15,800	5,950	15,200	15,400	13,600	6,630	3,460	2,250	2,010
20	2,750	3,650	6,860	15,400	5,950	15,200	15,400	13,600	6,630	3,460	2,250	2,010
21	2,750	3,840	6,630	15,400	5,950	15,200	15,400	13,400	6,400	3,460	2,250	2,090
22	2,920	4,240	6,400	15,200	5,950	15,400	15,400	13,400	6,400	3,460	2,250	2,090
23	3,100	4,240	6,400	14,800	6,170	15,800	15,200	13,400	6,400	3,280	2,250	2,090
24	3,100	4,440	6,630	14,600	6,170	15,800	15,200	12,800	6,170	3,280	2,090	2,090
25	3,280	4,440	7,340	14,000	6,400	15,800	15,200	12,200	6,170	3,100	2,090	2,090
26	3,460	4,440	8,080	13,600	6,400	15,800	14,800	12,200	5,950	3,100	2,090	2,250
27	3,460	4,650	8,850	13,400	6,400	16,400	14,600	11,600	5,950	3,100	2,250	2,250
28	3,460	4,650	9,110	12,800	6,630	16,400	14,600	11,300	5,730	3,100	2,250	2,410
29	3,460	5,070	9,110	12,400	-------	16,400	14,000	11,000	5,510	2,920	2,250	2,410
30	3,460	5,730	8,850	11,600	-------	16,100	13,400	10,700	5,510	2,920	2,250	2,410
31	3,460	-------	8,590	11,000	-------	15,800	-------	10,400	-------	2,750	2,250	-------

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for the period Oct. 1, 1896, to Mar. 31, 1904, and for the year ending Sept. 30, 1921—Con.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1900–1901.												
1	2,410	4,040	5,950	11,600	7,830	10,400	11,000	13,000	19,700	9,110	4,040	2,580
2	2,410	4,240	5,950	11,000	7,340	12,800	11,000	14,000	19,000	8,850	3,840	2,580
3	2,250	4,240	6,400	10,400	7,340	15,200	10,700	14,600	18,300	8,850	3,840	2,580
4	2,250	4,860	6,630	10,200	6,860	17,300	10,400	15,800	18,000	8,590	3,840	2,580
5	2,250	5,290	7,340	9,890	6,630	18,600	10,400	16,700	17,300	8,330	3,650	2,580
6	2,250	5,510	7,830	9,370	6,400	19,000	10,400	17,300	16,700	8,080	3,650	2,410
7	2,250	5,730	8,590	9,110	6,170	19,000	10,200	17,600	16,100	7,830	3,650	2,410
8	2,410	5,730	9,370	8,850	5,950	19,000	9,890	18,300	15,400	7,830	3,460	2,410
9	2,410	5,730	9,630	8,330	5,950	18,300	9,890	18,600	14,800	7,580	3,460	2,410
10	2,410	5,730	9,890	8,080	5,730	17,600	9,630	19,000	14,600	7,340	3,460	2,410
11	2,410	5,730	9,890	8,080	5,510	17,300	9,370	19,300	14,000	7,340	3,460	2,410
12	2,410	5,510	9,890	7,830	5,510	16,700	9,370	19,700	13,400	6,860	3,280	2,410
13	2,410	5,510	9,890	7,580	5,070	16,400	9,370	19,700	12,800	6,860	3,100	2,410
14	2,410	5,510	9,890	8,590	5,070	15,400	9,630	19,700	12,400	6,400	3,100	2,410
15	2,410	5,510	9,630	9,890	5,070	14,800	10,200	20,400	12,200	6,170	3,100	2,410
16	2,410	5,290	9,630	11,000	5,510	14,600	10,400	20,700	11,900	6,170	3,100	2,410
17	2,410	5,070	9,630	11,600	5,950	14,000	10,400	21,100	11,600	5,950	2,920	2,410
18	2,410	5,290	9,630	11,600	7,580	13,600	10,400	21,800	11,600	5,510	2,920	2,410
19	2,410	5,510	9,630	11,600	8,330	13,400	10,700	22,200	11,300	5,510	2,750	2,410
20	2,410	5,510	9,890	11,600	8,850	12,800	11,000	22,200	11,300	5,510	2,750	2,410
21	2,410	5,510	10,400	11,000	8,850	12,800	11,000	22,200	11,000	5,290	2,750	2,410
22	2,750	5,510	11,600	10,700	8,850	12,400	11,300	21,800	11,000	5,070	2,750	2,410
23	3,100	5,510	12,800	10,400	8,850	12,400	11,600	21,100	11,000	5,070	2,750	2,410
24	3,280	5,290	14,000	9,890	8,850	12,400	12,200	21,100	10,400	4,860	2,750	2,410
25	3,460	5,290	14,200	9,890	8,850	12,200	12,200	20,700	10,400	4,650	2,750	2,410
26	3,650	5,290	14,200	9,370	8,850	12,200	12,800	20,400	10,200	4,650	2,750	2,410
27	3,840	5,510	14,000	9,370	8,850	12,200	12,800	20,400	9,890	4,650	2,750	2,410
28	3,840	5,510	13,400	8,850	9,630	11,900	12,800	20,400	9,890	4,440	2,750	2,410
29	3,840	5,510	13,000	8,590	-------	11,600	12,800	20,400	9,890	4,240	2,750	2,410
30	4,040	5,510	12,800	8,330	-------	11,600	12,800	20,400	9,370	4,240	2,750	2,410
31	4,040	-------	12,200	7,830	-------	11,300	-------	20,400	-------	4,240	2,750	-------
1901–2.												
1	2,410	2,250	4,240	5,070	5,070	8,590	6,170	12,200	24,000	8,330	6,400	3,100
2	2,410	2,250	4,240	5,070	4,860	8,850	6,170	12,200	23,300	7,830	6,400	2,920
3	2,410	2,250	4,240	5,070	4,650	8,850	6,170	12,200	22,500	7,830	5,950	2,750
4	2,410	2,410	4,240	5,070	4,650	8,850	6,170	12,200	21,800	8,330	5,950	2,750
5	2,410	2,410	4,440	5,070	4,650	8,850	6,400	12,200	21,100	8,850	5,510	2,750
6	2,410	2,410	4,650	5,070	4,440	8,850	6,400	12,200	20,000	12,200	5,510	2,750
7	2,410	2,410	4,650	5,290	4,240	8,850	6,860	12,200	18,000	13,400	5,290	2,750
8	2,410	2,410	4,650	5,730	4,240	8,590	7,100	12,800	17,600	14,800	5,290	2,750
9	2,410	2,410	4,650	6,630	4,240	8,590	7,830	13,400	17,000	15,200	4,860	2,750
10	2,410	2,410	4,650	7,340	4,240	8,590	8,590	14,000	16,400	15,400	4,650	2,750
11	2,410	2,410	4,650	7,830	4,240	8,590	9,110	15,200	15,800	15,200	4,650	2,580
12	2,410	2,410	4,650	8,590	4,240	8,590	9,370	15,800	15,800	15,200	4,650	2,580
13	2,410	2,410	4,650	8,590	4,240	8,590	9,370	16,400	15,200	14,600	4,440	2,580
14	2,410	2,410	4,650	8,590	4,240	8,590	9,370	17,000	15,200	14,000	4,240	2,580
15	2,410	2,410	4,440	8,590	4,240	8,850	9,370	17,600	14,600	13,600	4,240	2,580
16	2,410	2,410	4,240	8,330	4,240	8,590	9,370	18,300	14,200	13,000	4,240	2,410
17	2,410	2,410	4,240	8,330	4,240	8,330	9,370	19,000	13,600	12,800	4,040	2,410
18	2,410	2,410	4,240	7,830	4,650	8,330	9,370	19,700	12,800	12,200	3,840	2,410
19	2,410	2,410	4,040	7,580	5,290	8,080	9,630	20,000	12,200	11,600	3,840	2,410
20	2,250	2,410	3,840	7,580	5,950	7,830	10,200	20,000	12,200	11,000	3,840	2,410
21	2,250	2,410	3,840	7,340	6,400	7,830	11,000	20,400	11,600	10,400	3,650	2,410
22	2,250	2,410	3,840	7,100	6,860	7,830	11,600	20,700	11,300	9,890	3,650	2,410
23	2,250	2,410	3,840	6,860	7,100	7,340	11,900	21,800	11,000	9,630	3,650	2,410
24	2,250	3,100	4,040	6,860	7,100	7,340	12,200	23,300	10,400	9,370	3,650	2,410
25	2,090	3,280	4,650	6,400	7,340	7,340	12,200	24,400	10,200	9,110	3,460	2,410
26	2,090	3,650	5,070	6,170	7,830	7,100	12,400	24,800	9,890	8,590	3,460	2,410
27	2,090	3,840	5,070	5,950	8,080	6,860	12,200	24,800	9,370	8,080	3,460	2,410
28	2,090	3,840	5,070	5,510	8,330	6,860	12,200	24,400	9,110	7,830	3,280	2,410
29	2,250	3,840	5,290	5,510	-------	6,630	12,200	24,400	8,850	7,580	3,100	2,410
30	2,250	4,040	5,070	5,070	-------	6,400	12,200	24,400	8,330	7,340	3,100	2,410
31	2,250	-------	5,070	5,070	-------	6,400	-------	24,400	-------	6,860	3,100	-------

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for the period Oct. 1, 1896, to Mar. 31, 1904, and for the year ending Sept. 30, 1921—Con.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1902-3.												
1	2,410	2,250	4,650	5,070	10,700	4,650	11,500	19,300	18,600	11,500	4,550	2,260
2	2,410	2,250	4,650	5,510	10,200	4,650	12,600	19,300	19,600	11,000	4,350	2,260
3	2,410	2,250	4,650	5,730	9,890	4,650	13,200	18,900	20,600	10,700	4,350	2,260
4	2,410	2,410	4,650	7,340	9,370	4,650	13,800	18,900	21,700	10,200	4,160	2,260
5	2,410	2,410	4,650	9,890	8,850	4,650	13,800	18,300	23,100	9,890	3,970	2,260
6	2,410	2,410	4,650	11,900	8,330	4,650	13,800	18,300	23,900	9,890	3,970	2,260
7	2,410	2,410	4,650	12,800	8,330	4,650	13,800	19,300	23,900	9,370	3,970	2,260
8	2,410	2,410	4,650	13,000	7,830	4,440	13,500	19,600	23,900	8,870	3,780	2,260
9	2,410	2,580	4,650	13,000	7,830	4,240	13,200	20,300	23,100	8,620	3,600	2,260
10	2,250	3,100	4,650	12,800	7,830	4,240	13,200	20,600	23,100	8,370	3,600	2,260
11	2,250	3,650	5,070	12,800	7,340	4,240	13,200	20,600	23,100	8,370	3,600	2,260
12	2,250	3,840	5,070	12,200	7,100	4,240	12,600	20,300	22,800	7,870	3,420	2,260
13	2,250	4,040	5,510	11,600	6,630	4,240	12,400	20,000	22,400	7,870	3,250	2,260
14	2,250	4,240	5,730	11,600	6,400	4,650	11,500	19,600	21,700	7,380	3,250	2,260
15	2,250	4,240	5,950	11,000	6,400	4,650	11,500	20,300	21,000	7,380	3,250	2,260
16	2,250	4,440	5,730	10,200	6,170	4,650	11,000	21,000	20,600	6,920	3,080	2,260
17	2,250	4,440	5,510	9,890	5,950	4,650	11,000	22,100	20,300	6,920	3,080	2,260
18	2,090	4,650	5,510	9,890	5,730	4,650	11,000	22,400	19,600	6,470	2,910	2,260
19	2,090	4,860	5,510	9,110	5,510	4,650	11,500	22,400	19,600	6,470	2,910	2,260
20	2,090	5,290	5,070	8,850	5,510	4,650	11,500	22,400	18,600	6,030	2,910	2,260
21	2,090	5,290	5,070	8,850	5,510	4,650	11,800	21,700	17,600	6,030	2,580	2,260
22	2,010	5,070	5,070	8,330	5,510	4,650	12,100	21,000	16,900	5,590	2,580	2,260
23	2,010	5,070	5,070	8,330	5,070	4,650	12,900	20,300	16,300	5,590	2,580	2,260
24	2,010	5,070	4,860	8,080	5,070	4,860	13,800	19,600	15,700	5,590	2,260	2,260
25	1,930	5,070	4,650	8,330	5,070	5,070	14,400	18,900	15,000	5,370	2,260	2,260
26	1,930	5,070	4,650	9,890	4,860	5,290	15,000	18,900	14,400	5,160	2,260	2,260
27	1,930	4,650	4,650	11,000	4,860	5,730	16,000	18,600	13,800	4,950	2,260	2,260
28	2,090	4,650	4,650	11,000	4,650	6,400	17,600	18,300	13,200	4,950	2,260	2,260
29	2,090	4,650	4,860	11,000	-------	7,340	18,300	18,300	12,600	4,750	2,260	2,260
30	2,090	4,650	5,070	11,000	-------	8,850	19,300	18,300	12,100	4,750	2,260	2,100
31	2,090	-------	5,070	11,000	-------	11,000	-------	18,300	-------	4,550	2,260	-------
1903-4.												
1	2,100	2,910	5,160	5,590	4,350	4,750	-------	-------	-------	-------	-------	-------
2	2,100	2,910	5,810	5,590	4,350	4,750	-------	-------	-------	-------	-------	-------
3	2,100	2,910	6,470	5,590	4,350	4,750	-------	-------	-------	-------	-------	-------
4	2,100	2,910	7,150	5,370	4,160	4,750	-------	-------	-------	-------	-------	-------
5	2,100	2,910	7,620	5,160	4,160	4,750	-------	-------	-------	-------	-------	-------
6	2,260	2,910	7,870	5,160	4,160	5,160	-------	-------	-------	-------	-------	-------
7	2,260	2,910	7,870	5,160	4,160	5,160	-------	-------	-------	-------	-------	-------
8	2,260	2,910	7,620	5,160	3,970	6,030	-------	-------	-------	-------	-------	-------
9	2,260	3,600	7,620	4,950	3,970	7,620	-------	-------	-------	-------	-------	-------
10	2,260	3,970	7,620	4,750	3,970	9,630	-------	-------	-------	-------	-------	-------
11	2,260	3,970	7,620	4,750	3,970	11,000	-------	-------	-------	-------	-------	-------
12	2,260	4,160	7,620	4,750	3,970	11,500	-------	-------	-------	-------	-------	-------
13	2,420	4,350	7,150	4,750	3,970	11,500	-------	-------	-------	-------	-------	-------
14	2,580	4,350	6,920	4,750	3,970	11,500	-------	-------	-------	-------	-------	-------
15	2,580	4,350	6,920	4,950	3,780	11,500	-------	-------	-------	-------	-------	-------
16	2,580	4,350	6,690	5,160	3,780	11,500	-------	-------	-------	-------	-------	-------
17	2,580	4,350	6,470	4,550	3,970	11,500	-------	-------	-------	-------	-------	-------
18	2,580	4,350	6,470	4,750	3,970	11,000	-------	-------	-------	-------	-------	-------
19	2,580	4,160	6,470	4,950	3,970	10,400	-------	-------	-------	-------	-------	-------
20	2,580	4,160	6,470	5,160	3,970	10,700	-------	-------	-------	-------	-------	-------
21	2,580	4,160	6,470	5,160	3,970	10,700	-------	-------	-------	-------	-------	-------
22	2,580	4,160	6,470	5,160	3,970	10,700	-------	-------	-------	-------	-------	-------
23	2,580	4,350	6,470	5,160	3,970	10,400	-------	-------	-------	-------	-------	-------
24	2,420	4,550	6,470	5,160	3,970	10,200	-------	-------	-------	-------	-------	-------
25	2,420	4,750	6,470	5,160	4,160	9,890	-------	-------	-------	-------	-------	-------
26	2,420	4,750	6,250	4,950	4,350	9,630	-------	-------	-------	-------	-------	-------
27	2,580	4,950	6,250	4,750	4,350	9,370	-------	-------	-------	-------	-------	-------
28	3,080	4,950	6,030	4,750	4,550	8,870	-------	-------	-------	-------	-------	-------
29	2,910	4,950	6,030	4,750	4,750	8,870	-------	-------	-------	-------	-------	-------
30	2,910	5,160	6,030	4,750	-------	8,870	-------	-------	-------	-------	-------	-------
31	2,910	-------	5,590	4,550	-------	8,370	-------	-------	-------	-------	-------	-------

Daily discharge, in second-feet, of Spokane River at Spokane, Wash., for the period Oct. 1, 1896, to Mar. 31, 1904, and for the year ending Sept. 30, 1921—Con.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920–21.												
1	1,650	2,560	7,150	9,620	6,460	10,200	17,100	19,000	20,600	4,790	1,870	1,740
2	1,630	2,580	6,950	10,800	6,260	10,400	16,800	18,800	19,600	4,570	1,750	1,770
3	1,550	2,540	6,780	11,600	6,180	10,800	16,800	18,500	19,000	3,780	1,770	1,670
4	1,720	2,380	6,620	12,500	6,000	11,100	16,800	18,800	18,800	3,420	1,830	1,630
5	1,930	2,220	6,390	13,000	5,820	11,400	16,600	18,800	18,200	2,910	1,960	1,550
6	2,050	2,180	4,980	13,200	5,640	11,900	16,600	18,800	17,600	2,480	1,910	1,560
7	2,300	2,070	3,780	13,200	5,450	12,200	16,300	19,000	17,100	2,480	1,950	1,590
8	2,770	2,070	3,730	12,800	5,260	12,400	15,800	19,600	16,600	2,460	1,910	1,640
9	2,660	2,060	3,700	12,600	5,120	12,600	15,300	20,600	16,300	2,410	1,900	1,590
10	2,360	2,100	4,300	12,200	4,990	12,600	14,800	22,000	15,500	2,330	1,880	1,560
11	2,820	2,160	5,950	11,600	5,370	12,200	14,500	22,500	15,000	2,380	1,880	1,480
12	4,060	2,060	5,760	11,100	6,360	12,200	14,300	23,000	14,500	2,360	1,880	1,480
13	4,180	2,000	5,680	10,600	7,980	12,000	14,300	23,600	13,800	2,410	1,770	1,640
14	4,120	1,900	5,320	10,300	9,960	11,900	14,800	23,500	13,300	2,410	1,750	1,640
15	4,130	1,880	4,020	10,000	11,500	11,600	15,500	23,500	12,800	2,250	1,790	1,720
16	4,140	1,960	2,670	9,600	12,800	11,600	15,800	23,800	12,300	2,250	1,770	1,750
17	4,100	2,500	2,850	9,120	13,400	11,600	15,800	24,500	11,900	2,170	1,790	1,720
18	3,840	2,760	3,920	9,090	13,500	13,200	16,000	24,800	11,000	2,030	1,710	1,710
19	3,240	3,660	3,930	9,000	13,500	15,800	16,300	25,600	10,100	1,880	1,670	1,850
20	3,040	4,640	3,140	8,960	13,400	17,900	16,800	25,900	7,020	1,720	1,640	1,650
21	3,040	5,790	3,150	8,740	12,900	19,000	17,400	26,200	4,340	1,470	1,640	1,610
22	3,080	7,670	3,440	8,580	12,600	19,300	17,900	25,900	3,560	1,640	1,740	1,640
23	2,960	8,220	3,260	8,320	12,200	19,300	18,800	25,600	3,280	1,720	1,720	1,640
24	2,810	8,170	3,310	8,120	11,600	19,000	19,900	25,600	3,080	1,770	1,670	1,660
25	2,470	8,130	2,540	7,850	11,400	18,500	20,900	24,800	3,280	1,870	1,690	1,660
26	2,300	7,920	2,480	7,580	10,800	18,800	21,200	24,500	3,560	1,740	1,720	1,630
27	2,680	7,920	2,320	7,380	10,600	18,800	21,200	24,200	3,970	1,690	1,800	1,610
28	2,460	7,730	2,550	7,200	10,400	18,500	20,900	23,800	4,160	1,690	1,740	1,550
29	2,500	7,560	3,850	6,900	-------	17,900	20,200	23,200	3,680	1,720	1,640	1,640
30	2,730	7,360	5,870	6,760	-------	17,600	19,600	22,200	4,020	1,750	1,710	1,660
31	2,690	-------	7,460	6,640	-------	17,400	-------	21,500	-------	1,750	1,690	-------

NOTE.—Discharge records in the tables above, for the period Oct. 1, 1896, to Mar. 31, 1904, supersede previously published records.

Year ending Sept. 30, 1921: Water-stage recorder at steam plant not operating May 10–13; discharge determined from records at Cochrane Street station. Recorder at Cochrane Street not operating July 6–8, 11, 12, 19, and Sept. 20–21; discharge determined from records at steam-plant station.

Monthly discharge of Spokane River at Spokane, Wash., for the years ending Sept. 30, 1891–1904, and 1921.

[Drainage area, 4,350 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1891.						
April	11,700	2,740	6,700	1.54	1.72	399,000
May	12,300	8,460	11,100	2.55	2.94	682,000
June	8,720	3,960	5,640	1.30	1.45	336,000
July	3,960	1,860	3,010	.692	.80	185,000
August	1,860	----------	1,660	.382	.44	102,000
September	----------	----------	1,560	.359	.40	92,800
The period						1,800,000
1891–92.						
October	----------	----------	1,510	.347	.40	92,800
November	3,070	1,500	2,680	.616	.69	159,000
December	3,600	3,070	3,530	.811	.94	217,000
January	3,600	2,740	2,980	.685	.79	183,000
February	4,340	2,900	3,160	.726	.78	182,000
March	11,200	4,540	8,480	1.95	2.25	521,000
April	10,600	8,460	9,210	2.12	2.36	548,000
May	21,800	10,300	15,000	3.45	3.98	922,000
June	21,800	10,300	15,900	3.66	4.08	946,000
July	9,760	3,600	6,540	1.50	1.73	402,000
August	----------	----------	2,940	.676	.78	181,000
September	----------	1,300	1,600	.368	.41	95,200
The year	21,800	1,300	6,140	1.41	19.19	4,450,000

Monthly discharge of Spokane River at Spokane, Wash., for the years ending Sept. 30, 1891–1904, and 1921—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1892–93.						
October	1,300	1,300	1,300	0.299	0.34	79,900
November	2,430	1,300	1,580	.363	.40	94,000
December	2,900	2,280	2,690	.618	.71	165,000
January	3,600	2,430	3,060	.703	.81	188,000
February	2,430	1,990	2,090	.480	.50	116,000
March	4,740	1,990	2,400	.552	.64	148,000
April	15,500	5,360	11,000	2.53	2.82	655,000
May	37,500	16,100	25,100	5.77	6.65	1,540,000
June	23,400	13,200	19,400	4.46	4.98	1,150,000
July	12,900	4,540	8,380	1.93	2.22	515,000
August	4,340	1,860	3,140	.722	.83	193,000
September	1,860	1,400	1,530	.352	.39	91,000
The year	37,500	1,300	6,820	1.57	21.29	4,930,000
1893–94.						
October	4,740	1,500	3,810	.876	1.01	234,000
November	8,460	3,960	5,950	1.37	1.53	354,000
December	8,980	3,960	6,250	1.44	1.66	384,000
January	10,600	3,780	6,640	1.53	1.76	408,000
February	5,800	2,280	3,430	.789	.82	190,000
March	6,520	2,280	3,230	.743	.86	199,000
April	22,200	7,720	14,800	3.40	3.79	881,000
May	49,000	22,200	28,900	6.64	7.66	1,789,000
June	47,600	16,400	29,900	6.87	7.66	1,780,000
July	16,100	6,760	10,400	2.39	2.76	640,000
August	6,520	2,740	4,360	1.00	1.15	268,000
September	2,740	2,280	2,380	.547	.61	142,000
The year	49,000	1,500	10,000	2.30	31.27	7,260,000
1894–95.						
October	3,070	2,130	2,350	.540	.62	144,000
November	5,140	3,240	4,370	1.00	1.12	260,000
December	5,580	3,420	4,670	1.07	1.23	287,000
January	7,480	2,900	5,090	1.17	1.35	313,000
February	8,200	3,420	4,520	1.04	1.08	251,000
March	9,240	5,800	7,350	1.69	1.95	452,000
April	14,800	7,000	10,100	2.32	2.59	601,000
May	17,100	11,700	14,400	3.31	3.82	885,000
June	11,700	5,360	8,120	1.87	2.09	483,000
July	4,940	2,280	3,390	.779	.90	208,000
August	2,280	1,500	1,790	.411	.47	110,000
September	1,500	1,300	1,350	.310	.35	80,300
The year	17,100	1,300	5,630	1.29	17.57	4,070,000
1895–96.						
October	1,300	1,300	1,300	.299	.34	79,900
November	1,610	1,300	1,470	.338	.38	87,500
December	2,280	1,860	2,050	.471	.54	126,000
January	6,520	2,280	3,800	.874	1.01	234,000
February	12,600	6,520	7,070	1.63	1.76	407,000
March	17,100	10,900	12,700	2.92	3.37	781,000
April	17,100	13,900	15,400	3.54	3.95	916,000
May	18,800	15,800	17,000	3.91	4.51	1,050,000
June	21,400	18,800	20,300	4.67	5.21	1,210,000
July	18,100	4,940	9,960	2.29	2.64	612,000
August	4,740	2,430	3,490	.802	.92	215,000
September	2,280	1,730	2,030	.467	.52	121,000
The year	21,400	1,300	8,030	1.85	25.15	5,840,000
1896–97.						
October	1,860	1,500	1,600	.368	.42	98,400
November	13,400	1,780	6,630	1.52	1.70	395,000
December	17,000	8,330	12,800	2.94	3.39	787,000
January	10,700	6,400	7,870	1.81	2.09	484,000
February	6,860	5,070	6,000	1.38	1.44	333,000
March	8,330	4,240	5,180	1.19	1.37	319,000
April	33,900	8,850	20,100	4.62	5.16	1,200,000
May	30,900	21,100	27,400	6.30	7.26	1,680,000
June	20,400	9,630	12,500	2.87	3.20	744,000
July	9,370	5,070	7,790	1.79	2.06	479,000
August	5,070	2,580	3,580	.823	.95	220,000
September	2,750	2,250	2,450	.563	.63	146,000
The year	33,900	1,500	9,510	2.19	29.67	6,890,000

Monthly discharge of Spokane River at Spokane, Wash., for the years ending Sept. 30, 1891–1904, and 1921—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1897–98.						
October	2,250	1,860	1,970	0.453	0.52	121,000
November	11,300	1,860	5,480	1.26	1.41	326,000
December	12,200	8,080	10,000	2.30	2.65	615,000
January	11,300	4,650	7,900	1.82	2.10	486,000
February	19,000	4,440	11,100	2.55	2.66	616,000
March	14,200	7,830	12,000	2.76	3.18	738,000
April	26,800	7,340	14,500	3.33	3.72	863,000
May	27,200	22,500	24,800	5.70	6.57	1,520,000
June	25,200	12,200	19,100	4.39	4.90	1,140,000
July	11,600	4,650	7,320	1.68	1.94	450,000
August	4,650	2,750	3,470	.798	.92	213,000
September	2,750	2,410	2,460	.566	.63	146,000
The year	27,200	1,860	9,990	2.30	31.20	7,230,000
1898–99.						
October	2,750	2,410	2,490	.572	.66	153,000
November	3,100	2,750	3,040	.699	.78	181,000
December	3,460	2,580	2,800	.644	.74	172,000
January	11,000	3,460	5,840	1.34	1.54	359,000
February	10,700	6,400	7,610	1.75	1.82	423,000
March	6,400	5,950	6,170	1.42	1.64	379,000
April	20,700	5,950	14,000	3.22	3.59	833,000
May	28,900	17,300	23,500	5.40	6.23	1,440,000
June	28,400	19,700	24,800	5.70	6.36	1,480,000
July	19,300	6,400	11,900	2.74	3.16	732,000
August	6,400	3,460	4,740	1.09	1.26	291,000
September	3,460	2,750	3,230	.743	.83	192,000
The year	28,900	2,410	9,170	2.11	28.61	6,640,000
1899–1900.						
October	3,460	2,580	2,870	.660	.76	176,000
November	5,730	3,280	3,800	.874	.98	226,000
December	10,400	6,400	8,460	1.94	2.24	520,000
January	15,880	8,330	11,900	2.74	3.16	732,000
February	10,700	5,950	7,450	1.71	1.78	414,000
March	16,400	6,630	12,700	2.92	3.37	781,000
April	17,000	13,400	15,700	3.61	4.03	934,000
May	13,600	10,400	12,900	2.97	3.42	793,000
June	10,400	5,510	7,360	1.69	1.89	438,000
July	5,510	2,750	3,950	.908	1.05	243,000
August	2,750	2,090	2,390	.549	.63	147,000
September	2,410	2,010	2,150	.494	.55	128,000
The year	17,000	2,010	7,640	1.76	23.86	5,530,000
1900–1901.						
October	4,040	2,250	2,250	.634	.73	170,000
November	5,730	4,040	5,330	1.23	1.37	317,000
December	14,200	5,950	10,300	2.37	2.73	633,000
January	11,600	7,580	9,690	2.23	2.57	596,000
February	9,630	5,070	7,150	1.64	1.71	397,000
March	19,000	10,400	14,500	3.33	3.84	892,000
April	12,800	9,370	10,900	2.51	2.80	649,000
May	22,200	13,000	19,400	4.46	5.14	1,190,000
June	19,700	9,370	13,200	3.03	3.38	786,000
July	9,110	4,240	6,320	1.45	1.67	389,000
August	4,040	2,750	3,150	.724	.83	194,000
September	2,580	2,410	2,440	.561	.63	145,000
The year	22,200	2,250	8,780	2.02	27.40	6,360,000
1901–2.						
October	2,410	2,090	2,330	.536	.62	143,000
November	4,040	2,250	2,680	.616	.69	159,000
December	5,290	3,840	4,490	1.03	1.19	276,000
January	8,590	5,070	6,620	1.52	1.75	407,000
February	8,330	4,240	5,350	1.23	1.28	297,000
March	8,850	6,400	8,060	1.85	2.13	496,000
April	12,400	6,170	9,420	2.17	2.42	561,000
May	24,800	12,200	18,100	4.16	4.80	1,110,000
June	24,000	8,330	14,800	3.40	3.79	881,000
July	15,400	6,860	11,000	2.53	2.92	676,000
August	6,400	3,100	4,370	1.00	1.15	269,000
September	3,100	2,410	2,570	.591	.66	153,000
The year	24,800	2,090	7,500	1.72	23.40	5,430,000

Monthly discharge of Spokane River at Spokane, Wash., for the years ending Sept. 30, 1891–1904, and 1921—Continued.

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1902–3.						
October	2,410	1,930	2,200	0.506	0.58	135,000
November	5,290	2,250	3,910	.899	1.00	233,000
December	5,950	4,650	4,990	1.15	1.33	307,000
January	13,000	5,070	10,000	2.30	2.65	615,000
February	10,700	4,650	6,880	1.58	1.64	382,000
March	11,000	4,240	5,140	1.18	1.36	316,000
April	19,300	11,000	13,400	3.08	3.44	797,000
May	22,400	18,300	19,900	4.57	5.27	1,220,000
June	23,900	12,100	19,300	4.44	4.95	1,150,000
July	11,500	4,550	7,330	1.69	1.95	451,000
August	4,550	2,260	3,150	.724	.83	194,000
September	2,260	2,100	2,250	.517	.58	134,000
The year	23,900	1,930	8,200	1.89	25.58	5,930,000
1903–4.						
October	3,080	2,100	2,460	.566	.65	151,000
November	5,160	2,910	4,000	.920	1.03	238,000
December	7,870	5,160	6,710	1.54	1.78	413,000
January	5,590	4,550	5,010	1.15	1.33	308,000
February	4,750	3,780	4,100	.943	1.02	236,000
March	11,500	4,750	8,880	2.04	2.35	546,000
April	27,900	8,450	18,800	4.32	4.82	1,120,000
May	27,600	18,500	22,100	5.08	5.86	1,360,000
June	18,200	8,660	13,500	3.10	3.46	804,000
July	8,450	3,660	5,710	1.31	1.51	351,000
August	3,500	1,970	2,600	.598	.69	160,000
September	1,970	1,420	1,620	.372	.42	96,200
The year	27,900	1,420	7,970	1.83	24.92	5,780,000
1920–21.						
October	4,180	1,550	2,840			175,000
November	8,220	1,880	4,160			248,000
December	7,460	2,320	4,450			274,000
January	13,200	6,640	9,830			604,000
February	13,500	4,990	9,190			510,000
March	19,300	10,200	14,500			892,000
April	21,200	14,300	17,200			1,020,000
May	26,200	18,500	22,600			1,390,000
June	20,600	3,080	11,300			672,000
July	4,790	1,470	2,330			143,000
August	1,960	1,640	1,780			109,000
September	1,850	1,480	1,640			97,600
The year	26,200	1,470	8,480	1.95	26.47	6,130,000

NOTE.—Records in the above tables for the period April, 1891, to December, 1896, supersede records previously published in Water-Supply Paper 272, pp. 130–131. Records for the period October, 1896, to March, 1904, supersede records previously published in the eighteenth to twenty-second annual reports of the United States Geological Survey, and in water-supply papers 75, 85, 100, and 135. Results for the period April to September, 1904, are the same as those published in Water-Supply Paper 135, p. 51, except that they have been reduced to three significant figures.

Monthly discharge in second-feet per square mile and run-off in inches for year ending Sept. 30, 1921, not published owing to regulation. Yearly figures represent the natural discharge and run-off 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 compiled from best information available.

RECORDS AVAILABLE.—November 5, 1912, to September 20, 1921.

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 during year, from water-stage recorder, 87.0 feet at 9 p. m. May 21 (discharge, 29,300 second-feet). Minimum mean daily discharge, 1,870 second-feet on August 21 when intake to stilling well was closed; determined by means of a curve of relation between gage at station and tailrace gage at Little Falls power plant.

1912–1921: Maximum stage, from water-stage recorder, 90.32 feet at 8.30 p. m. May 18, 1917 (discharge, 41,300 second-feet). Minimum mean daily discharge, 1,720 second-feet September 15, 1918; minimum discharge lower when water was below intake for parts of many days during low-water seasons.

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

DIVERSIONS.—Water is diverted by Spokane Valley Land & Water Co. for irrigation above station.

REGULATIONS.—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, by applying to rating table mean daily gage height determined from recorder graph by inspection, or, during periods of faulty operation of recorder, by applying to rating table mean daily gage height determined from readings on gage in tailrace of Little Falls power plant, by means of curve of relation between that gage and station gage. Records excellent except for period July 11 to September 16, for which they are good.

COOPERATION.—Gage-height record and part of the discharge measurements furnished by Washington Water Power Co.

Discharge measurements of Spokane River below Little Falls, near Long Lake, Wash., during the year ending Sept. 20, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 23	Lee and Logan	79.99	9,200	June 15	McCombs and Collins	81.96	13,700
27	Collins and Ford	86.38	26,700	Sept. 9	Kilgore and Collins	76.05	2,880

Daily discharge, in second-feet, of Spokane River below Little Falls, near Long Lake, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,070	3,480	7,740	9,000	7,880	11,700	19,700	22,200	22,500	5,210	2,530	2,260
2	2,050	3,490	6,840	11,900	7,760	12,400	19,400	21,600	21,300	4,890	2,630	2,260
3	2,210	2,620	7,150	15,800	7,950	13,400	19,400	21,300	21,300	4,260	2,630	2,180
4	2,360	3,130	8,210	15,300	6,240	14,100	19,700	20,600	20,600	3,600	2,630	2,100
5	2,680	3,180	6,200	14,700	6,230	14,000	19,700	20,600	19,700	3,730	2,630	2,180
6	2,670	2,770	6,250	15,000	6,630	13,700	19,400	20,900	19,100	3,030	2,440	2,180
7	2,540	2,380	4,510	12,100	7,030	14,100	19,100	20,900	18,300	2,390	2,100	2,440
8	2,890	3,110	4,250	15,400	6,460	15,200	17,650	20,900	18,800	2,250	2,440	2,180
9	3,230	2,620	4,120	13,900	5,690	15,900	17,000	21,900	18,000	3,020	2,630	2,440
10	3,240	2,400	5,080	13,800	8,840	15,200	17,000	23,200	17,100	2,180	2,530	2,530
11	3,020	2,940	6,140	12,700	13,100	15,200	17,000	24,200	15,900	3,250	2,530	2,180
12	4,810	2,810	5,860	11,900	12,300	14,200	16,400	25,500	15,600	2,630	2,440	2,440
13	4,490	2,810	6,290	11,700	11,800	13,700	15,800	26,500	15,600	3,140	2,440	2,530
14	4,810	2,920	6,760	11,800	14,800	13,800	17,000	25,900	13,800	2,730	1,940	2,440
15	4,320	2,420	5,250	11,000	16,300	14,000	17,800	24,800	13,600	3,250	2,440	2,260
16	4,850	2,610	3,850	10,600	16,000	13,300	17,900	25,500	12,600	2,630	2,530	2,260
17	4,410	3,610	2,830	9,480	16,200	14,600	17,900	26,200	9,610	2,830	2,440	2,340
18	4,310	3,210	3,640	9,760	16,800	19,700	19,400	26,500	9,920	2,630	2,530	2,000
19	4,290	4,100	5,390	10,400	16,700	23,200	19,400	27,600	9,590	2,630	2,530	2,360
20	3,040	4,690	4,770	10,700	16,100	23,200	19,400	27,600	4,110	2,630	2,440	2,480
21	3,670	6,420	3,800	10,400	16,100	23,200	19,700	27,900	2,450	2,530	1,870	2,390
22	3,770	6,730	3,620	9,620	15,300	22,900	20,600	28,200	4,200	2,630	2,530	2,320
23	3,670	8,690	3,620	9,350	14,600	22,900	22,200	28,200	3,490	2,440	2,530	2,360
24	2,990	8,910	3,770	9,710	13,800	22,900	23,200	27,900	4,060	2,100	2,630	2,350
25	3,130	8,370	4,000	9,090	13,900	22,900	23,800	27,600	3,300	2,440	2,440	2,040
26	2,910	8,320	3,550	8,050	13,700	22,500	24,500	27,200	4,100	2,630	2,180	2,330
27	2,920	8,300	2,880	8,140	13,600	22,200	24,500	26,900	4,090	2,440	2,350	2,420
28	3,110	8,030	2,920	8,200	13,100	21,600	24,200	26,500	4,690	2,530	2,100	2,370
29	2,930	8,210	4,090	8,140	-------	20,900	23,800	25,200	4,410	2,530	2,350	2,430
30	3,090	8,250	12,000	7,920	-------	20,000	22,500	24,800	3,940	2,530	2,530	2,430
31	2,900	-------	13,100	8,060	-------	19,700	-------	23,200	-------	2,100	2,530	-------

NOTE.—Water-stage recorder not operating satisfactorily Feb. 13-14 and well intake closed July 11 to Sept. 16; discharge ascertained by means of a curve of relation between gage at station 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, 1921.

[Drainage area, 6,380 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4,850	2,050	3,340	-------	-------	205,000
November	8,910	2,380	4,720	-------	-------	281,000
December	13,100	2,830	5,430	-------	-------	334,000
January	15,800	7,920	11,100	-------	-------	682,000
February	16,800	5,690	12,000	-------	-------	666,000
March	23,200	11,700	17,600	-------	-------	1,080,000
April	24,500	15,800	19,800	-------	-------	1,180,000
May	28,200	20,600	24,800	-------	-------	1,520,000
June	22,500	2,450	11,900	-------	-------	708,000
July	5,210	2,100	2,900	-------	-------	178,000
August	2,630	1,870	2,440	-------	-------	150,000
September	2,530	2,000	2,320	-------	-------	138,000
The year	28,200	1,870	9,840	1.54	20.90	7,120,000

NOTE.—Monthly discharge in second-feet per square mile and run-off in inches not published owing to regulation. Yearly figures represent the natural discharge and run-off 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 compiled from best information available).

RECORDS AVAILABLE.—July 13, 1920, to September 30, 1921. 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; installed December 22, 1920; inspected by C. P. Latham. July 13 to December 21, 1920, vertical staff gage at practically same site and at same datum. Elevation of gage datum 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, 87.5 feet 4 a. m. to 9 a. m. May 8 (discharge, 17,400 second-feet); minimum stage recorded, 79.41 feet at 5 p. m. August 28 (discharge, 390 second-feet).

1911–1912; 1920–1921: Maximum stage recorded on May 8, 1921; minimum stage, 1.6 feet (old station) November 2, 1911 (discharge, 380 second-feet).

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

DIVERSIONS.—None.

REGULATION.—Flash dam at Marble Creek used to store water for flushing logs down river during low water. Water released twice daily during summer and once daily in early autumn. Operation of dam causes diurnal fluctuation at gage of at least 1 foot. Duration of effect about 4 hours.

ACCURACY.—Stage-discharge relation changed November 21; not affected by ice. Rating curve used prior to change, well defined below 2,000 second-feet; curve used subsequent to change, well defined. Staff gage read to tenths twice daily prior to installation of water-stage recorder on December 22. Owing to incomplete intake of well and damaged staff gage, operation of water-stage recorder was not wholly satisfactory during several periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from staff-gage readings prior to December 22, and thereafter by inspection from recorder graph corrected to agree with staff-gage readings. Owing to slight regulation, the mean of two staff-gage readings daily prior to December 22 may not indicate true mean stage. Records fair.

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

Discharge measurements of St. Joe River at Calder, Idaho, during the year ending ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 26	Lee and Logan	81.25	1,880	July 13	E. H. Collins	80.49	1,060
June 8	McCombs and Collins	84.18	6,230	Sept. 5	Kilgore and Collins	79.60	488

Daily discharge, in second-feet, of St. Joe River at Calder, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.
1	1,040	990	1,520	2,940	850	2,940	3,620	6,150	9,100	2,030	661	450
2	1,170	990	1,320	3,010	850	3,540	3,960	8,500	9,100	1,970	685	445
3	1,460	990	1,370	3,460	866	3,160	3,870	8,500	9,400	1,910	589	460
4	1,560	950	1,420	2,530	787	3,700	4,350	8,200	9,400	1,800	655	559
5	1,360	950	1,140	2,660	734	5,050	4,150	9,400	9,100	1,690	685	470
6	1,360	795	1,010	2,270	715	4,550	4,150	11,200	8,500	1,640	625	465
7	1,360	795	1,180	1,910	703	3,870	3,870	15,700	8,200	1,580	515	440
8	1,080	795	1,090	1,740	836	3,460	3,300	16,800	7,650	1,520	485	475
9	1,260	795	1,180	1,580	858	3,160	3,160	15,400	6,650	1,520	589	475
10	1,460	630	1,050	1,420	1,270	3,160	3,010	14,600	5,780	1,320	485	495
11	1,560	660	1,050	1,270	3,540	3,010	3,230	14,000	5,900	1,220	500	495
12	1,360	630	1,010	1,520	4,350	2,730	4,750	11,800	5,550	1,220	480	515
13	1,120	990	930	1,580	5,150	2,270	7,900	12,100	5,250	1,140	530	480
14	1,260	1,170	850	1,320	5,150	2,340	7,900	13,600	4,950	1,050	505	450
15	1,460	760	715	1,470	4,650	2,030	7,650	15,400	4,350	1,010	643	510
16	1,560	870	1,010	1,470	3,700	1,910	6,400	16,800	3,870	1,050	631	480
17	1,560	950	850	1,420	3,230	5,650	5,150	15,700	3,700	1,180	583	485
18	1,170	1,360	815	1,640	2,870	11,500	5,900	16,400	3,460	890	547	485
19	1,120	2,760	780	1,520	2,400	7,900	7,900	15,400	3,230	882	535	510
20	1,040	3,490	715	1,420	2,270	4,250	8,200	13,600	3,080	898	515	685
21	1,360	3,160	715	1,270	1,970	3,780	10,900	13,000	2,870	794	450	691
22	1,080	2,400	673	1,270	1,740	3,540	9,400	13,300	2,870	836	520	667
23	1,040	2,530	679	1,180	1,690	3,540	9,100	13,000	2,730	815	510	667
24	950	2,150	722	1,090	1,580	4,150	9,400	13,000	2,660	774	455	565
25	1,360	1,800	709	1,090	1,640	4,750	7,400	13,600	2,660	748	495	495
26	1,360	1,910	722	1,090	1,800	4,250	6,400	13,600	2,340	815	465	558
27	870	1,860	655	1,010	1,740	3,700	5,780	11,800	2,270	801	455	601
28	910	1,800	760	1,050	2,090	3,960	5,350	9,700	2,270	643	450	541
29	1,040	1,690	1,580	1,000	------	4,550	5,250	8,500	2,030	679	420	475
30	1,170	1,470	7,150	954	------	4,450	5,550	8,500	2,210	741	475	450
31	1,120	------	5,780	930	------	4,450	------	9,100	------	601	450	------

Monthly discharge of St. Joe River at Calder, Idaho, for the year ending Sept. 30, 1921.

[Drainage area, 1,080 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1,560	870	1,240	1.15	1.33	76,200
November	3,490	630	1,440	1.33	1.48	85,700
December	7,150	655	1,330	1.23	1.42	81,800
January	3,460	930	1,620	1.50	1.73	99,600
February	5,150	703	2,140	1.98	2.06	119,000
March	11,500	1,910	4,040	3.74	4.31	248,000
April	10,900	3,010	5,900	5.46	6.09	351,000
May	16,800	6,150	12,500	11.6	13.37	769,000
June	9,400	2,030	5,040	4.67	5.21	300,000
July	2,030	601	1,150	1.06	1.22	70,700
August	685	420	535	.495	.57	32,900
September	691	440	518	.480	.54	30,800
The year	16,800	420	3,120	2.89	39.33	2,260,000

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 of Washington Power Co. on map compiled from best information available).

RECORDS AVAILABLE.—July 9, 1911, to October 31, 1912, and July 15, 1920, to September 30, 1921.

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 1,600 feet above gage.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Channel straight for 500 feet below gage. Left bank high; not subject to overflow at gage. Right bank subject to overflow at high stages. Riffle control 300 feet below gage; shifting at high stages. Stage of zero flow according to measurements made August 6 and September 22, 1920, gage height 58.1 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 66.5 feet at 6 a. m. March 18 (discharge, 8,660 second-feet); minimum stage recorded, 59.12 feet September 1 and 2 (discharge, 60 second-feet).

1911–12; 1920–21: Maximum stage recorded on March 18, 1921; minimum stage recorded, 59.09 feet at 11.30 a. m. August 25, 1920 (discharge, 54 second-feet).

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

ACCURACY.—Stage-discharge relation permanent except as affected by logs on control September 5–30; not affected by ice. Rating curve used prior to September 5, fairly well defined below 4,000 second-feet; parallel curve used September 5–30. Gage read to hundredths once daily; more often during floods. Daily discharge ascertained by applying daily gage height to rating table. Records good except those for extremely high water and for month of September.

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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 27	Lee and Logan	60.50	588	Sept. 6	Collins and Kilgore	59.35	77.9
June 9	McCombs and Collins	60.14	421	6	do	59.35	80.0
July 14	E. H. Collins	59.40	113				

Daily discharge, in second-feet, of St. Maries River at Lotus, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	98	140	292	1,300	392	1,910	1,300	1,160	565	249	79	60
2	110	119	297	1,400	369	1,910	1,300	1,300	565	212	75	60
3	171	160	292	2,350	392	1,600	1,600	1,300	565	266	75	62
4	178	157	301	1,600	369	1,700	1,500	1,160	540	216	74	75
5	140	96	266	1,300	257	2,350	1,300	1,120	515	193	70	79
6	116	70	208	1,120	224	1,910	1,160	1,030	465	178	70	86
7	108	108	241	860	346	1,500	985	1,300	465	157	70	216
8	119	143	212	710	324	1,160	900	1,400	465	143	70	75
9	103	103	186	620	324	1,030	820	1,300	416	137	70	83
10	108	84	197	392	346	1,500	820	1,300	392	140	72	96
11	113	100	249	369	1,210	1,300	940	1,210	392	137	69	75
12	140	108	324	440	1,500	1,120	1,160	1,120	369	134	66	79
13	279	106	279	515	1,800	985	1,500	985	346	128	64	84
14	197	143	171	515	1,910	940	1,700	940	324	113	64	93
15	292	106	189	490	1,500	860	1,700	1,080	301	113	75	84
16	257	134	224	440	1,120	1,400	1,700	1,210	297	108	143	77
17	197	171	249	440	680	5,010	1,600	1,160	297	108	100	72
18	178	324	208	650	710	7,710	1,700	1,120	288	106	88	113
19	168	416	201	1,120	780	3,990	2,020	1,080	275	100	88	122
20	143	290	182	1,700	680	2,350	2,460	1,080	261	100	83	266
21	137	416	171	1,500	620	1,800	2,580	985	257	98	74	346
22	168	346	93	1,300	515	1,500	3,450	985	241	96	70	301
23	171	540	125	1,080	540	1,400	3,190	940	232	96	70	324
24	143	515	182	465	540	1,800	2,460	900	241	88	67	301
25	137	416	164	440	540	2,460	2,020	900	232	88	66	253
26	137	392	125	416	590	2,130	1,600	860	224	100	64	249
27	128	590	143	440	620	1,700	1,400	820	208	96	66	241
28	140	490	346	440	710	1,400	1,300	710	201	88	69	236
29	257	392	392	369	-------	1,400	1,400	650	193	83	66	216
30	257	301	2,700	440	-------	1,300	1,300	620	193	79	64	216
31	205	-------	2,460	416	-------	1,300	-------	590	-------	79	62	-------

Monthly discharge of St. Maries River at Lotus, Idaho, for the year ending Sept. 30, 1921.

[Drainage area, 420 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	292	98	164	0.390	0.45	10,100
November	590	70	256	.610	.68	15,200
December	2,700	93	376	.895	1.03	23,100
January	2,350	369	827	1.97	2.27	50,800
February	1,910	224	711	1.69	1.76	39,500
March	7,710	860	1,950	4.64	5.35	120,000
April	3,450	820	1,630	3.88	4.33	97,000
May	1,400	590	1,040	2.48	2.86	64,000
June	565	193	344	.819	.91	20,500
July	266	79	130	.310	.36	7,990
August	143	62	74.3	.177	.20	4,570
September	346	60	155	.369	.41	9,220
The year	7,710	60	638	1.52	20.61	462,000

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 compiled from best information available).

RECORDS AVAILABLE.—April 25, 1911, to December 31, 1912; July 29, 1920, to September 30, 1921.

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; both controls fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period July 29, 1920, to September 30, 1921, 49.0 feet March 18, 1921 (discharge, 22,000 second-feet); minimum stage recorded, 37.70 feet September 5–9, 1920, when stage-discharge relation was affected by logs (discharge, 312 second-feet).

1911–1912 and 1920–1921: Maximum stage recorded on March 18, 1921; minimum stage recorded, 2.0 feet (original gage) October 24 and 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.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent except as affected by logs on control August 5 to September 13, 1920, and by logs and backwater from Coeur d'Alene Lake May 1 to June 9, 1921; not affected by ice. Rating curve fairly well defined below 15,000 second-feet; revised slightly for use after September 30, 1920. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Shifting-control method used August 5 to September 13, 1920, and May 1 to June 9, 1921. Records good except those 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 period July 30, 1920, to Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1920.		*Feet.*	*Sec.-ft.*	1921.		*Feet.*	*Sec.-ft.*
July 30	Eugene Logan	38.00	606	May 13	Stevens and Koehler	44.82	8,730
Aug. 4	McCombs and Logan	37.84	508	June 3	Koehler and Ball	42.06	4,170
28	John McCombs	37.91	402	10	Collins and McCombs	40.78	2,700
Sept. 23	Calkins and Logan	37.87	540	July 15	E. H. Collins	38.30	703
				Sept. 7	Kilgore and Collins	37.58	391
1921.							
Feb. 17	Eugene Logan	43.28	6,560				

Daily discharge, in second-feet, of Coeur d'Alene River near Cataldo, Idaho, for the years ending Sept. 30, 1920 and 1921.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1920.				1920.				1920			
1		536	488	11		441	441	21		396	488
2		536	396	12		441	685	22		396	488
3		536	374	13		441	1,130	23		418	536
4		512	353	14		396	1,010	24		396	685
5		512	312	15		396	1,070	25		374	685
6		488	312	16		374	840	26		418	950
7		464	312	17		396	635	27		418	1,010
8		488	312	18		418	585	28		396	1,130
9		464	312	19		396	488	29	536	396	1,070
10		464	332	20		418	488	30	585	441	840
								31	536	585	

Daily discharge, in second-feet, of Coeur d'Alene River near Cataldo, Idaho, for the years ending Sept. 30, 1920 and 1921—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1920-21.												
1	850	970	1,660	11,600	3,000	4,350	6,400	6,800	4,200	1,220	540	355
2	1,090	970	1,740	7,430	2,890	5,430	7,220	9,980	4,200	1,150	515	375
3	1,290	910	1,740	7,640	1,660	5,240	7,060	9,470	4,200	1,150	540	375
4	1,360	910	1,740	7,220	1,580	5,240	7,640	8,510	3,910	1,090	515	395
5	1,290	910	1,660	6,800	1,500	6,400	6,000	8,510	3,770	1,030	490	418
6	1,150	850	1,580	6,800	1,220	6,400	5,430	9,220	3,630	970	490	395
7	1,090	790	1,430	6,600	1,290	5,810	4,510	14,400	3,370	910	490	395
8	1,090	790	1,430	6,600	1,360	5,050	4,510	15,500	3,120	910	465	395
9	910	790	1,430	6,400	1,430	4,510	3,910	13,800	2,780	910	465	395
10	910	640	1,500	6,000	1,660	4,680	4,350	12,700	2,670	790	465	395
11	910	590	1,430	4,200	3,910	4,860	6,400	12,100	2,570	850	465	395
12	850	565	1,360	3,910	8,740	3,910	7,640	10,500	2,470	740	440	375
13	910	590	1,290	4,200	17,800	3,500	11,000	8,740	2,270	740	440	375
14	1,150	640	1,220	3,910	14,600	3,370	11,600	9,720	2,270	740	440	375
15	1,290	615	1,030	4,350	9,980	3,000	9,220	10,300	2,170	740	515	375
16	1,290	615	1,030	4,510	8,070	3,240	7,640	10,800	2,170	790	540	375
17	1,360	615	1,150	4,350	6,600	7,430	7,220	8,980	1,900	790	540	355
18	1,290	1,030	1,150	4,510	5,050	22,000	8,290	9,470	1,660	850	540	375
19	1,150	1,900	1,090	4,860	4,680	17,600	9,980	9,220	1,580	790	540	375
20	1,150	3,240	1,030	4,510	4,050	10,500	10,800	8,070	1,500	740	490	395
21	1,150	3,770	1,030	4,200	3,630	8,070	10,500	7,010	1,430	740	465	440
22	1,150	3,370	970	3,910	3,120	6,400	12,400	7,010	1,360	740	440	440
23	1,090	3,240	910	3,770	2,890	5,620	16,400	7,010	1,220	690	465	440
24	970	2,890	910	3,630	2,670	6,200	14,100	6,800	1,290	690	440	395
25	910	2,570	910	3,630	2,570	7,640	10,500	7,010	1,220	740	418	395
26	910	2,570	910	3,630	2,670	7,220	8,290	7,010	1,290	690	418	395
27	910	2,470	910	3,370	2,780	6,000	7,220	5,810	1,220	690	418	395
28	910	2,370	910	3,370	3,000	5,620	6,200	4,860	1,150	590	440	395
29	910	2,080	970	3,240	-------	6,000	6,800	4,050	1,150	590	395	375
30	1,030	1,900	10,500	3,120	-------	6,000	6,800	4,050	1,150	565	375	355
31	970	-------	14,000	3,120	-------	6,000	-------	4,050	-------	540	375	-------

NOTE.—Gage-height reading doubtful for Dec. 31, 1920; discharge determined from study of inflow outflow, and storage in Coeur d'Alene Lake. Gage not read Apr. 3, May 15, 22, and July 14, 1921; discharge for April 3 determined by comparison with flow of St. Joe River at Calder; for May 15, 22, and July 14, by interpolation.

Monthly discharge of Coeur d'Alene River near Cataldo, Idaho, for the years ending Sept. 30, 1920 and 1921.

[Drainage area, 1,220 square miles.]

Month	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
1920.						
August	585	374	444	0.364	0.42	27,300
September	1,130	312	625	.512	.57	37,200
The period						64,500
1920-21.						
October	1,360	850	1,070	.877	1.01	65,800
November	3,770	565	1,540	1.26	1.41	91,600
December	14,000	910	1,960	1.61	1.86	121,000
January	11,600	3,120	5,010	4.11	4.74	308,000
February	17,800	1,220	4,440	3.64	3.79	247,000
March	22,000	3,000	6,560	5.38	6.20	403,000
April	16,400	3,910	8,200	6.72	7.50	488,000
May	15,500	4,050	8,760	7.18	8.28	539,000
June	4,200	1,150	2,300	1.89	2.11	137,000
July	1,220	540	812	.666	.77	49,900
August	540	375	470	.385	.44	28,900
September	440	355	390	.320	.36	23,200
The year	22,000	355	3,450	2.83	38.47	2,500,000

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, 1921.

GAGE.—Vertical staff in two sections fastened to rock and to rock-crib foundation of boat house about 300 feet north of substation of Spokane & Eastern Railway & Power Co.; also vertical staff in sump of Hayden Lake pumping plant about 200 feet north of the substation for use during ice season. Gage read to hundredths once daily by Sigurd Berven.

EXTREMES OF STAGE.—Maximum stage recorded during year, 10.06 feet from April 30 to May 18; minimum stage recorded, 0.40-foot, November 13–15. 1920–1921: Maximum and minimum stages same as for 1921.

ICE.—No ice during period of record.

DIVERSIONS.—Water is pumped from lake for irrigation and domestic purposes.

REGULATION.—None.

Daily gage height, in feet, of Hayden Lake at Hayden Lake, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.08	0.66	0.64	2.00	3.22	5.75	9.10	10.06	10.01	8.30	6.15	4.41
2	1.08	.64	.66	2.06	3.24	5.85	9.15	10.06	10.00	8.25	6.10	4.34
3	1.06	.64	.66	2.12	3.26	5.90	9.18	10.06	10.00	8.20	6.00	4.28
4	1.02	.62	.68	2.22	3.28	5.95	9.20	10.06	9.95	8.10	5.90	4.23
5	1.00	.62	.70	2.32	3.28	6.00	9.22	10.06	9.90	8.00	5.80	4.16
6	.98	.60	.70	2.40	3.30	6.10	9.24	10.06	9.85	7.95	5.75	4.13
7	.94	.58	.72	2.52	3.35	6.20	9.26	10.06	9.80	7.85	5.65	4.10
8	.92	.56	.72	2.60	3.35	6.25	9.27	10.06	9.75	7.80	5.58	4.06
9	.90	.52	.74	2.66	3.40	6.30	9.28	10.06	9.70	7.70	5.55	4.01
10	.90	.50	.74	2.70	3.45	6.30	9.30	10.06	9.65	7.65	5.47	3.96
11	.90	.48	.74	2.72	3.55	6.35	9.35	10.06	9.60	7.55	5.40	3.90
12	.88	.44	.74	2.74	3.70	6.40	9.40	10.06	9.55	7.50	5.34	3.85
13	.88	.40	.74	2.78	4.00	6.45	9.45	10.06	9.40	7.40	5.27	3.80
14	.86	.40	.76	2.84	4.40	6.50	9.50	10.06	9.30	7.35	5.21	3.75
15	.86	.40	.76	2.88	4.60	6.65	9.55	10.06	9.25	7.25	5.19	3.70
16	.86	.42	.76	2.90	4.75	6.80	9.60	10.06	9.15	7.20	5.16	3.67
17	.84	.44	.78	2.94	4.90	6.95	9.65	10.06	9.05	7.10	5.15	3.64
18	.84	.46	.78	2.98	5.00	7.70	9.70	10.06	9.00	7.05	5.10	3.61
19	.82	.48	.78	3.00	5.20	8.00	9.75	10.05	8.95	6.95	5.08	3.58
20	.82	.50	.78	3.00	5.35	8.30	9.80	10.05	8.85	6.90	5.05	3.55
21	.80	.52	.78	3.02	5.45	8.40	9.90	10.04	8.80	6.80	5.00	3.53
22	.80	.54	.78	3.02	5.45	8.50	10.00	10.04	8.75	6.95	4.95	3.50
23	.79	.56	.78	3.02	5.50	8.60	10.05	10.04	8.65	6.85	4.90	3.48
24	.78	.58	.78	3.04	5.50	8.70	10.05	10.04	8.60	6.75	4.85	3.46
25	.76	.60	.78	3.06	5.55	8.80	10.05	10.04	8.55	6.65	4.80	3.43
26	.74	.60	.80	3.10	5.60	8.85	10.05	10.03	8.50	6.55	4.75	3.40
27	.72	.62	.84	3.12	5.65	8.90	10.05	10.03	8.45	6.45	4.70	3.39
28	.70	.62	.86	3.16	5.70	8.95	10.05	10.02	8.40	6.40	4.65	3.38
29	.68	.62	.90	3.20	-------	9.00	10.05	10.02	8.35	6.30	4.60	3.36
30	.68	.64	.94	3.20	-------	9.05	10.06	10.02	8.30	6.25	4.55	3.35
31	.66	-------	.98	3.22	-------	9.08	-------	10.01	-------	6.20	4.48	-------

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 gates 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, 1921.

GAGE.—Vertical staff on left side of flume; read by Emil Johnson. Prior to April 21, 1915, a vertical staff at end of flume, about 1,200 feet below present gage.

DISCHARGE MEASUREMENTS.—Made from crossties on top of flume or from footbridge across flume one-fourth 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 discharge, 157 second-feet June 10–20. No water in canal October 1–6 and April 25 to May 8.

1911–1917 and 1919–1921: 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, and 1921.

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

ACCURACY.—Stage-discharge relation changed continually throughout the year. Rating curve defined by measurements made in April 22 and 23, 1920, well defined between 10 and 160 second-feet, is used as standard curve. 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 of canal to remain constant even though the stage of the river is subject to considerable daily fluctuation. Daily discharge ascertained by shifting-control method. Records fair December to April, during which period no measurements were made; otherwise 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 7	Calkins and Becker	1.47	41.8	June 14	McCombs and Collins	3.12	155
Nov. 29	Lee and Logan	1.25	21.2	Sept. 3	Kilgore and Collins	2.55	96.6
May 25	Collins and Ford	2.74	120				

Daily discharge, in second-feet, of Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0	50	27	33	31	29	33	0	136	143	136	101
2	0	47	27	33	29	27	33	0	143	143	136	101
3	0	47	29	33	29	27	33	0	143	143	136	101
4	0	47	29	35	29	27	35	0	143	143	136	101
5	0	47	29	35	29	27	40	0	143	143	136	101
6	0	44	29	35	29	27	40	0	150	143	136	101
7	42	44	29	35	29	27	42	0	150	143	136	94
8	57	44	29	35	29	27	42	0	150	143	136	101
9	57	44	31	35	29	27	42	29	150	143	136	94
10	57	44	31	33	29	27	42	29	157	143	136	94
11	57	44	31	33	29	27	42	33	157	143	136	94
12	57	44	31	33	29	27	42	33	157	143	136	94
13	54	44	31	33	27	27	42	47	157	143	136	94
14	54	44	31	33	27	27	42	47	157	143	136	94
15	54	42	31	33	29	27	42	52	157	143	136	87
16	54	42	31	33	29	27	42	52	157	143	136	87
17	50	42	33	33	29	27	47	57	157	150	136	87
18	50	40	33	33	29	27	47	57	157	150	136	87
19	50	37	33	33	29	27	50	72	157	150	129	87
20	50	37	33	33	29	27	50	81	157	143	129	87
21	50	35	33	33	29	27	52	94	143	143	129	81
22	50	33	33	33	29	27	52	101	143	143	129	81
23	50	33	33	33	29	27	52	101	143	143	129	81
24	50	29	33	33	29	27	52	108	143	143	129	81
25	50	29	33	31	29	27	0	115	143	143	129	81
26	52	25	33	31	29	27	0	115	143	143	129	81
27	52	23	33	31	29	27	0	122	143	143	129	81
28	52	23	33	31	29	27	0	129	143	143	129	81
29	50	25	33	31	-------	27	0	129	143	136	129	81
30	50	25	33	31	-------	27	0	136	143	136	129	81
31	50	-------	33	31	-------	27	-------	136	-------	136	129	-------

Monthly discharge of Spokane Valley Land & Water Co.'s canal at Post Falls, Idaho, for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	57	0	41.9	2,580
November	50	23	38.5	2,290
December	33	27	31.3	1,920
January	35	31	32.9	2,020
February	31	27	28.9	1,600
March	29	27	27.1	1,670
April	52	0	34.5	2,050
May	136	0	60.5	3,720
June	157	136	149	8,870
July	150	136	143	8,790
August	136	129	133	8,180
September	101	81	89.9	5,350
The year	157	0	67.7	49,000

SANPOIL RIVER BASIN.

LOST CREEK NEAR AENEAS, WASH.

LOCATION.—In sec. 36, T. 35 N., R. 30 E., a quarter of a mile below Sheep Creek and 5 miles south of Aeneas post office, Okanogan County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 1, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Vertical staff in three sections, lowest section on right bank, two upper sections on left bank; installed October 9, 1920. Gage used prior to October 9, 1920, vertical staff on left bank, installed September 9, 1920. Gages read by Ranger Leese.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Bed composed of boulders and bedrock. Low-water control is riffle of solid rock; drowned out at high stage when brush-lined channel is factor in control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 3.0 feet May 16 (discharge, 290 second-feet); minimum stage recorded, 0.47 foot August 30 to September 1 (discharge, 2.3 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by ice November 7–11, December 6–8, 10–16, 18–27, and January 10–12. Sections of gage on opposite sides of stream rated separately; rating curves fairly well defined. Gage read to hundredths twice daily November 1 to May 31; once daily during remainder of year. Daily discharge ascertained by applying mean daily gage height to rating table except as noted in footnote to table of daily discharge. Records fair.

COOPERATION.—Station maintained in cooperation with Bonaparte Irrigation District.

Discharge measurements of Lost Creek near Aeneas, Wash., during the period Sept. 9, 1920, to Sept. 30, 1921.

Date.	Made by—	Gage height.		Discharge.
		Low-water gage on right bank.	Gage on left bank.	
		Feet.	*Feet.*	*Sec.-ft.*
1920.				
Sept. 9	R. B. Kilgore	0.44		2.0
Oct. 11	John McCombs	.55		2.9
11	do	.55		2.9
1921.				
Jan. 27	McCombs and Dobbins	.68		6.4
Apr. 19	John McCombs	2.20	1.90	128
19	do		1.90	128
May 27	do	2.40	1.88	122

Daily discharge, in second-feet, of Lost Creek near Aeneas, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.5	4.8	30	9.0	6.5	16	41	113	87	16	3.7	2.3
2	2.6	5.6	27	9.0	6.5	18	44	133	89	16	3.6	2.6
3	2.9	5.6	12	9.0	5.9	19	44	140	80	15	3.4	2.6
4	3.2	4.2	12	7.9	5.6	190	41	140	84	15	3.2	2.6
5	4.2	4.2	10	7.9	5.6	98	40	140	80	13	3.2	2.6
6	3.6	4.2	}	7.9	5.4	22	36	161	76	11	3.2	2.6
7	3.2	}	10	7.9	7.1	23	42	190	71	10	2.9	2.6
8	2.9	}	}	7.9	6.8	22	41	198	63	9	2.9	2.6
9	2.9	}	11	7.9	6.8	25	48	198	59	7.9	2.9	2.6
10	3.4	3	}	}	7.9	50	59	228	55	7.1	2.9	2.6
11	3.4	}	}	4	8.7	20	84	228	47	7.1	2.9	2.6
12	9.0	2.6	}	}	28	15	94	213	44	7.1	2.8	2.6
13	11	2.6	7	7.9	94	11	107	228	40	6.5	2.8	2.8
14	7.1	2.6	}	7.9	71	12	98	228	47	6.5	2.6	3.2
15	5.6	2.9	}	7.1	19	11	94	258	44	6.5	2.6	3.2
16	5.6	4.8	}	7.1	12	12	98	290	41	6.2	2.6	3.2
17	5.6	18	7.1	7.9	11	71	98	243	40	5.6	2.6	3.2
18	5.6	41	}	7.9	9.0	183	98	228	40	5.6	2.6	3.2
19	5.6	47	}	7.1	7.5	41	114	228	36	5.6	2.6	}
20	5.6	47	}	7.1	9.4	28	140	228	33	5.6	2.6	}
21	5.6	30	}	7.1	7.1	18	133	228	30	5.1	2.6	}
22	5.6	22	}	7.1	7.1	23	140	198	30	5.1	2.6	}
23	5.6	17	10	6.5	7.9	25	126	176	27	4.2	2.6	}
24	4.2	18	}	7.1	8.3	23	126	154	24	3.9	2.6	}
25	4.2	16	}	7.1	8.7	25	126	140	21	3.9	2.6	3.5
26	4.2	17	}	7.1	10	23	120	140	18	3.4	2.6	}
27	4.2	20	}	6.2	9.8	26	113	126	17	3.9	2.6	}
28	5.6	20	10	7.1	13	27	113	113	16	3.9	2.6	}
29	5.6	17	7.9	7.1	-------	30	113	106	16	3.9	2.6	}
30	5.6	22	7.1	7.1	-------	31	113	100	16	3.7	2.3	}
31	5.6	-------	6.5	6.8	-------	33	-------	94	-------	3.7	2.3	}

NOTE.—Gage not read Oct. 1 and Sept. 19–30; discharge ascertained by comparison with flow of neighboring streams. Braced figures show mean discharge for periods indicated.

Monthly discharge of Lost Creek near Aeneas, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	11	2.5	4.89	301
November	47		13.7	815
December	30		10.3	633
January	9.0		7.18	441
February	94	5.4	14.5	805
March	190	11	37.8	2,320
April	140	36	89.5	5,330
May	290	94	186	11,400
June	89	16	45.7	2,720
July	16	3.4	7.32	450
August	3.7	2.3	2.79	172
September		2.3	3.06	182
The year	290	2.3	34.9	25,600

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, 1921.

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, 4.2 feet April 15 (discharge, 387 second-feet); minimum stage recorded, 0.75 foot September 17 and 18 (discharge, 5.6 second-feet).

1911–1921: Maximum stage recorded, 4.9 feet April 5, 1919, determined by leveling to high-water mark (discharge, 483 second-feet); minimum discharge recorded September 17 and 18, 1921.

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

DIVERSIONS.—Nespelem canal diverts water above gage for irrigation. Water was turned into canal for first time on March 31, 1921. For records for Nespelem canal see pages 156–157.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by aquatic growth July to September. Standard rating curve well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table except for period July to September for which it was ascertained by shifting-control method. Records below 10 second-feet, good; otherwise excellent.

Discharge measurements of Nespelem River at Nespelem, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 27	3.23	267	Apr. 28	3.09	254	June 2	1.80	113
27	3.20	267	May 4	2.82	223	3	1.78	113

Daily discharge, in second-feet, of Nespelem River at Nespelem, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7.1	9.6	32	30	30	66	243	231	120	25	7.8	6.3
2	7.1	9.6	32	30	30	63	243	231	114	22	7.8	6.3
3	7.8	10.1	32	30	30	56	243	231	114	19.6	7.4	6.3
4	7.8	9.6	32	27	29	60	243	220	102	19.6	7.4	6.3
5	7.8	9.6	31	29	27	66	243	220	102	18.8	7.4	6.3
6	7.8	9.6	30	24	27	77	231	220	102	18.8	7.1	6.3
7	7.8	10.1	30	26	27	74	220	220	96	16.7	7.4	6.3
8	7.8	10.1	30	26	27	84	220	231	90	16.7	7.4	6.0
9	7.8	10.1	29	26	27	90	209	231	84	16.0	7.4	6.0
10	7.8	10.1	30	26	29	102	209	243	78	15.2	7.1	6.0
11	8.1	10.1	32	23	31	108	209	255	76	13.8	6.7	6.0
12	9.0	10.1	29	22	36	108	220	255	72	13.3	6.7	6.3
13	8.5	10.6	30	22	36	114	303	243	67	12.2	6.7	6.0
14	8.1	10.6	25	22	36	114	363	231	63	12.2	6.7	6.3
15	8.5	10.6	27	23	36	108	387	243	60	11.7	6.7	6.0
16	9.0	11.7	26	25	32	108	368	243	54	11.2	6.7	6.0
17	9.0	21	26	26	29	125	351	243	56	10.6	6.7	5.6
18	9.0	25	27	27	27	146	339	231	53	10.6	6.7	5.6
19	9.0	31	30	29	28	166	351	231	46	10.1	6.7	6.3
20	9.0	40	30	29	28	176	351	231	45	9.6	6.7	6.3
21	9.0	43	28	30	27	176	351	243	41	9.6	6.3	6.3
22	9.0	43	27	29	36	198	351	220	39	9.6	6.3	6.0
23	9.0	40	27	28	37	209	327	209	36	9.6	6.3	6.0
24	9.0	38	27	28	38	231	315	198	33	9.0	6.3	6.0
25	9.0	37	27	29	39	243	303	187	31	9.0	6.3	6.2
26	9.0	40	25	28	40	243	291	176	28	8.5	6.3	6.3
27	9.6	38	26	29	43	243	267	166	27	8.5	6.3	6.3
28	9.6	36	26	30	46	243	255	166	27	8.5	6.3	6.7
29	9.6	33	27	29	-------	243	255	146	26	8.1	6.3	6.7
30	9.6	32	29	30	-------	243	243	136	24	8.1	6.3	6.7
31	9.6	-------	29	30	-------	243	-------	130	-------	7.8	6.0	-------

NOTE.—Gage not read Feb. 20, June 12, and Sept. 25; discharge interpolated.

Combined monthly discharge of Nespelem River and Nespelem canal at Nespelem, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Combined.		River (mean).	Canal (mean).	Combined (mean).	
	Maximum.	Minimum.				
October	9.6	7.1	8.57	----------	8.57	527
November	43	9.6	22.0	----------	22.0	1,310
December	32	25	28.6	----------	28.6	1,760
January	30	22	27.2	----------	27.2	1,670
February	46	27	32.4	----------	32.4	1,800
March	243	56	146	----------	146	8,980
April	394	213	283	5.66	289	17,200
May	263	136	215	7.16	222	13,600
June	126	33	63.5	7.66	71.2	4,240
July	35	14.4	12.9	8.07	21.0	1,290
August	14.4	11.4	6.78	5.81	12.6	775
September	12.1	11.0	6.19	5.40	11.6	690
The year	394	7.1	71.1	3.33	74.4	53,800

NOTE.—No discharge through canal prior to April.

84390—24†—WSP 532——11

NESPELEM CANAL AT NESPELEM, WASH.

LOCATION.—In sec. 24, T. 31 N., R. 30 E., three-quarters of a mile below cana intake and three-quarters of a mile northwest of Nespelem post office, Okanogan County.

RECORDS AVAILABLE.—April 1 to September 30, 1921.

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 period of record, 1. 72 feet July 3 and 4 (discharge, 9.8 second-feet); minimum stage recorded 1.16 feet April 5–10 (discharge, 4.1 second-feet).

ACCURACY.—Stage-discharge relation changed gradually April 29 to June 1. Rating curve used prior to change well defined; curve used after change fairly well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table except for period April 29 to June 1 for which shifting-control method was used. 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 secs. 24 and 13, T. 31 N., R. 30 E.

Discharge measurements of Nespelem canal at Nespelem, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 27	1.38	6.8	Apr. 28	1.03	2.6	June 2	1.30	4.9
28	1.24	5.0	28	1.52	8.2			

Daily discharge, in second-feet, of Nespelem canal at Nespelem, Wash., for the year ending Sept. 30, 1921.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.3	6.5	6.0	9.6	6.6	5.4	16	7.0	7.8	6.5	8.5	5.7	5.4
2	4.3	6.2	4.9	9.6	6.6	5.4	17	6.8	7.8	6.5	8.5	5.3	5.4
3	4.3	6.1	7.8	9.8	6.5	5.4	18	6.8	7.8	6.2	8.4	5.3	5.4
4	4.3	6.0	7.8	9.8	6.5	5.4	19	6.8	7.7	8.4	7.7	5.3	5.4
5	4.1	7.0	6.7	9.6	6.5	5.4	20	6.8	7.7	8.4	7.7	5.3	5.4
6	4.1	7.1	7.0	9.0	6.5	5.4	21	6.7	7.7	8.4	7.6	5.4	5.4
7	4.1	8.6	7.2	8.8	6.5	5.4	22	6.6	6.4	8.4	7.2	5.4	5.4
8	4.1	8.5	6.5	8.4	6.2	5.4	23	7.3	6.4	8.4	7.0	5.4	5.4
9	4.1	9.4	8.4	8.4	6.1	5.4	24	7.2	6.4	8.4	7.0	5.4	5.4
10	4.1	8.5	8.3	8.6	6.0	5.4	25	6.8	6.4	8.4	6.8	5.4	5.4
11	4.3	8.0	8.3	8.6	6.0	5.4	26	6.7	6.3	8.4	6.6	5.4	5.4
12	4.2	7.9	8.3	8.6	6.0	5.4	27	6.6	6.1	8.9	6.6	5.4	5.4
13	6.9	7.9	7.8	8.5	6.0	5.4	28	6.4	6.1	8.9	6.6	5.4	5.4
14	4.3	7.7	6.6	8.5	6.0	5.4	29	6.6	6.1	8.6	6.6	5.4	5.4
15	6.6	7.9	6.7	8.5	5.8	5.4	30	6.6	6.0	8.8	6.6	5.4	5.4
							31	------	6.0	------	6.6	5.4	------

Monthly discharge of Nespelem canal at Nespelem, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
April	7.3	4.1	5.66	337
May	9.4	6.0	7.16	440
June	8.9	4.9	7.66	456
July	9.8	6.6	8.07	496
August	6.6	5.3	5.81	357
September	5.4	5.4	5.40	321
The period				2,410

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, 1921.

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 from highway bridge at Omak, 4 miles upstream.

CHANNEL AND CONTROL.—Bed composed of boulders and cobblestones; likely to shift at extremely high water. Banks fairly high. One channel at all stages. Stage of zero flow estimated on October 4, 1918, at gage height −2.4 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.44 feet June 9 (discharge, 20,900 second-feet); minimum discharge, 570 second-feet January 13 and September 21.

1911–1921: Maximum stage recorded, 12.21 feet June 20, 1916 (discharge, 22,200 second-feet); minimum 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 the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed June 8–9; not affected by ice Rating curves fairly well defined. Gage read to hundredths once daily except as indicated in footnote to table of daily discharge. Daily discharge ascertained by applying daily gage height to rating table except as indicated in footnote to table of daily discharge. Records good except for periods when gage was not read.

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

Discharge measurements of Okanogan River at Okanogan, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 14	3.41	2,290
June 1	9.90	15,200
July 15	5.15	5,020

Daily discharge, in second-feet, of Okanogan River at Okanogan, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,160	1,560	1,010	880	820	1,250	1,160	2,330	15,100	8,990	2,740	840
2	1,160	1,450	1,010	910	820	1,250	1,160	2,330	15,800	8,770	2,610	840
3	1,200	1,350	1,010	940	820	1,250	1,200	2,330	16,900	8,210	2,480	840
4	1,200	1,350	940	940	820	1,250	1,250	2,330	17,800	7,660	2,360	840
5	1,300	1,450	940	1,010	820	1,250	1,250	2,470	18,800	7,100	2,360	840
6	1,830	1,350	940	820	820	1,250	1,160	2,540	19,700	6,700	2,240	840
7	2,360	1,300	800	765	820	1,250	1,160	2,610	20,400	6,500	2,120	840
8	2,890	1,250	940	940	820	1,250	1,160	2,980	20,400	6,130	2,000	840
9	3,040	1,160	940	778	765	1,250	1,080	3,340	20,800	5,950	1,880	840
10	2,760	1,080	940	615	820	1,160	1,120	3,640	20,100	5,780	1,880	840
11	2,470	1,080	940	570	820	1,160	1,160	4,300	18,300	5,600	1,760	810
12	2,190	1,080	940	615	880	1,160	1,160	5,010	17,200	5,430	1,760	780
13	2,190	1,080	940	570	880	1,120	1,350	4,830	16,000	5,260	1,650	840
14	2,190	1,040	880	715	880	1,080	1,670	5,010	15,100	5,260	1,600	780
15	2,190	1,010	940	820	1,250	1,080	2,050	6,680	14,600	5,090	1,540	780
16	1,920	1,080	880	850	1,160	1,080	2,050	8,340	13,500	4,920	1,430	780
17	1,920	1,080	820	880	820	1,080	1,980	9,870	12,800	4,660	1,430	695
18	1,920	1,160	765	880	715	1,160	1,920	11,600	12,100	4,410	1,330	658
19	1,790	1,250	822	880	765	1,160	2,050	12,800	11,800	4,250	1,330	620
20	1,790	1,160	880	940	852	1,160	2,050	13,900	11,400	4,090	1,330	620
21	1,670	1,160	940	820	940	1,160	2,190	15,300	11,600	4,090	1,280	570
22	1,670	1,160	880	880	975	1,160	2,330	16,900	11,600	3,930	1,230	595
23	1,560	1,160	880	822	1,010	1,160	2,330	17,800	11,800	3,770	1,140	620
24	1,600	1,160	870	765	1,080	1,160	2,400	18,800	11,600	3,620	1,140	670
25	1,640	1,120	860	820	1,080	1,160	2,470	18,800	11,200	3,460	1,140	695
26	1,670	1,080	850	820	1,080	1,160	2,420	19,400	11,000	3,460	1,050	720
27	1,710	1,080	840	820	1,160	1,160	2,380	20,100	10,800	3,310	1,050	780
28	1,750	1,080	830	820	1,250	1,160	2,330	19,400	10,100	3,160	1,010	840
29	1,790	1,080	820	820	-------	1,080	2,330	17,900	9,430	3,090	970	1,330
30	1,670	1,010	820	820	-------	1,080	2,330	16,300	8,990	3,020	900	2,120
31	1,620	-------	850	820	-------	1,080	-------	14,800	-------	2,880	870	-------

NOTE.—Gage not read on Sundays except on May 22; also not read Oct. 4–7, 25–28, Nov. 25, Dec. 10, 24–28, 31, Jan. 1, Feb. 22, Apr. 26, 27, May 6, 30, July 4, 9, 29, Aug. 31, Sept. 3–5 and 27; discharge interpolated except for period Oct. 3–7, for which it was estimated by comparison with flow of Methow River at Twisp.

Monthly discharge of Okanogan River at Okanogan, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	3,040	1,160	1,870	115,000
November	1,560	1,010	1,180	70,200
December	1,010	765	897	55,200
January	1,010	570	818	50,300
February	1,250	715	919	51,000
March	1,250	1,080	1,170	71,900
April	2,470	1,080	1,760	105,000
May	20,100	2,330	9,830	604,000
June	20,800	8,990	14,600	869,000
July	8,990	2,880	5,110	314,000
August	2,740	870	1,600	98,400
September	2,120	570	823	49,000
The year	20,800	570	3,380	2,450,000

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, 1921.

GAGE.—Vertical staff in seven sections on left bank used prior to January 30, 1921. Vertical staff on concrete foundation wall of power house on right bank installed January 31, 1921, and used since that date. Gages read by Mace Reed, jr., and Charles Bilke.

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, 18.2 feet at 4 p. m. May 26 (discharge, 20,800 second-feet); no flow past gage at 4 p. m. December 5 (water being impounded behind new dam).

1911–1921: Maximum and minimum stages recorded during 1921.

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

DIVERSIONS.—Some water is diverted for irrigation from tributaries above the station. The principal diversion is made from the river above the gage by West Okanogan Irrigation District, and has increased from about 75 second-feet to about 140 second-feet since irrigation season of 1916. For discharge measurement of West Okanogan flume see under "Miscellaneous discharge measurements," page 217.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed with change of gage location on January 31; not affected by ice. Rating curves well defined. Gages read to tenths or half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Gage-height record furnished by Okanogan Valley Power Co.

Discharge measurements of Similkameen River near Oroville, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.		Discharge.	Date.	Gage height.		Discharge.
	Old gage.	New gage.			Old gage.	New gage.	
	Feet.	*Feet.*	*Second-ft.*		*Feet.*	*Feet.*	*Second-ft.*
Oct. 4	3.14	.....	1,200	May 28	14.20	14.77	14,300
Jan. 23	1.86	.....	535	July 20	4.30	5.71	2,040
Apr. 25	4.02	5.50	1,920				

Daily discharge, in second-feet, of Similkameen River near Oroville, Wash., for the the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	910	1,150	710	665	530	1,150	770	1,680	14,200	5,580	1,220	445
2	1,090	1,090	710	665	670	1,150	820	1,770	15,500	5,580	1,150	445
3	1,150	1,030	710	665	720	1,150	940	1,770	16,200	4,670	1,150	445
4	1,210	1,150	760	710	620	1,150	940	1,770	17,400	4,240	1,010	445
5	1,840	1,090	470	575	620	1,080	940	1,860	18,700	4,040	1,010	445
6	2,400	710	710	530	620	1,010	940	1,950	19,600	3,640	880	445
7	2,640	970	620	490	620	1,080	940	2,130	19,300	3,540	880	445
8	2,880	970	620	530	645	1,080	880	2,670	20,000	3,440	880	445
9	2,320	970	620	510	670	1,010	880	2,940	18,500	3,440	820	445
10	2,080	1,030	575	361	670	1,010	880	3,340	16,200	3,240	770	445
11	1,920	1,030	620	378	720	940	1,010	3,740	14,000	3,040	770	445
12	1,920	970	620	361	720	880	1,010	3,740	13,100	2,850	770	445
13	1,920	760	665	279	820	880	1,290	3,840	11,900	2,850	720	445
14	1,760	710	620	378	940	880	1,440	4,560	11,200	2,670	670	445
15	1,620	710	432	490	1,010	880	1,440	5,950	10,500	2,670	645	445
16	1,550	810	450	552	880	880	1,440	7,580	9,530	2,490	620	445
17	1,480	860	450	620	670	820	1,440	9,530	8,750	2,310	575	445
18	1,480	910	552	620	720	820	1,520	11,000	8,450	2,130	575	405
19	1,410	910	620	620	720	820	1,600	12,900	8,000	2,130	575	405
20	1,340	970	575	620	770	820	1,680	15,800	7,440	2,040	530	405
21	1,340	910	575	575	770	820	1,770	17,000	7,720	1,950	530	405
22	1,270	910	620	575	880	820	1,770	18,100	8,600	1,770	530	405
23	1,270	860	620	575	940	820	1,860	18,700	8,600	1,770	530	620
24	1,270	860	552	552	940	770	1,950	18,300	8,450	1,600	530	620
25	1,210	810	530	530	1,010	770	1,860	18,900	8,300	1,600	530	620
26	1,550	810	530	552	1,080	770	1,860	20,800	7,720	1,520	530	620
27	1,550	810	552	530	1,150	770	1,770	18,500	7,300	1,440	530	530
28	1,410	760	530	552	1,150	770	1,770	14,500	6,340	1,440	485	1,080
29	1,410	760	530	530	-------	770	1,770	12,200	5,820	1,360	485	1,770
30	1,410	760	620	530	-------	770	1,680	11,900	5,820	1,290	445	1,290
31	1,270	-------	665	530	-------	770	-------	12,900	-------	1,290	445	-------

Monthly discharge of Similkameen River near Oroville, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	2,880	910	1,610	99,000
November	1,150	710	902	53,700
December	760	432	595	36,600
January	710	279	537	33,000
February	1,150	530	796	44,200
March	1,150	770	907	55,800
April	1,950	770	1,360	80,900
May	20,800	1,680	9,110	560,000
June	20,000	5,820	11,800	702,000
July	5,580	1,290	2,700	166,000
August	1,220	445	703	43,200
September	1,770	405	558	33,200
The year	20,800	279	2,630	1,910,000

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, 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 to September 30, 1921. At Blue Lake, June 1 to October 31, 1920.

GAGE.—Staff gage on right bank; read by N. R. Judson. June 1 to October 31, 1920, vertical staff on left bank near Blue Lake, 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; subject to change by high water, and by deposition of débris.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 2.42 feet on May 16 (discharge, 339 second-feet); minimum stage recorded, 0.32 foot August 12, 13, 22, and 31 (discharge, 2.4 second-feet).

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

DIVERSIONS.—Water diverted above gage for irrigation of a few acres.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed May 15–16. Rating curve used prior to change, poorly defined; curve used after change, fairly well defined. Gage read once daily to tenths May 5–22 and to hundredths thereafter. Daily discharge ascertained by applying daily gage height to rating table. Records good for June and July; otherwise fair.

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, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 6	0.88	34.5	May 30	1.29	121
23	1.80	219	July 18	.46	5.8

Daily discharge, in second-feet, of Sinlahekin Creek at twin bridges near Loomis, Wash., for the year ending Sept. 30, 1921.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1		123	27	3.3	2.8	16	339	55	6.7	2.8	3.3
2		142	24	3.3	2.8	17	279	59	6.7	2.8	3.7
3	24	142	22	2.8	3.3	18	279	76	6.7	3.3	3.7
4		142	22	2.8	3.3	19	279	62	6.1	3.3	4.1
5		142	20	3.3	3.3	20	279	52	5.4	3.3	3.7
6	37	132	20	3.3	2.8	21	259	49	5.4	2.8	3.7
7	55	123	18	3.3	3.3	22	239	46	5.4	2.4	4.1
8	72	115	14	3.3	3.3	23	219	43	5.4	3.3	4.1
9	90	100	14	3.3	3.3	24	239	40	4.8	3.3	4.1
10	90	90	13	3.3	3.3	25	259	40	4.1	3.3	4.1
11	90	83	11	2.8	3.3	26	228	34	5.4	2.8	3.7
12	90	76	10	2.4	2.8	27	170	34	4.8	2.8	4.1
13	108	69	8.7	2.4	3.7	28	152	32	4.1	2.8	3.7
14	142	62	8.7	2.8	4.1	29	142	27	4.1	2.8	4.1
15	161	59	7.4	3.3	3.7	30	132	27	4.1	2.8	4.1
						31	132		3.7	2.4	

NOTE.—Discharge May 1–5 determined by comparison with flow of Toats Coulee Creek. Braced figure shows mean discharge for period indicated.

Monthly discharge of Sinlahekin Creek at twin bridges near Loomis, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
May	339		151	9,280
June	142	27	75.9	4,520
July	27	3.7	10.4	640
August	3.3	2.4	2.99	184
September	4.1	2.8	3.58	213
The period				14,800

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, 1921.

GAGE.—Stevens continuous water-stage recorder on left bank at head of falls; installed June 3, 1920; inspected by Dolores Douglas and Mrs. Lucile Vander Meer. 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 establishment of present station.

DISCHARGE MEASUREMENTS.—Made from footbridge just above intake of irrigation flume or by wading.

CHANNEL AND CONTROL.—Bed composed of large boulders and gravel. One channel at all stages. Banks high and wooded. Control at head of 20-foot falls several feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 5.1 feet at midnight May 19 (discharge, 607 second-feet); minimum stage, from recorder, 1.20 feet August 25 to September 2 (discharge, 6 second-feet); discharge may have been lower during winter when recorder was not operating.

1920–1921: Maximum stage recorded May 19, 1921; minimum stage, from water-stage recorder, 1.09 feet August 24–25, 1920 (discharge, 4 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed May 19–20; not affected by ice while recorder was operating. Rating curves fairly well defined. Operation of water-stage recorder not satisfactory (see footnote to table of daily discharge). Daily discharge ascertained by applying to rating table daily mean gage height determined from recorder graph by inspection except as noted in footnote to table of daily discharge. Records fair except for periods when recorder did not operate.

COOPERATION.—Station maintained in cooperation with Whitestone Irrigation District.

Discharge measurements of Toats Coulee Creek near Loomis, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 6	John McCombs	2.08	32.1	May 23	John McCombs	4.66	482
13	do	1.96	25.9	30	do	3.78	333
Jan. 25	do	1.44	7.5	July 19	do	1.91	29.0
Apr. 17	do	1.70	14.5	21	do	1.85	27.1
May 22	McCombs and Morrison	4.76	562				

NOTE.—Several of the above measurements were referred to the staff gage at the weir, 1,200 feet downstream, as follows: Oct. 6, 0.53 foot; Oct. 13, 0.47 foot; Jan. 25, 0.20 foot; Apr. 17, 0.24 foot; May 22, 1.96 feet; May 23, 1.86 feet; and May 30, 1.59 feet.

Daily discharge, in second-feet, of Toats Coulee Creek near Loomis, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	20	10.7	11.6		7.4	7.7	10.2	15.2	460	99	18	6.0
2	24	19.2	11.5		7.4	7.9	10.8	22	470	91	16	6.0
3	26	19.7	11.4		7.5	8.0	11.3	22	460	84	15	7.3
4	28	15.9	11.4		7.4	8.1	10.2	24	481	82	14	8.6
5	30	13.1	11.3		7.2		9.3	27	481	79	13	9.4
6	31	9.1	10.7		7.4		9.1	35	460	77	13	9.4
7	35	8.4	10.2		7.4		8.6	50	439	74	12	9.1
8	29	11.3	10.5		7.0	9	8.6	64	368	72	11	8.9
9	26	14.4	10.5		7.2		9.6	92	337	70	10.0	8.6
10	23	11.6	10.2		7.2		10.7	126	296	68	9.4	8.4
11	22	11.3	10.2		7.5		13.4	106	265	63	9.0	8.1
12	27	9.6	9.3	7	7.6		16.3	102	244	58	8.6	7.9
13	24	9.1	9.8		7.6		17.9	144	234	53	7.9	7.6
14	22	11.6	6.8		7.6		15.6	181	216	48	7.2	7.4
15	19.2	10.7	6.8		6.5	8	14.8	218		43	7.2	7.3
16	13.4	10.2	6.8		6.2		14.4	337	190	38	6.8	7.3
17	17.0	11.6	6.9		6.2		13.7	337		33	6.6	7.2
18	19.2	12.5	7.0		6.2		15.2	429		28	6.4	7.2
19	18.3	12.5	7.5		6.4	7.4	17.0	502	187	29	6.4	7.1
20	19.7	12.5			6.6		16.7	450	181	27	6.2	7.1
21	19.7	12.2			6.6		16.3	523	173	27	6.2	7.0
22	17.4	12.2			6.6		17.0	544	165	25	6.2	6.9
23	20	11.9			6.8	8	17.0		154	24	6.2	6.8
24	19.2	11.9		7.4	6.9		12.2		148	22	6.6	6.7
25	20	11.9	8	7.4	7.4		14.8	460	146	21	6.2	6.6
26	21	11.9		7.4	7.4		14.1		136	22	6.0	6.5
27	21	11.8		7.6	7.5		14.4		129	22	6.0	6.4
28	22	11.8		7.6	7.6	8.1	14.4	368	121	21	6.0	6.5
29	21	11.7		7.5		8.6	14.4	373	114	19	6.0	6.5
30	11.9	11.6		7.5		9.2	14.4	378	106	17	6.0	6.6
31	11.6			7.5		9.7		429		18	6.0	

NOTE.—No gage-height record available Dec. 20 to Jan. 23, Mar. 5–18, 20–27, May 23–27, and June 15–18; discharge ascertained by comparison with flow of near-by streams. No gage-height record available Oct. 1, 3–4, Nov. 27 to Dec. 4, Feb. 26, Feb. 28 to Mar. 3, Mar. 29 to Apr. 2, May 29, June 27 to July 2, July 4–9, 11–17, Aug. 13, Sept. 3, 7, 8, 10–13, 15–20, 22–26, and 28–30; discharge interpolated. Braced figures show mean discharge for periods included.

Monthly discharge of Toats Coulee Creek near Loomis, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	35	11.6	21.9	1,350
November	19.7	8.4	12.1	720
December	11.6		8.92	548
January			7.13	438
February	7.6	6.2	7.08	393
March			8.31	511
April	17.9	8.6	13.4	797
May	544	15.2	264	16,200
June	481	106	258	15,400
July	99	17	46.9	2,880
August	18	6.0	8.75	538
September	9.4	6.0	7.41	441
The year	544		55.5	40,200

BONAPARTE CREEK NEAR ANGLIN, WASH.

LOCATION.—In sec. 35, T. 37 N., R. 28 E., 4 miles below mouth of south fork, a quarter of a mile below headgate of Anglin ditch, and 1½ miles northeast of Anglin post office, Okanogan County.

DRAINAGE AREA.—110 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 1, 1920, to April 30, 1921, when station was discontinued.

GAGE.—Vertical staff in two sections on right bank; installed October 8, 1920. Temporary vertical staff, installed September 7, used October 3–7. Gages read by Joseph Donovan.

84390—24†—WSP 532——12

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; winding. Bed composed of silt. Banks covered with brush. Control is a weir, roughly of the Cippoletti type; drowned out at high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 2.04 feet February 11 (discharge, 118 second-feet); practically no flow past gage October 24–26.

ICE.—Stage-discharge relation not affected by ice during period of record as artificial control was kept free of ice.

DIVERSIONS.—Several small ditches divert water above gage for irrigation. Anglin ditch diverts a maximum of about 4 second-feet from a point about a quarter of a mile above gage.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve fairly well defined. Gage read to hundredths once daily or oftener during floods. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

COOPERATION.—Station maintained in cooperation with Bonaparte Irrigation District.

Discharge measurements of Bonaparte Creek near Anglin, Wash., during the period Sept. 9, 1920, to May 25, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1920.		*Feet*	*Sec.-ft.*	1921.		*Feet*	*Sec.-ft.*
Sept. 9	R. B. Kilgore	0.08	0.12	Jan. 28	McCombs and Dobbins	0.21	2.9
Oct. 8	John McCombs	.10	.14	Apr. 20	John McCombs	.56	14.9
8	do	.12	.27	20	do	.56	15.0
				May 25	do	.75	22.4

Daily discharge, in second-feet, of Bonaparte Creek near Anglin, Wash., for the period Oct. 1, 1920, to Apr. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr
1	0.1	0.1	4.8	2.5	4.0	14	26
2	.1	.1	5.4	2.5	4.0	15	26
3	.1	.1	5.4	2.5	4.0	15	31
4	.1	.1	5.4	2.5	4.0	18	17
5	.1	.1	6.0	4.0	4.0	13	14
6	.1	.1	6.0	2.5	4.0	9.0	13
7	.1	.1	6.0	4.0	4.0	11	16
8	.1	.1	6.0	4.0	4.0	15	12
9	.1	.1	6.0	2.5	4.8	12	13
10	.1	.1	6.0	2.5	4.0	15	17
11	.1	.1	6.0	1.9	54	9.0	17
12	.1	.1	6.0	4.0	94	7.0	17
13	.1	.1	5.4	4.0	26	5.7	17
14	.1	.1	5.4	4.2	12	5.7	17
15	.1	.1	2.5	2.8	5.4	7.0	19
16	.1	.1	2.5	4.0	5.4	6.4	21
17	.1	3.4	2.5	4.8	5.4	19	23
18	.1	4.5	2.5	4.8	2.8	33	16
19	.1	4.5	2.5	4.8	4.8	13	16
20	.1	4.5	2.5	4.8	4.8	5.7	15
21	.1	4.5	2.5	2.5	4.8	9.0	15
22	.1	3.4	2.5	4.0	4.8	17	15
23	.1	3.4	2.5	4.0	3.7	21	15
24	.0	3.4	2.5	4.0	4.2	22	
25	.0	3.4	2.5	2.5	5.7	25	
26	.0	4.5	2.5	2.5	11	17	
27	.1	4.5	2.5	4.0	18	13	15
28	.1	4.8	2.5	2.8	20	17	
29	.1	4.8	2.5	2.8	-------	19	
30	.1	4.8	2.5	2.8	-------	17	
31	.1	-------	2.5	4.0	-------	17	-------

NOTE.—Gage not read Oct. 1-2 and Apr. 24-30; discharge estimated by comparison with flow of Toats Coulee Creek. Braced figure shows mean discharge for period included.

Combined monthly discharge of Bonaparte Creek and Anglin ditch near Anglin, Wash., for the period Oct. 1, 1920, to Apr. 30, 1921.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Creek.			Ditch (mean).[a]	Combined (mean).	
	Maximum.	Minimum.	Mean.			
October	0.1	0.0	0.09	1.04	1.13	69.5
November	4.8	.1	2.00	.53	2.53	151
December	6.0	2.5	3.95	.19	4.14	255
January	4.8	1.9	3.40	.95	4.35	267
February	94	2.8	11.7	----------	11.7	650
March	25	5.7	14.3	----------	14.3	879
April	31	12	17.1	----------	17.1	1,020
The period	----------	----------	----------	----------	----------	3,290

[a] Mean discharge for Anglin ditch based upon three discharge measurements, published under miscellaneous measurements at end of this volume, and fragmentary gage-height record covering the period. Probably no flow in ditch from February to April.

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 ranch (revised measurements on topographic maps).

RECORDS AVAILABLE.—July 6, 1910, to September 30, 1921. From April 12, 1903, to March 31, 1912, records were obtained at Jones ranch in sec. 31, T. 34 N, R. 26 E., about 3 miles above Okanogan.

GAGE.—Vertical staff half a mile below reservoir indicates head on weir; read by 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 1.29 feet July 20–22 (discharge, 104 second-feet); minimum stage recorded, 0.04 foot October 14–17, 21–23, October 31 to November 14, and November 28 to December 17 (discharge, 0.8 second-foot).

1903–1921: Maximum stage recorded, 3.63 feet at old site April 29, 1904 (discharge, 577 second-feet); no flow 4 p. m. October 3 to 6 p. m. October 11, 1910, and November 20–21, 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; monthly summaries for years ending September 30, 1919 to 1921, not corrected for storage.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once daily; oftener when head was changed. Daily discharge ascertained by applying daily gage height to rating table or, for days when head was changed, by taking weighted mean of results obtained by applying to rating table the gage heights for the various periods of constant head. Records excellent.

COOPERATION.—Gage-height record furnished by United States Bureau of Reclamation.

Discharge measurements of Salmon Creek near Conconully, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 31	1.11	73.2
July 17	1.17	86.0

NOTE.—These measurements do not represent total flow past gage owing to fact that the flow of one small tributary and the leakage from Conconully reservoir, which enter creek between the measuring section and gage, were not included.

Daily discharge, in second-feet, of Salmon Creek near Conconully, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	17.0	0.8	0.8	1.3	1.3	1.5	1.5	2.1	87	84	84	62
2	19.8	.8	.8	1.0	1.3	1.5	1.5	2.1	88	79	95	62
3	20	.8	.8	1.0	1.3	1.5	1.5	2.1	92	76	97	58
4	17.0	.8	.8	1.0	1.3	1.5	1.5	2.1	86	74	95	58
5	17.7	.8	.8	1.0	1.3	1.3	1.5	2.1	79	76	95	56
6	19.1	.8	.8	1.0	1.3	1.3	1.5	2.1	80	90	95	48
7	19.8	.8	.8	1.0	1.3	1.3	1.5	2.1	79	92	94	49
8	20	.8	.8	1.0	1.3	1.3	1.5	2.1	90	95	97	51
9	17.0	.8	.8	1.0	1.3	1.3	1.5	2.1	92	98	91	52
10	14.6	.8	.8	1.0	1.5	1.3	1.5	3.6	93	98	86	48
11	11.6	.8	.8	1.0	1.5	1.3	1.5	15.5	92	96	85	47
12	13.4	.8	.8	1.0	1.5	1.3	1.5	36	89	88	83	51
13	13.4	.8	.8	1.0	1.5	1.3	1.7	56	87	82	82	75
14	.8	.8	.8	1.3	1.5	1.3	1.5	70	82	79	82	89
15	.8	1.0	.8	1.3	1.5	1.3	1.7	79	78	78	84	84
16	.8	1.0	.8	1.3	1.3	1.3	1.5	80	74	82	92	85
17	.8	1.0	.8	1.3	1.3	1.3	1.5	76	70	89	95	81
18	1.3	1.3	1.0	1.3	1.3	1.3	1.7	65	70	90	95	75
19	1.3	1.3	1.3	1.3	1.3	1.3	1.7	62	67	97	93	68
20	1.0	1.0	1.3	1.3	1.3	1.3	1.7	60	67	103	92	52
21	.8	1.0	1.0	1.3	1.3	1.3	2.1	61	78	104	92	28
22	.8	1.0	1.0	1.3	1.3	1.5	2.1	64	84	104	91	17.8
23	.8	1.0	1.0	1.3	1.3	1.5	2.1	69	91	101	84	6.8
24	1.0	1.0	1.0	1.3	1.5	1.5	2.1	68	91	98	78	2.0
25	1.0	1.0	1.0	1.3	1.5	1.5	2.1	69	92	93	74	1.3
26	1.0	1.0	1.0	1.3	1.5	1.5	1.9	75	92	80	74	1.3
27	1.0	1.0	1.0	1.3	1.5	1.5	1.9	79	90	76	74	1.3
28	1.0	.8	1.0	1.3	1.5	1.5	1.9	81	83	77	72	1.3
29	1.0	.8	1.3	1.3	-------	1.5	1.9	82	81	78	73	1.3
30	1.0	.8	1.3	1.3	-------	1.5	1.9	84	82	80	75	1.3
31	.8	-------	1.3	1.3	-------	1.5	-------	83	-------	82	63	-------

Monthly discharge of Salmon Creek near Conconully, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean	
October	20	0.8	7.66	471
November	1.3	.8	.91	54.1
December	1.3	.8	.94	57.8
January	1.3	1.0	1.18	72.6
February	1.5	1.3	1.38	76.6
March	1.5	1.3	1.39	85.5
April	2.1	1.5	1.70	101
May	84	2.1	46.4	2,850
June	93	67	83.5	4,970
July	104	74	87.7	5,390
August	97	63	85.9	5,280
September	89	1.3	43.8	2,610
The year	104	.8	30.4	22,000

NOTE.—Information is not available for determining monthly regulation from storage in Conconully and Salmon Lake reservoirs. Therefore, correction for storage, as published in previous reports, is not possible.

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, 1921.

GAGE.—Chain gage on upstream side of highway bridge; installed June 14, 1920. June 13 to July 25, 1919, vertical staff in two sections on right bank 40 feet above highway bridge, at present datum; July 26 to August 12, 1919, temporary vertical section for low water at same site but different datum; August 13 to October 2, 1919, vertical section on left bank, 25 feet below bridge, at different datum; October 3, 1919, to June 13, 1920, chain gage on bridge, at different datum. All gage heights have been referred to datum of present gage.

DISCHARGE MEASUREMENTS.—Made from highway bridge or by wading nearby.

CHANNEL AND CONTROL.—One channel at all stages; straight for long distance above and below gage. Bed composed of boulders and gravel. Control is riffle of large boulder about 300 feet below gage; may shift during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.4 feet at 9 a. m. June 5 (discharge, 13,400 second-feet); minimum stage recorded, 1.76 feet February 17 (discharge, 233 second-feet).

1919–1921: Maximum stage recorded on June 5, 1921; 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.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined below 6,000 second-feet; revised slightly for use after July 20. Gage read to hundredths twice daily except from October 23 to March 30 and September 1–30, when diurnal fluctuation was slight and gage was read once daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent except for extremely high stage.

COOPERATION.—Station maintained in cooperation with Methow-Okanogan Irrigation District.

Discharge measurements of Methow River at Twisp, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 31	John McCombs	1.98	340
July 22	do	3.84	1,590

Daily discharge, in second-feet, of Methow River at Twisp, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	495	700	449	343	304	363	819	1,260	9,470	4,320	1,060	324
2	543	729	449	343	323	363	950	1,350	10,800	3,680	1,060	324
3	593	729	427	343	323	363	1,020	1,350	11,400	3,050	990	324
4	593	672	427	304	285	384	950	1,350	12,100	2,900	920	324
5	819	672	427	304	285	384	950	1,450	12,700	2,760	850	324
6	1,020	672	427	285	249	405	883	1,550	12,100	2,760	815	324
7	1,450	619	405	323	323	405	883	1,870	12,500	2,620	815	324
8	1,350	619	405	304	304	405	883	2,220	12,100	2,760	780	324
9	1,260	619	405	323	304	427	883	2,480	9,890	2,620	715	304
10	1,170	593	405	285	304	472	950	2,900	8,210	2,490	715	304
11	1,090	593	405	249	323	495	1,020	2,900	7,410	2,490	655	304
12	1,170	543	363	323	343	495	1,450	2,900	6,630	2,360	655	304
13	1,170	543	384	323	343	495	1,550	3,200	6,630	2,360	628	304
14	1,020	543	323	343	363	495	1,550	4,320	6,630	2,360	628	304
15	950	543	304	384	343	472	1,550	5,160	6,060	2,240	600	304
16	883	543	363	343	267	495	1,450	8,010	5,160	2,120	624	324
17	883	568	363	363	233	495	1,450	9,050	4,820	1,900	549	304
18	950	568	363	363	267	495	1,450	9,890	4,990	1,900	549	324
19	883	568	363	323	343	495	1,450	11,600	4,990	1,900	524	304
20	819	543	363	285	285	495	1,550	11,600	5,330	1,900	500	304
21	788	519	363	323	285	495	1,550	11,200	5,510	1,700	476	324
22	758	519	363	343	343	495	1,550	11,600	6,440	1,600	453	344
23	758	495	363	343	363	519	1,650	10,500	5,690	1,500	453	344
24	729	495	363	323	363	495	1,550	11,200	5,690	1,500	408	324
25	729	495	343	323	363	543	1,550	11,600	5,690	1,400	408	324
26	758	472	323	343	363	543	1,450	10,800	5,160	1,310	408	324
27	758	495	323	343	363	568	1,450	8,420	4,820	1,400	386	344
28	788	472	343	323	363	593	1,350	7,010	4,480	1,310	408	344
29	788	472	343	304	-------	645	1,350	6,440	4,480	1,220	386	365
30	758	449	343	323	-------	672	1,260	6,820	4,480	1,140	365	365
31	729	-------	323	323	-------	729	-------	7,810	-------	1,140	344	-------

Combined monthly discharge of Methow River, Risley ditch, and Methow Valley Irrigation District's canal at Twisp, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.						Combined run-off in acre-feet.
	River.			Risley ditch (mean).	Methow Valley Irrigation District's canal (mean).	Combined (mean).	
	Maximum.	Minimum.	Mean.				
October	1,450	495	886	4	12	902	55,500
November	729	449	569	1	1	571	34,000
December	449	304	375	----------	----------	375	23,100
January	384	249	325	----------	----------	325	20,000
February	363	233	319	----------	----------	319	17,700
March	729	363	490	----------	----------	490	30,100
April	1,650	819	1,280	4	10	1,290	76,800
May	11,600	1,260	6,120	5	40	6,160	379,000
June	12,700	4,480	7,410	6	60	7,480	445,000
July	4,320	1,140	2,150	8	59	2,220	136,000
August	1,060	344	617	8	54	679	41,800
September	365	304	323	6	46	375	22,300
The year	12,700	233	1,740	----------	----------	1,770	1,280,000

NOTE.—Estimates of discharge of Risley ditch and Methow Valley Irrigation District's canal based upon discharge measurements published under miscellaneous measurements at end of this volume and others made since the close of the climatic year, and upon actual gage-height record for Methow Valley Irrigation District's canal over period October 1 to November 4 and July 24 to September 30, and for Risley ditch over the period October 1 to November 14.

CHEWACK CREEK BELOW BOULDER CREEK, NEAR WINTHROP, WASH.

LOCATION.—In sec. 35, T. 36 N., R. 21 E., at sawmill of Chewack Lumber Co., 200 feet above intake of skyline ditch, 400 feet below Boulder Creek, and 7½ miles north of Winthrop, Okanogan County.

DRAINAGE AREA.—475 square miles (measured on map of Okanogan National Forest, edition of 1918).

RECORDS AVAILABLE.—June 1, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Vertical and inclined staff on left bank; read by Mortimer Carroll, Homer French, Keith Jones, and Miss Wanda Jones.

DISCHARGE MEASUREMENTS.—At low stages, made by wading at gage; at medium stages, by wading at ford 2 miles above gage; and at high stages, from highway bridge 1,000 feet above gage and above Boulder Creek. The flow of Boulder Creek is measured by wading and added to discharge of Chewack Creek when measured at bridge or ford.

CHANNEL AND CONTROL.—Bed composed of boulders. Gradient steep. Right bank high; left bank low but not subject to overflow. Control not well defined; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 10.5 feet June 5, 1921 (discharge, 4,700 second-feet); minimum discharge, estimated 29 second-feet January 11, 1921, when stage-discharge relation was affected by ice.

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

DIVERSION.—Jones ditch diverts small amount from Boulder Creek above station; no other important diversions above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by ice January 3 to February 22. Rating curve well defined below 1,500 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table except as noted in footnote to table of daily discharge. Records excellent except those estimated and those for extemely high stages.

Discharge measurements of Chewack Creek below Boulder Creek, near Winthrop, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Oct. 15	5.80	251
Feb. 1	[a] 4.83	63.4
July 23	5.93	290

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Chewack Creek below Boulder Creek, near Winthrop, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	128	198	112	104		48	123	250	3,520	970	218	
2	162	198	104	102		50	125	290	3,140	852	208	
3	162	198	104			54	128	294	3,260	785	208	
4	154	198	104			64	128	294	4,300	717	198	
5	278	180	96			74	128	310	4,700	650	189	
6	328	162	96	80	60	82	120	364	3,780	620	189	
7	404	154	98			89	146	404	4,040	592	180	
8	364	154	101			94	154	492	3,650	565	171	
9	310	154	104			95	162	540	3,260	540	162	
10	310	154	96			96	154	620	3,020	492	158	
11	310	154	82			78	162	620	2,560	492	154	
12	328	137	75			90	171	712	2,360	468	149	
13	294	137	69			86	189	780	2,260	446	145	
14	278	137	64			82	218	1,110	2,160	424	141	
15	251	137	69			78	240	1,360	1,960	424	136	
				40								70
16	240	146	85			78	251	2,360	1,860	404	132	
17	228	154	94		50	79		2,360	1,860	382	128	
18	240	154	101			85	250	2,560	1,960	365	128	
19	228	154	112			88		3,260	1,760	345	128	
20	218	154	108			90		4,040	1,660	328		
21	208	146	104			91		4,560	1,760	310		
22	208	137	98			92		4,040	1,760	294		
23	208	137	101		42	92	280	3,520	1,660	278		
24	208	137	104		43	89		4,040	1,660	271		
25	198	137	104		44	88		4,300	1,560	264		
				60							90	
26	208	137	104		46	88		4,000	1,460	258		
27	198	137	120		46	86		3,140	1,260	252		
28	198	137	101		47	90	260	2,560	1,110	246		
29	198	128	112		-------	95		2,670	1,060	240		
30	198	112	112		-------	108		2,670	1,020	234		
31	198	-------	112		-------	120	-------	3,260	-------	228		-------

NOTE.—Gage not read Oct. 10, 24, Nov. 25, Dec. 3, 7, 20, 25, Feb. 27, Mar. 21, 28, 30, Apr. 1, 2, July 3, 4, 17, 18, 24, 26–30, and Aug. 10–16; discharge interpolated. Gage not read Apr. 17 to May 2, May 25, 26, and Aug. 20 to Sept. 30; discharge ascertained by comparison with flow of Methow River at Twisp. Stage-discharge relation affected by ice Jan. 3 to Feb. 22; discharge ascertained by means of gage heights, observer's notes, one discharge measurement, and weather records. Braced figures show mean discharge for periods included.

Monthly discharge of Chewack Creek below Boulder Creek, near Winthrop, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 475 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	404	128	240	0.505	0.58	14,800
November	198	112	152	.320	.36	9,040
December	120	64	98.3	.207	.24	6,040
January	104	-------	61.5	.129	.15	3,780
February	-------	-------	52.8	.111	.12	2,930
March	120	48	84.5	.178	.21	5,200
April	-------	120	210	.442	.49	12,500
May	4,560	250	1,990	4.19	4.83	122,000
June	4,700	1,020	2,380	5.01	5.59	142,000
July	970	228	443	.933	1.08	27,200
August	218	-------	136	.286	.33	8,360
September	-------	-------	70	.147	.16	4,170
The year	4,700	-------	495	1.04	14.14	358,000

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, 1921.

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 bent of upper bridge at Chelan; elevation not determined. Gage read by H. E. and C. M. Farley.

EXTREMES OF STAGE.—Maximum stage recorded during year, 8.2 feet June 8; minimum stage recorded, 2.90 feet September 10.

1898–99 and 1911–1921: Maximum stage recorded 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.—Record furnished in part by Chelan Electric Co.

Daily gage height, in feet, of Lake Chelan at Chelan, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1				3.10								
2	3.75						3.35			6.00		
3												2.98
4			3.40						7.00			
5					3.21	3.52						
6									7.70		3.35	
7								2.98	7.88			
8				3.10					8.20			
9							3.33			5.15		
10												2.90
11			3.30						7.80			
12					3.40	3.40						
13		3.45									3.35	
14								3.40				
15				3.40								
16	4.02						3.60			4.70		
17												2.91
18			3.20						6.40			
19					3.58	3.42						
20		3.45		3.35							3.20	
21								6.00				
22				3.50								
23	3.90						3.50			4.35		
24												2.93
25			3.10						6.20			
26					3.51	3.25						
27											2.92	
28					3.52			6.40				
29				3.18								
30	3.75	3.45					3.00		6.00	3.95		3.20
31	3.75			3.18		3.27		6.40		3.92	2.96	

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 Lake Chelan 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, 1921.

GAGE.—Vertical staff on fourth bent of left approach to lower bridge; read by H. E. and C. M. Farley.

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, 12.3 feet June 8 (discharge, 11,600 second-feet); minimum stage recorded, 4.9 feet September 6, 9–12, 14–18, 20, 24 (discharge, 586 second-feet).

1903–1921: Maximum stage recorded on June 8, 1921; 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.

DIVERSIONS.—Several irrigation ditches divert from tributaries a very small proportion of the run-off.

REGULATION.—Flashboard dam 800 feet above gage controls lake level at low water in the interest of navigation. Monthly summaries of flow have been corrected for storage.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 10,000 second-feet. Gage read to hundredths twice daily during October and November; once daily thereafter. 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, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 20	5.41	798	Feb. 4	5.32	771
Feb. 4	5.28	800	July 25	8.72	5,180

Daily discharge, in second-feet, of Chelan River at Chelan, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,240	1,440	980	730	845	1,060	1,340	2,500	8,420	7,880	4,290	785
2	1,340	1,440	980	785	910	980	1,440	2,500	8,780	7,700	4,450	785
3	1,440	1,440	910	910	845	1,060	1,550	2,500	9,140	7,340	4,290	785
4	1,660	1,340	980	845	845	1,060	1,440	2,370	9,860	6,980	4,130	730
5	1,660	1,240	910	845	730	1,150	1,440	2,370	10,400	6,980	4,130	730
6	1,660	1,240	845	845	845	1,150	1,340	2,370	10,400	6,620	3,040	586
7	1,770	1,240	785	845	910	1,150	1,440	2,370	11,200	6,260	3,040	630
8	1,890	1,150	845	845	785	1,060	1,440	2,370	11,600	6,260	3,040	630
9	1,890	1,060	845	845	785	1,150	1,440	2,370	11,400	6,260	3,040	586
10	1,890	1,060	845	785	785	1,660	1,440	2,630	11,000	6,090	3,040	586
11	2,010	1,060	845	730	785	1,550	1,440	2,500	10,800	5,920	2,900	586
12	2,010	980	845	785	845	1,550	1,440	2,630	10,400	5,920	2,900	586
13	2,010	980	845	730	910	1,550	1,660	2,760	10,000	5,920	2,500	630
14	2,010	980	845	785	910	1,660	1,660	2,900	9,860	5,920	2,500	586
15	2,010	980	845	910	980	1,440	1,660	3,040	9,680	5,920	2,500	586
16	2,010	980	845	910	1,060	1,440	1,660	3,490	9,320	5,750	2,370	586
17	2,010	1,060	785	980	980	1,440	1,770	4,450	8,960	5,580	2,370	586
18	1,890	1,060	785	980	1,060	1,440	1,770	5,920	8,600	5,580	2,370	586
19	1,890	980	785	980	1,060	1,440	1,770	6,620	8,240	5,410	2,370	630
20	1,770	980	785	910	1,060	1,440	1,890	7,340	8,060	5,580	2,370	586
21	1,770	980	730	845	1,060	1,340	2,010	7,700	8,060	5,250	2,250	630
22	1,660	980	730	845	1,060	1,440	3,340	8,060	8,060	5,250	2,250	630
23	1,550	980	785	845	1,060	1,340	3,190	8,420	8,240	5,090	2,250	630
24	1,550	980	730	845	980	1,340	3,040	8,600	8,420	4,930	1,660	586
25	1,550	1,060	785	910	1,060	1,550	2,900	8,960	8,240	5,090	1,660	630
26	1,550	1,060	730	845	1,150	1,550	2,900	9,140	8,060	4,930	1,550	678
27	1,550	980	730	845	980	1,440	2,900	9,140	8,060	4,930	1,550	630
28	1,550	980	678	845	980	1,440	2,760	8,780	8,060	4,770	1,550	678
29	1,550	910	730	845	-------	1,340	2,760	8,600	7,880	4,610	1,550	678
30	1,550	980	980	845	-------	1,340	2,630	8,420	7,700	4,450	1,150	678
31	1,550	-------	730	845	-------	1,340	-------	8,420	-------	4,450	845	-------

Monthly discharge of Chelan River at Chelan, Wash., for the year ending Sept. 30, 1921.

[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	2,010	1,240	1,720	106,000	+3,250	109,000	1,770	1.86	2.14
November	1,440	910	1,090	64,900	−9,750	55,200	928	.977	1.09
December	980	678	822	50,500	−10,800	39,700	646	.680	.78
January	980	730	850	52,300	+2,400	54,700	890	.937	1.08
February	1,150	730	938	52,100	+10,700	62,800	1,130	1.19	1.24
March	1,660	980	1,350	83,000	−8,000	75,000	1,220	1.28	1.48
April	3,340	1,340	1,980	118,000	−8,100	110,000	1,850	1.95	2.18
May	9,140	2,370	5,170	318,000	+105,000	423,000	6,880	7.24	8.35
June	11,600	7,700	9,230	549,000	−12,500	536,000	9,010	9.48	10.58
July	7,880	4,450	5,790	356,000	−63,900	292,000	4,750	5.00	5.76
August	4,450	845	2,580	159,000	−29,800	129,000	2,100	2.21	2.55
September	785	586	641	38,100	+7,200	45,300	761	.801	.89
The year	11,600	586	2,690	1,950,000	−14,300	1,930,000	2,670	2.81	38.12

NOTE.—Storage estimated from gage-height record of Lake Chelan and capacity of lake determined from areas measured on topographic maps.

ENTIAT RIVER BASIN.

ENTIAT RIVER AT ENTIAT, WASH.

LOCATION.—In sec. 18, T. 25 N., R. 21 E., one-eighth 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, 1921.

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.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.7 feet June 5–7 (discharge, 4,360 second-feet); minimum discharge, estimated 106 second-feet January 11, when stage-discharge relation was affected by ice.

1910–1921: 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.

DIVERSIONS.—Several diversions above station for irrigation. Entiat Irrigation Co.'s high-line canal (capacity, about 15 second-feet) carries water past station.

REGULATION.—Flow affected by changes in load at power plant.

ACCURACY.—Stage-discharge relation permanent except as affected by ice January 4 to February 6 and February 15–22. Rating curve well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Mean discharge for periods during which stage-discharge relation was affected by ice, ascertained by means of gage heights, observer's notes, and weather records. Records good except for periods during which stage-discharge relation was affected by ice.

COOPERATION.—Gage-height record furnished by Wenatchee Valley Gas & Electric Co.

The following discharge measurement was made by John McCombs:

July 25: Gage height, 2.25 feet; discharge, 771 second-feet.

Daily discharge, in second-feet, of Entiat River at Entiat, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	177	248	167	161		260	332	550	3,120	1,900	583	174
2	193	237	161	167		260	355	518	3,460	1,830	550	180
3	207	245	155	161		252	355	518	3,820	1,540	550	180
4	229	237	155		130	260	380	518	4,000	1,410	458	177
5	245	222	152			268	380	518	4,360	1,350	404	161
6	289	200	149	130		268	550	518	4,360	1,290	404	155
7	550	193	149		144	268	458	583	4,360	1,290	404	144
8	458	193	149		149	268	518	583	4,180	1,290	380	138
9	458	187	149		155	268	518	728	3,640	1,240	380	141
10	458	187	138		167	289	518	893	3,460	1,180	380	141
11	404	190	138		229	310	518	1,030	3,120	1,130	380	138
12	404	187	144		310	310	518	1,080	2,610	1,080	355	132
13	380	187	146		310	289	518	1,130	2,450	1,080	355	129
14	355	187	122		289	268	518	1,350	2,450	1,080	332	132
15	310	183	116			268	518	1,680	2,450	1,030	332	127
16	310	190	132	125		268	518	2,290	2,130	1,030	310	127
17	310	193	161			268	518	3,290	1,980	1,030	310	124
18	310	193	155			260	518	3,460	2,130	984	310	132
19	310	211	155		195	260	518	3,460	2,130	984	289	141
20	310	215	144			252	518	3,460	2,130	938	289	177
21	268	215	149			260	518	3,460	2,130	893	229	248
22	260	200	155			268	518	3,460	2,290	850	225	183
23	260	193	155		222	268	583	3,460	2,290	808	222	183
24	252	187	149		229	268	583	3,460	2,290	768	207	158
25	260	187	138		233	289	550	3,460	2,290	768	204	138
26	268	180	132	120	222	289	550	3,460	2,450	653	193	135
27	268	177	132		229	289	550	3,120	2,290	653	187	215
28	268	183	138		245	289	550	2,610	1,980	653	180	211
29	268	177	155		-------	310	518	2,450	1,900	618	167	200
30	268	167	180		-------	310	550	2,290	1,830	583	167	200
31	260	-------	161		-------	310	-------	2,450	-------	583	174	-------

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

Monthly discharge of Entiat River at Entiat, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	550	177	309	19,000
November	248	167	198	11,800
December	180	116	148	9,100
January	167	----------	128	7,870
February	310	----------	195	10,800
March	310	252	276	17,000
April	583	332	500	29,800
May	3,460	518	1,990	122,000
June	4,360	1,830	2,800	167,000
July	1,900	583	1,050	64,600
August	583	167	320	19,700
September	248	124	161	9,580
The year	4,360	----------	675	488,000

WENATCHEE RIVER BASIN.

WENATCHEE RIVER NEAR LEAVENWORTH, WASH.

LOCATION.—In SW. ¼ sec. 12, T. 26 N., R. 17 E., 1,500 feet below highway bridge at Plain, half a mile below Beaver Creek, and 14 miles north of Leavenworth, Chelan County.

DRAINAGE AREA.—591 square miles (measured on topographic maps).

RECORDS AVAILABLE.—November 27, 1910, to September 30, 1921.

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, 9.4 feet June 5–8 (discharge, 13,800 second-feet); minimum stage recorded, 2.85 feet September 18 (discharge, 505 second-feet).

1910–1921: Maximum stage recorded, 11.1 feet December 30, 1917 (discharge, 18,700 second-feet); minimum discharge, 316 second-feet September 29 and 30 and October 11 and 12, 1915.

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

DIVERSIONS.—The Wenatchee Park Land & Irrigation Co. diverts a maximum of about 12 second-feet from Chiwawa River during irrigation season.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by logs October 1 to May 14. Rating curve well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table or, for period during which stage-discharge relation was affected by logs, by applying to rating table the daily gage height corrected for effect of logs by means of three discharge measurements and observer's notes. Records good October 1 to May 14; others excellent.

COOPERATION.—Gage-height record furnished by Quincy Valley Irrigation District.

Discharge measurements of Wenatchee River near Leavenworth, Wash., during the year ending Sept. 30, 1921.

[Made by John McCombs.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Oct. 19	a 4.16	1,720	Feb. 6	a 3.32	784
Jan. 18	a 4.18	1,420	July 26	5.32	3,650

a Stage-discharge relation affected by logs.

Daily discharge, in second-feet, of Wenatchee River near Leavenworth, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,790	1,360	1,140	1,920	880	2,610	2,180	2,760	9,840	7,200	2,760	880
2	2,050	1,420	1,140	2,180	880	2,610	2,460	2,760	11,200	6,000	2,760	880
3	2,460	1,420	1,030	2,760	880	2,610	2,320	2,610	11,200	5,110	2,760	835
4	3,560	1,300	1,080	2,320	835	2,610	2,320	2,760	12,600	4,900	2,050	790
5	5,550	1,190	980	2,180	835	2,460	2,180	2,910	13,800	4,690	2,050	835
6	5,550	1,190	980	1,790	790	2,460	2,050	3,070	13,800	4,490	1,920	700
7	5,330	980	930	1,660	880	2,320	2,050	3,740	13,800	4,490	2,050	700
8	4,300	1,030	930	1,540	835	2,180	2,050	4,110	13,800	4,900	2,050	700
9	3,560	1,030	930	1,360	835	2,180	2,240	4,490	11,500	4,900	2,050	745
10	3,070	980	880	1,140	1,540	2,180	2,420	5,110	11,000	4,900	1,920	745
11	2,910	930	880	1,030	3,740	2,050	2,610	5,330	9,300	4,690	1,920	745
12	2,760	905	930	1,080	5,770	1,920	3,070	5,110	8,230	4,900	1,660	745
13	2,320	880	930	1,080	5,110	1,920	3,230	5,770	8,760	4,900	1,660	660
14	2,460	835	790	1,240	4,300	1,790	3,070	6,000	8,760	5,110	1,660	620
15	2,180	835	790	1,790	3,390	1,790	3,070	7,710	7,450	5,110	1,660	620
16	1,920	880	790	1,660	2,910	1,920	2,910	9,300	6,710	4,490	1,540	620
17	1,790	980	790	1,660	2,460	2,050	2,910	11,000	6,230	4,490	1,480	580
18	1,790	1,300	790	1,420	2,320	2,320	3,070	11,500	6,230	4,110	1,480	505
19	1,660	1,660	790	1,300	2,180	2,180	3,230	11,800	7,200	4,490	1,360	540
20	1,660	1,790	700	1,190	2,050	2,050	3,070	11,200	6,710	4,110	1,300	700
21	1,540	1,660	700	1,140	1,920	1,920	3,390	10,700	7,450	3,560	1,240	1,480
22	1,540	1,660	700	1,140	1,790	1,920	3,740	10,400	8,230	3,390	1,140	1,080
23	1,540	1,540	660	1,080	2,180	1,790	3,740	10,400	7,710	3,560	1,080	980
24	1,660	1,540	700	1,030	2,320	1,920	3,390	11,500	7,970	3,920	980	930
25	1,660	1,480	700	980	2,320	1,790	3,390	11,500	8,490	3,560	930	835
26	1,790	1,480	660	980	2,320	1,920	3,230	11,000	7,970	3,390	880	1,030
27	1,790	1,480	660	930	2,320	1,790	3,070	9,300	7,200	3,230	880	1,660
28	1,660	1,360	790	930	2,460	1,790	2,910	7,710	7,200	3,070	880	2,180
29	1,660	1,300	1,140	880	-------	1,920	3,070	7,200	6,950	3,070	790	1,660
30	1,540	1,190	1,920	880	-------	2,050	2,910	7,200	7,200	2,760	880	1,540
31	1,480	-------	2,050	880	-------	2,050	-------	8,230	---------	2,760	980	-------

NOTE.—Gage not read Mar. 29 and Apr. 9–10; discharge interpolated.

Monthly discharge of Wenatchee River near Leavenworth, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 591 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	5,550	1,480	2,470	4.18	4.82	152,000
November	1,790	835	1,250	2.12	2.36	74,400
December	2,050	660	932	1.58	1.82	57,300
January	2,760	880	1,390	2.35	2.71	85,500
February	5,770	790	2,180	3.69	3.84	121,000
March	2,610	1,790	2,100	3.55	4.09	129,000
April	3,740	2,050	2,840	4.81	5.37	169,000
May	11,800	2,610	7,230	12.2	14.07	445,000
June	13,800	6,230	9,150	15.5	17.29	544,000
July	7,200	2,760	4,330	7.33	8.45	266,000
August	2,760	790	1,570	2.66	3.07	96,500
September	2,180	505	917	1.55	1.73	54,600
The year	13,800	505	3,030	5.13	69.62	2,190,000

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, 1921.

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 accomodate 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, 2,515.43 feet at 6.45 a. m. July 10 (storage, 153,780 acre-feet); minimum stage recorded, 2,434.43 feet at 6 p. m. October 1 (storage, 11,880 acre-feet).

1906–1921: Maximum stage recorded on July 10, 1921; minimum stage, from water-stage recorder, 2,430.74 feet at 6:30 p. m. October 11, 1918 (storage, 7,190 acre-feet).

STORAGE.—Capacity of new reservoir, 152,000 acre-feet; elevation of gate sill 2,425 feet, and of spillway crest, 2,515 feet. Record of storage or release each month used to determine discharge without storage at gaging station below dam.

ACCURACY.—Water-stage recorder not operated during year. Staff gage read to hundredths twice daily. Records excellent.

COOPERATION.—Complete record furnished by Bureau of Reclamation.

Daily storage, in acre-feet, in Keechelus Lake near Martin, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	11,930	22,190	37,480	55,490	79,080	105,000	95,180	112,300	136,530	150,570	117,090	49,040
2	12,100	22,500	37,830	58,320	79,400	105,550	95,790	112,730	137,630	151,200	113,740	47,980
3	12,990	22,880	38,240	61,520	79,830	105,800	96,290	113,100	138,860	151,480	110,410	46,980
4	14,820	23,110	38,630	63,260	80,000	106,090	96,790	113,410	140,000	151,730	107,080	46,150
5	15,790	23,440	39,030	64,640	80,220	106,010	97,170	114,060	141,630	151,860	103,820	45,190
6	15,800	23,620	39,380	65,540	80,420	104,790	97,590	114,820	143,070	152,060	100,480	44,220
7	15,640	23,800	39,310	66,370	80,700	103,400	97,930	115,750	144,450	152,690	97,150	43,250
8	15,060	24,030	39,900	67,060	81,050	102,040	98,310	116,610	143,980	153,200	93,900	42,470
9	14,600	24,280	40,140	67,680	81,360	100,480	98,720	117,490	143,320	153,630	90,610	41,680
10	13,930	24,490	40,460	68,050	82,610	99,140	99,140	118,560	143,150	153,350	87,310	40,890
11	13,430	24,660	40,980	68,410	86,060	97,790	99,710	119,760	143,000	152,770	84,410	40,150
12	12,970	24,820	41,360	68,890	89,970	96,090	100,420	120,770	143,000	152,660	82,360	39,460
13	12,550	24,960	41,720	69,510	92,200	94,490	101,260	121,870	143,000	152,770	80,490	38,620
14	13,200	25,160	42,030	70,310	93,560	92,780	101,980	123,390	143,120	152,840	78,650	37,720
15	13,930	25,350	42,250	71,510	94,580	91,090	102,640	125,420	142,950	152,890	76,880	36,920
16	14,610	25,660	42,430	72,490	95,260	89,760	103,200	128,470	142,830	152,790	75,040	36,150
17	15,150	26,310	42,690	73,260	95,890	89,510	103,820	131,220	142,900	152,390	73,210	35,290
18	15,700	27,280	42,900	73,950	96,550	90,100	104,420	132,280	143,120	151,910	71,460	34,480
19	16,260	28,390	43,140	74,500	97,110	90,740	105,090	132,720	143,390	150,820	69,480	33,830
20	16,700	29,480	43,350	75,040	97,690	91,000	105,780	132,750	143,810	149,240	67,550	33,510
21	17,230	30,430	43,530	75,420	98,050	91,090	107,160	132,560	144,330	147,620	65,560	33,490
22	17,670	31,310	43,710	75,840	98,530	91,130	109,430	132,540	144,800	145,610	63,740	32,970
23	18,240	32,420	43,940	76,200	99,300	91,190	109,900	132,920	145,260	143,200	62,060	32,410
24	18,680	33,370	44,240	76,570	100,170	91,520	109,730	133,480	145,810	140,530	60,520	31,900
25	19,190	34,190	44,550	76,850	100,990	91,950	109,770	134,050	146,280	137,650	59,070	31,230
26	19,720	34,900	44,790	77,200	101,890	92,260	110,220	134,360	146,700	134,830	57,570	30,790
27	20,200	35,620	45,020	77,520	102,820	92,730	110,280	134,360	147,080	131,970	56,080	30,340
28	20,730	36,170	45,810	77,840	103,820	93,170	110,540	134,380	147,920	129,170	54,620	30,380
29	21,150	36,570	47,180	78,070	-------	93,680	111,290	134,430	148,770	126,430	53,140	30,160
30	21,500	37,100	50,820	78,300	-------	94,130	111,850	134,640	149,770	123,550	51,750	29,760
31	21,830	-------	53,770	78,700	-------	94,660	-------	135,380	-------	120,380	50,340	-------

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, 1921.

GAGE.—Inclined staff in paved channel 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, 9.47 feet August 1–10 (discharge, 1,790 second-feet); no flow October 14–22, when reservoir gates were closed.

1904–1921: 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; revised slightly for use during year. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table except for periods July 7–11 and 13–16, when water flowed over spillway, and flow past gage was increased by computed discharge over spillway. Records good.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Discharge measurements of Yakima River near Martin, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 7	Parker and Ball	6.51	728	May 20	Crawford and Ball	7.50	1,010
Feb. 10	Ball and Shupe	.88	256	June 22	D. E. Ball	5.60	447
10	do	.88	267	Aug. 2	do	9.28	1,700
May 3	D. E. Ball	3.60	153	31	do	6.90	814

Daily discharge, in second-feet, of Yakima River near Martin, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	485	2	2	2	2	93	10	149	564	243	1,790	700
2	451	2	2	3	2	391	10	149	578	250	1,790	550
3	536	2	2	3	2	356	10	149	607	250	1,790	550
4	668	2	2	3	2	332	10	50	592	280	1,790	550
5	700	2	2	4	2	607	10	9	550	373	1,790	550
6	716	2	2	4	2	1,020	10	9	700	138	1,790	550
7	700	2	2	4	2	1,020	10	8	1,300	24	1,790	497
8	668	2	2	4	2	1,020	10	11	1,470	106	1,790	462
9	637	2	2	14	2	1,020	11	11	1,280	234	1,790	462
10	592	2	2	28	3	1,020	11	11	1,020	738	1,790	462
11	550	2	2	14	3	1,020	11	11	924	461	1,020	462
12	523	2	2	2	3	1,020	11	11	860	310	1,020	462
13	183	2	2	2	3	1,020	11	11	860	267	1,020	462
14	0	2	2	2	3	1,020	11	12	828	281	1,020	462
15	0	2	2	2	2	1,020	11	12	812	285	1,020	462
16	0	2	2	2	2	700	11	12	637	338	1,020	462
17	0	2	2	2	2	373	11	177	430	410	1,020	462
18	0	2	2	2	2	295	11	700	430	578	1,020	462
19	0	2	2	2	2	265	11	860	430	892	1,020	462
20	0	2	2	2	2	265	12	924	430	988	1,020	462
21	0	2	2	2	2	265	12	1,020	430	1,050	1,020	462
22	0	2	2	2	2	265	236	1,020	440	1,240	924	462
23	1	2	2	2	2	195	860	485	451	1,430	860	462
24	1	2	2	2	2	138	523	1,020	451	1,590	860	462
25	2	2	2	2	2	138	302	1,020	451	1,590	860	462
26	2	2	2	2	3	53	302	1,020	451	1,590	860	462
27	2	2	2	2	3	11	302	732	250	1,590	860	462
28	2	2	2	2	3	11	222	550	107	1,590	860	462
29	2	2	2	2	------	11	149	523	108	1,590	860	462
30	2	2	2	2	------	10	149	523	171	1,630	860	462
31	2	------	2	2	------	10	------	550	------	1,750	860	------

Monthly discharge of Yakima River near Martin, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 55 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage, in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	716	0	240	14,800	+9,510	24,300	395	7.18	8.28
November	2	2	2.00	119	+15,300	15,400	259	4.71	5.26
December	2	2	2.00	123	+16,700	16,800	273	4.96	5.72
January	28	2	3.97	244	+24,900	25,100	408	7.42	8.55
February	3	2	2.29	127	+25,100	25,200	454	8.25	8.59
March	1,020	10	483	29,700	−9,160	20,500	333	6.05	6.98
April	860	10	109	6,490	+17,200	23,700	398	7.24	8.08
May	1,020	8	379	23,300	+23,500	46,800	761	13.8	15.91
June	1,470	107	617	36,700	+14,400	51,100	859	15.6	17.40
July	1,750	24	777	47,800	−29,400	18,400	299	5.44	6.27
August	1,790	860	1,220	75,000	−70,000	5,000	81	1.47	1.70
September	700	462	486	28,900	−20,600	8,300	139	2.53	2.82
The year	1,790	0	364	263,000	+17,400	281,000	388	7.05	95.56

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, 1921.

GAGE.—Friez water-stage recorder on right bank under highway bridge; installed July 12, 1911; inspected by J. F. Huffman. Since June 27, 1916, vertica 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 MEASUREMENTS.—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 during year, from water-stage recorder, 6.95 feet at 5 p. m. May 25, (discharge, 8,820 second-feet); minimum stage, from recorder, 1.10 feet at 6 a. m. November 7 (discharge, 275 second-feet).

1906–1921: Maximum stage, measured from high-water marks, 12.5 feet November 14, 1906 (discharge, about 25,600 second-feet); minimum stage recorded, 1.11 feet at 6 p. m. September 30, 1915 (discharge, 192 second-feet).

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

DIVERSIONS.—None.

REGULATION.—Flow partly regulated by storage and release of water at Keechelus, Kachess, and Cle Elum reservoirs. Monthly discharge without storage determined from records of stage at reservoirs.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined. Water-stage recorder inspected daily; gage-height record excellent. Daily discharge ascertained by applying mean daily gage height to rating table. Records good October to January; otherwise 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 6	Parker and Ball	4.38	3,540	May 4	D. E. Ball	3.30	1,960
12	D. E. Ball	3.42	1,970	19	Ball and Crawford	6.65	8,190
Jan. 6	do	3.61	2,350	June 23	D. E. Ball	4.73	4,070
Feb. 11	do	3.70	2,280	Aug. 3	do	3.91	2,710
Apr. 2	Ball and Crawford	3.24	1,780	Sept. 1	do	4.12	3,080

Daily discharge, in second-feet, of Yakima River at Cle Elum, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,710	1,030	856	2,920	710	2,780	1,760	2,190	7,200	2,920	2,780	2,990
2	1,760	1,010	805	3,680	710	3,280	1,820	2,120	7,680	2,850	2,710	2,920
3	1,940	956	791	4,480	717	3,200	1,820	2,190	7,680	2,450	2,710	2,850
4	2,190	956	777	3,680	691	3,060	1,760	1,940	7,920	2,120	2,710	2,710
5	2,920	549	750	2,990	672	3,130	1,660	1,880	7,920	2,060	2,780	2,710
6	3,360	320	697	2,320	641	3,840	1,550	1,940	7,920	2,060	2,850	2,780
7	3,200	328	672	1,940	605	3,840	1,490	2,260	7,920	1,820	2,920	2,710
8	3,490	475	653	1,710	635	3,680	1,440	2,520	8,430	1,880	2,920	2,580
9	2,640	480	635	1,550	759	3,680	1,440	2,640	7,440	2,000	2,920	2,380
10	2,320	522	605	1,340	1,190	3,680	1,490	2,780	6,530	2,060	2,920	2,120
11	2,120	538	629	1,290	2,450	3,590	1,660	2,920	5,900	2,260	2,990	2,060
12	2,060	538	665	1,240	3,840	3,510	2,060	2,920	5,690	2,060	3,130	2,060
13	1,940	495	672	1,140	3,930	3,430	2,320	2,920	5,690	1,940	3,200	1,940
14	1,710	495	647	1,140	3,280	3,360	2,320	3,430	5,480	1,940	3,200	1,340
15	1,490	495	635	1,390	2,640	3,280	2,190	4,380	4,970	1,880	3,130	1,200
16	1,390	495	623	1,490	2,190	3,430	2,000	6,110	4,380	1,820	3,200	1,200
17	1,060	538	588	1,440	1,880	3,360	1,880	7,440	3,840	1,880	3,200	1,290
18	757	611	538	1,340	1,660	3,510	1,940	7,680	3,430	1,820	3,200	1,490
19	1,240	704	506	1,240	1,490	3,430	2,060	7,920	3,360	2,060	3,280	1,550
20	1,200	743	475	1,160	1,440	3,200	2,060	7,440	3,430	2,260	3,200	1,660
21	1,170	743	465	1,080	1,340	3,060	2,450	6,970	3,680	2,260	3,200	1,550
22	1,240	834	445	1,020	1,240	2,990	3,590	7,440	3,930	2,260	3,130	1,440
23	1,290	1,180	421	965	1,490	2,920	4,380	7,440	3,930	2,450	3,060	1,440
24	1,240	1,240	416	902	1,760	2,580	3,930	7,680	4,020	2,580	2,990	1,390
25	1,200	1,200	470	849	1,940	2,580	3,200	8,690	4,020	2,640	3,130	1,390
26	1,190	1,160	480	805	2,190	2,380	2,780	8,430	3,930	2,640	3,130	1,390
27	1,170	1,140	475	771	2,520	1,710	2,520	7,440	3,680	2,580	3,060	1,340
28	1,160	1,080	611	757	2,520	1,600	2,380	6,110	3,130	2,520	3,060	1,490
29	1,130	981	1,060	743	-------	1,600	2,380	5,690	2,780	2,520	2,990	1,710
30	1,110	917	2,780	723	-------	1,600	2,260	5,480	2,710	2,520	2,990	1,600
31	1,060	-------	3,200	717	-------	1,660	-------	6,110	-------	2,580	2,990	-------

Monthly discharge of Yakima River at Cle Elum, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 500 square miles.]

Month.	Observed discharge 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	3,490	757	1,720	106,000	+23,900	130,000	2,110	4.22	4.86
November	1,240	320	758	45,100	+32,900	78,000	1,310	2.62	2.92
December	3,200	416	776	47,700	+34,900	82,600	1,340	2.68	3.09
January	4,480	717	1,570	96,500	+46,900	143,000	2,330	4.66	5.37
February	3,930	605	1,680	93,300	+46,500	140,000	2,520	5.04	5.25
March	3,840	1,600	3,000	184,000	−29,200	155,000	2,520	5.04	5.81
April	4,380	1,440	2,220	132,000	+43,400	175,000	2,940	5.88	6.56
May	8,690	1,880	4,940	304,000	+46,100	350,000	5,690	11.4	13.14
June	8,430	2,710	5,290	315,000	+22,400	337,000	5,660	11.3	12.61
July	2,920	1,820	2,250	138,000	−17,000	121,000	1,970	3.94	4.54
August	3,280	2,710	3,020	186,000	−150,000	36,000	585	1.17	1.35
September	2,990	1,200	1,910	114,000	−68,500	45,500	765	1.53	1.71
The year	8,690	320	2,430	1,760,000	+32,300	1,790,000	2,480	4.96	67.21

YAKIMA RIVER AT UMTANUM, WASH.

LOCATION.—In sec. 30, T. 16 N., R. 19 E., at Umtanum, half a mile above Umtanum Creek and 10 miles south of Ellensburg, in Kittitas County.

DRAINAGE AREA.—1,620 square miles (measured on topographic maps and Pl. I, Water-Supply Paper 369).

RECORDS AVAILABLE.—August 25, 1906, to May 20, 1907; August 10, 1907, to November 15, 1915; irrigation seasons 1916 to September 30, 1921.

GAGE.—Stevens continuous water-stage recorder on right bank 100 feet east of railroad section house at Umtanum; installed July 10, 1914; inspected by D. B. Sage, and F. W. Creighton. Prior to June 26, 1908 vertical staff gage at datum 0.16 foot higher than that of present gage; June 26, 1908, to July 9, 1914, cantilever chain gage at datum 0.13 foot higher than present gage until January 1, 1911, and at approximately the same datum as present gage thereafter; Barrett and Lawrence water-stage recorder also used September 28, 1911, to July 9, 1914. All gages at practically the same site.

DISCHARGE MEASUREMENTS.—Made from cable 100 feet above gage or by wading.

CHANNEL AND CONTROL.—Bed composed of rocks and gravel. Control shifting. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 8.3 feet May 17 and 19 (discharge, 11,700 second-feet); minimum mean daily discharge, 1,100 second-feet September 17.

1906–1921: Maximum stage recorded, 14.2 feet November 15 or 16, 1906 (estimated from high-water marks; discharge, about 41,000 second-feet); minimum stage recorded, 2.86 feet at 7 p. m. October 3, 1915 (discharge, 138 second-feet).

ICE.—Observations discontinued during winter.

DIVERSIONS.—Water diverted above gage for irrigation of about 40,000 acres in Kittitas Valley.

REGULATION.—Flow partly regulated by storage and release of water at Keechelus, Kachess, and Cle Elum reservoirs.

ACCURACY.—Stage-discharge relation changed during winter. Rating curves well defined. Water-stage recorder inspected and staff gage read to hundredths twice daily; gage-height record excellent. Daily discharge ascertained by applying daily mean gage height to rating table. Records excellent.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Discharge measurements of Yakima River at Umtanum, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 5	Parker and Ball	5.22	3,000	May 27	Crawford and Ball	7.80	9,900
Nov. 2	D. E. Ball	4.26	1,280	June 24	D. E. Ball	5.98	4,390
Apr. 1	Ball and Crawford	5.60	3,680	July 22	do	4.78	1,990
May 5	D. E. Ball	5.20	2,830	Sept. 2	do	5.32	2,940
18	Crawford and Ball	7.98	10,900				

Daily discharge, in second-feet, of Yakima River at Umtanum, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,560	3,640	3,310	8,070	3,200	2,470	3,100
2	1,670	3,870	3,200	9,040	3,420	2,530	3,000
3	1,780	3,870	3,100	9,040	3,200	2,510	2,790
4	2,160	3,640	2,890	9,040	2,690	2,430	2,690
5	3,000	3,310	2,790	9,700	2,470	2,470	2,690
6	3,760	3,100	2,790	9,370	2,470	2,590	2,690
7	3,880	2,790	3,200	9,370	2,340	2,690	2,690
8	3,760	2,790	3,640	9,700	2,070	2,790	2,590
9	3,530	2,790	3,870	9,370	2,190	2,790	2,450
10	3,000	3,000	4,110	8,070	2,190	2,790	2,230
11	2,700	3,310	4,110	7,440	2,380	2,790	2,070
12	2,510	4,240	4,110	6,990	2,270	2,890	2,040
13	2,420	4,620	4,240	6,840	2,140	3,000	2,000
14	2,240	4,490	4,750	6,690	2,020	3,100	1,600
15	1,960	4,110	5,960	6,250	1,900	3,100	1,290
16	1,800	3,870	8,070	5,680	1,820	3,100	1,110
17	1,720	3,640	11,400	5,140	1,750	3,200	1,100
18	1,460	3,640	11,400	4,490	1,700	3,200	1,130
19	1,490	3,870	11,700	4,240	1,610	3,200	1,290
20	1,560	3,760	11,400	4,110	1,850	3,310	1,370
21	1,550	3,870	10,700	4,240	2,070	3,310	1,440
22	1,510	5,410	10,400	4,490	2,040	3,200	1,480
23	1,640	6,540	10,700	4,620	2,070	3,100	1,450
24	1,610	6,250	10,400	4,490	2,210	3,000	1,440
25	1,560	5,280	11,000	4,620	2,360	3,100	1,450
26	1,560	4,490	11,000	4,620	2,430	3,100	1,410
27	1,560	3,990	10,400	4,360	2,410	3,200	1,400
28	1,550	3,640	8,710	3,760	2,360	3,100	1,400
29	1,510	3,640	7,440	3,310	2,270	3,100	1,560
30	1,460	3,530	6,990	3,200	2,300	3,000	1,640
31	1,440	-------	7,290	-------	2,380	3,000	-------

Monthly discharge of Yakima River at Umtanum, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	3,880	1,440	2,090	129,000
April	6,540	2,790	3,970	236,000
May	11,700	2,790	6,940	427,000
June	9,700	3,200	6,340	377,000
July	3,420	1,610	2,280	140,000
August	3,310	2,430	2,940	181,000
September	3,100	1,100	1,890	112,000

YAKIMA RIVER NEAR PARKER, WASH.

LOCATION.—In sec. 28, T. 12 N., R. 19 E., below Sunnyside diversion dam, 2 miles below Union Gap, 1½ miles east of Parker, Yakima County, 3½ miles northwest of Wapato, and 11 miles below mouth of Naches River.

DRAINAGE AREA.—3,560 square miles (measured on topographic maps and Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—April 25, 1908, to September 30, 1921.

GAGE.—Stevens continuous water-stage recorder on left bank about 600 feet below Sunnyside diversion dam; installed August 17, 1915; inspected by H. J. Hanson, E. E. Anderson, and H. C. Beardsley. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from cable 80 feet above gage or by wading.

CHANNEL AND CONTROL.—Bed composed of solid rock, large boulders, and gravel. One channel at all stages. Control formed by diagonal riffle about 250 feet below gage; may shift slightly during extremely high floods.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 9.19 feet at 9.15 p. m. May 17 (discharge, 17,600 second-feet); minimum stage, from recorder, 1.38 feet at 2.30 p. m. September 18 (discharge, 45 second-feet).

1908–1921: Maximum stage recorded, 15.0 feet at 1 p. m. December 30, 1917 (discharge, 52,900 second-feet); practically no flow October 26, 1911, August 25 and 28, 1915, and September 14, 1918.

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

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 permanent; not affected by ice. Rating curve well defined; revised slightly for use during year. Water-stage recorder inspected twice daily. Daily discharge ascertained by applying mean daily gage height to rating table or, for days of considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records excellent October to July; others good.

COOPERATION.—Complete records furnished by United States Bureau of Reclamation.

Discharge measurements of Yakima River near Parker, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 31	D. E. Ball	6.80	7,650	May 18	Paul Taylor	9.10	17,300
Feb. 12	Ball and Nelson	7.87	11,400	June 25	D. E. Ball	6.40	6,290
Apr. 5	Ball and Crawford	6.04	5,660	July 30	R. O. Crawford	2.73	583
May 3	R. O. Crawford	4.57	2,700	Sept. 7	D. E. Ball	3.02	819

Daily discharge, in second-feet, of Yakima River near Parker, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,370	2,120	2,790	7,350	2,260	8,090	6,120	3,150	11,500	4,890	630	889
2	1,860	2,120	2,710	7,210	2,190	9,020	6,790	3,060	13,200	4,660	714	927
3	2,050	2,050	2,710	10,400	2,190	9,350	6,930	2,710	14,100	3,730	690	816
4	2,630	2,050	2,550	10,000	2,190	9,690	6,250	2,550	14,600	2,970	594	772
5	3,930	2,050	2,470	8,390	2,120	9,020	5,730	2,260	15,600	2,470	500	697
6	4,440	1,920	2,400	6,930	1,990	9,020	5,130	2,190	16,600	2,260	500	674
7	4,440	1,480	2,330	5,860	1,920	9,350	4,890	2,550	17,100	2,190	552	780
8	4,030	1,370	2,260	5,370	1,920	9,020	4,550	3,430	17,100	1,860	652	956
9	4,030	1,490	2,260	4,890	2,050	8,700	4,440	3,830	15,600	1,920	755	927
10	3,430	1,500	2,190	4,230	3,260	9,020	4,330	4,550	13,200	1,860	705	852
11	2,970	1,420	2,260	3,730	6,930	8,700	4,660	6,120	11,900	1,730	608	652
12	2,880	1,500	2,120	3,830	11,200	8,390	5,730	5,370	11,200	1,790	463	697
13	2,790	1,730	1,860	3,730	11,900	7,790	6,650	5,010	10,400	1,590	580	660
14	2,710	1,530	1,790	3,830	10,800	7,500	6,510	5,730	10,400	1,370	622	552
15	2,400	1,410	1,790	4,330	8,700	7,210	5,860	7,790	9,690	1,330	738	178
16	2,330	1,450	1,790	4,440	7,210	7,070	5,130	11,200	8,390	1,690	697	62
17	2,190	1,610	1,860	4,330	6,120	7,790	4,550	16,600	7,210	1,340	697	53
18	1,920	2,470	1,860	4,230	5,610	10,000	4,770	17,100	6,120	1,220	807	48
19	1,670	3,930	1,790	3,930	5,250	10,000	5,010	17,100	5,730	1,060	807	138
20	1,990	4,230	1,790	3,730	5,010	9,690	4,890	16,600	5,860	1,000	825	295
21	1,990	3,530	1,730	3,530	4,770	8,390	4,660	15,100	6,250	918	816	546
22	1,990	3,430	1,670	3,240	4,330	8,090	6,650	15,100	6,930	594	816	807
23	2,120	3,330	1,670	2,970	4,660	8,090	8,390	15,600	6,790	528	798	807
24	2,190	3,330	1,670	2,790	6,120	7,500	8,090	15,100	6,650	697	747	780
25	2,120	3,330	1,570	2,710	6,790	7,070	6,930	15,600	6,650	927	697	747
26	2,120	3,330	1,610	2,710	7,500	6,930	5,490	17,100	6,380	1,000	807	747
27	2,050	3,240	1,590	2,550	8,090	6,380	4,550	15,600	5,860	936	852	789
28	2,050	3,060	1,500	2,470	8,090	5,490	3,930	12,400	5,250	780	870	825
29	1,990	2,970	1,790	2,400	-------	5,610	3,730	10,000	4,440	660	843	1,020
30	2,050	2,880	3,730	2,400	-------	5,860	3,630	9,350	4,550	587	807	1,400
31	1,990	-------	7,500	2,260	-------	5,860	-------	9,690	-------	552	807	-------

Monthly discharge of Yakima River near Parker, Wash., New Reservation, Old Reservation, and Sunnyside canals, for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.							Run-off in acre-feet.	
	River.			New Reservation canal (mean).	Old Reservation canal (mean).	Sunnyside canal (mean).	Total mean.[a]	River.	Total.[a]
	Maximum.	Minimum.	Mean.						
October	4,440	1,370	2,540	92	28	496	3,160	156,000	194,000
November	4,230	1,370	2,400	------	------	------	2,400	143,000	143,000
December	7,500	1,500	2,250	------	------	------	2,250	138,000	138,000
January	10,400	2,260	4,540	------	------	------	4,540	279,000	279,000
February	11,900	1,920	5,400	------	------	------	5,400	300,000	300,000
March	10,000	5,490	8,050	------	------	99	8,150	495,000	501,000
April	8,390	3,630	5,500	477	184	938	7,100	327,000	422,000
May	17,100	2,190	9,340	1,180	224	1,210	12,000	574,000	738,000
June	17,100	4,440	9,840	1,170	262	1,200	12,500	586,000	744,000
July	4,890	520	1,650	1,170	194	1,240	4,250	101,000	261,000
August	870	463	710	1,170	152	1,240	3,270	43,700	201,000
September	1,400	48	670	687	92	936	2,380	39,900	142,000
The year	17,100	48	4,400	------	------	------	5,610	3,180,000	4,060,000

[a] Totals are comparable with monthly determinations previously ascertained for Yakima River at Union Gap, near Yakima, Wash.

NOTE.—For records of flow of the three canals, see pp. 204–208.

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, 1921.

GAGE.—Stevens continuous water-stage recorder on right bank, 1¼ miles below Prosser Falls; installed August 4, 1913. June 1, 1904, to December 30, 1905, chain gage on highway bridge 600 feet below Prosser Falls. February 1 to October 12, 1906, inclined staff at approximately same site as present gage but at different datum. Recorder inspected by T. H. Martinson, J. F. Roach, Hans Pries, and 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 during year, from water-stage recorder, 10.28 feet at 4 p. m. May 21 (discharge, 18,300 second-feet); minimum stage, from recorder, 2.44 feet at midnight September 19 (discharge, 1,140 second-feet).

1904–1906 and 1914–1921: 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 permanent; not affected by ice. Rating curve well defined. Water-stage recorder inspected daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records excellent October to June; others 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 27	D. E. Ball	4.65	3,850	May 19	Paul Taylor	9.91	16,800
Jan. 11	do	5.27	4,720	June 20	D. E. Ball	6.20	6,390
Mar. 7	do	7.76	9,920	July 29	R. O. Crawford	3.06	1,670
23	Ball and Crawford	7.44	9,130	Sept. 6	D. E. Ball	3.13	1,780
May 4	R. O. Crawford	4.51	3,510				

Daily discharge, in second-feet, of Yakima River near Prosser, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,760	2,660	3,280	7,890	2,800	9,040	6,980	4,280	10,500	5,540	1,480	1,760
2	2,030	2,800	3,220	7,430	2,800	9,270	7,200	4,040	12,000	5,540	1,480	1,820
3	2,460	2,800	3,080	8,120	2,720	9,990	7,430	3,960	12,600	5,160	1,520	1,870
4	2,720	2,520	3,000	10,500	2,720	10,200	7,660	3,570	12,800	4,440	1,520	1,820
5	3,360	2,520	2,940	9,740	2,720	10,500	6,980	3,360	13,500	3,880	1,520	1,760
6	4,280	2,390	2,860	8,580	2,590	9,990	6,550	3,220	14,100	3,570	1,480	1,760
7	4,790	2,260	2,800	7,200	2,520	9,990	6,140	3,080	14,800	3,360	1,440	1,760
8	4,790	1,920	2,720	6,340	2,520	9,990	6,140	3,500	15,200	3,220	1,480	1,820
9	4,620	1,820	2,660	5,940	2,520	9,740	5,740	4,280	15,200	2,860	1,570	1,870
10	4,440	1,870	2,590	5,350	2,800	9,500	5,350	4,620	14,500	2,860	1,620	1,980
11	3,880	1,870	2,520	4,790	5,350	9,500	5,350	5,740	12,800	2,800	1,620	1,920
12	3,500	1,820	2,590	4,440	9,740	9,270	5,540	6,340	12,600	2,720	1,480	1,760
13	3,360	1,820	2,520	4,280	12,200	8,810	6,550	5,740	12,200	2,660	1,390	1,760
14	3,360	1,980	2,260	4,280	12,600	8,350	7,200	5,740	11,700	2,460	1,440	1,720
15	3,360	1,870	2,140	4,440	11,100	8,120	6,980	6,760	10,800	2,260	1,480	1,620
16	3,080	1,760	2,140	4,970	9,500	7,660	6,340	8,810	9,740	2,260	1,520	1,390
17	2,940	1,760	2,140	4,970	8,120	7,890	5,540	12,200	8,810	2,330	1,570	1,260
18	2,860	1,920	2,260	4,790	6,980	9,270	5,350	15,200	7,660	2,090	1,520	1,180
19	2,590	2,860	2,260	4,620	6,550	11,100	5,540	16,600	6,980	2,030	1,620	1,180
20	2,460	4,120	2,200	4,440	6,140	10,500	5,740	17,700	6,550	1,820	1,670	1,180
21	2,590	4,280	2,140	4,280	5,940	9,740	5,540	18,000	6,550	1,870	1,670	1,260
22	2,590	4,040	2,090	4,040	5,540	9,270	5,540	17,700	6,980	1,760	1,670	1,520
23	2,590	3,800	2,030	3,800	5,350	9,270	7,430	16,200	7,430	1,620	1,670	1,720
24	2,660	3,720	2,030	3,570	6,340	9,040	7,890	16,200	7,430	1,520	1,670	1,760
25	2,720	3,720	2,030	3,360	7,430	8,580	7,890	16,200	7,430	1,570	1,620	1,760
26	2,720	3,720	1,980	3,280	7,890	8,350	6,980	16,600	7,430	1,670	1,570	1,760
27	2,660	3,720	2,030	3,220	8,350	7,890	5,940	16,900	6,980	1,820	1,670	1,760
28	2,030	3,640	1,980	3,140	9,040	7,200	5,160	16,600	6,550	1,760	1,720	1,720
29	2,660	3,500	1,920	3,080	-------	6,760	4,620	15,200	5,940	1,670	1,720	1,820
30	2,590	3,420	2,520	3,000	-------	6,760	4,440	12,200	5,740	1,620	1,720	1,920
31	2,520	-------	5,540	2,860	-------	6,980	-------	10,800	-------	1,520	1,760	-------

Monthly discharge of Yakima River near Prosser, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	4,790	1,760	3,060	188,000
November	4,280	1,760	2,760	164,000
December	5,540	1,920	2,530	156,000
January	10,500	2,860	5,190	319,000
February	12,600	2,520	6,100	339,000
March	11,100	6,760	8,980	552,000
April	7,890	4,440	6,260	372,000
May	18,000	3,080	10,000	615,000
June	15,200	5,740	10,100	601,000
July	5,540	1,520	2,650	163,000
August	1,760	1,390	1,580	97,200
September	1,980	1,180	1,670	99,400
The year	18,000	1,180	5,070	3,670,000

KACHESS LAKE NEAR EASTON, WASH.

LOCATION.—In sec. 24, T. 21 N., R. 13 E. (unsurveyed), at lake outlet, 2½ miles northwest of Easton, Kittitas County.

DRAINAGE AREA.—63 square miles (measured on topographic maps).

RECORDS AVAILABLE.—September 20, 1905, to September 30, 1921.

GAGE.—Stevens water-stage recorder installed in gate tower November 25, 1915, for use when gates are closed, and staff gage in three sections (datum, mean sea level). Recorder inspected by Fred Diener. For description of present staff gage and former gages see Water-Supply Paper 442.

EXTREMES OF STORAGE.—Maximum stage during year, from water-stage recorder, 2,261.11 feet at 8 a. m. July 31 (storage, 234,950 acre-feet); minimum stage, from recorder 2,227.13 feet at midnight October 1 (storage, 98,380 acre-feet).

1906–1921: 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 feet. Record of storage or release each month used for determining discharge without storage at gaging station below dam.

ACCURACY.—Water-stage recorder in gate tower, used when gates were closed; referred to staff gage once daily. When gates were open, staff gage read twice daily to hundredths. Records excellent.

COOPERATION.—Record furnished by United States Bureau of Reclamation.

Daily storage, in acre-feet, in Kachess Lake near Easton, Wash.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	98,590	117,310	124,770	142,270	165,800	185,520	166,250	192,100	210,420	221,080	234,860	163,570
2	99,470	117,640	125,180	144,660	166,130	185,900	166,990	192,780	210,200	222,060	234,730	159,540
3	101,020	117,930	125,580	147,300	166,700	186,150	167,520	193,080	209,900	222,730	234,590	155,630
4	103,100	118,140	125,920	149,250	166,950	186,450	168,130	193,600	209,980	223,400	234,460	151,830
5	105,120	118,400	126,250	150,620	167,150	186,400	168,620	194,320	210,730	224,020	234,280	148,040
6	106,330	118,550	126,510	151,680	167,270	185,390	169,110	195,050	211,520	224,780	233,780	144,120
7	107,180	118,330	126,800	152,500	167,560	184,250	169,600	195,910	212,180	225,490	233,150	140,350
8	107,040	118,040	127,140	153,250	167,850	182,900	170,100	196,900	212,880	226,200	232,480	137,290
9	107,330	117,890	127,360	153,920	167,890	181,560	170,550	197,890	212,920	226,870	231,710	134,290
10	107,860	117,640	127,810	154,400	168,740	180,470	171,080	199,090	213,010	227,540	231,040	131,850
11	108,430	117,310	128,590	154,830	170,960	179,130	171,660	200,080	213,140	228,080	230,140	129,480
12	108,930	116,910	129,220	155,710	173,770	177,670	172,530	201,250	213,190	228,700	227,760	127,030
13	109,290	116,760	129,780	156,500	175,550	176,260	173,560	202,370	213,190	229,330	225,090	124,990
14	109,970	116,470	130,050	157,260	176,840	174,840	174,300	203,890	213,360	229,820	222,420	123,810
15	110,580	116,220	130,230	158,460	177,840	173,440	175,090	205,890	213,140	230,320	220,060	122,960
16	110,970	116,140	130,530	159,060	178,460	172,610	175,760	209,020	212,920	230,720	216,970	121,990
17	111,400	116,360	130,760	159,820	179,010	171,740	176,500	211,120	212,840	231,130	214,110	120,930
18	111,840	116,730	130,980	160,420	179,720	171,040	177,130	212,480	212,970	231,490	211,470	119,460
19	112,340	117,240	131,250	161,020	180,260	170,100	177,750	213,710	213,190	231,940	208,630	118,260
20	112,670	118,140	131,440	161,430	180,850	168,950	178,710	214,500	213,760	232,250	205,930	117,450
21	113,140	118,840	131,590	161,830	181,430	167,760	180,340	215,300	214,240	232,610	203,240	116,510
22	113,460	119,640	131,700	162,230	181,980	166,460	182,530	215,650	214,810	232,840	200,430	115,380
23	113,900	120,480	132,000	162,520	182,690	165,190	184,550	216,440	215,250	233,240	197,760	114,040
24	114,300	121,110	132,410	162,880	183,450	164,460	185,600	216,570	216,000	233,510	194,920	112,700
25	114,590	121,810	132,860	163,320	184,210	163,730	186,700	216,440	216,400	233,740	191,080	111,440
26	115,200	122,330	133,200	163,650	184,800	162,920	187,800	216,090	216,840	233,920	187,040	110,250
27	115,820	123,180	133,540	163,890	184,840	163,570	188,650	215,250	217,190	234,140	182,900	109,180
28	116,140	123,580	134,260	164,260	185,050	163,970	189,420	213,980	217,900	234,370	179,300	108,460
29	116,400	124,030	135,540	164,460	-------	164,500	190,400	212,620	218,910	234,550	175,380	107,470
30	116,730	124,360	138,440	164,910	-------	165,150	191,380	211,430	220,020	234,770	171,450	107,000
31	117,050	-------	140,620	165,310	-------	165,680	-------	210,730	-------	234,910	167,440	-------

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, 1921.

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 stage recorded during year, 7.17 feet at 5 p. m. August 24 (discharge, 1,840 second-feet); practically no flow on days for which discharge is not shown in table of daily discharge.

1904–1921: 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.

DIVERSIONS.—None.

REGULATION.—Flow controlled by storage and release of water in Kachess Lake reservoir. Monthly discharge, without storage, determined from records of stage of reservoir.

ACCURACY.—Stage-discharge relation changed frequently during year; not affected by ice. Standard rating curve fairly well defined; was used May 1–13. Parallel curves used October 1 to February 8, February 9 to April 30, May 14 to June 17, June 18 to July 31, August 1–10, 11–24, August 25 to September 9, and September 12–30. Gage read to hundreths once daily. Daily discharge ascertained by applying daily gage height to rating table except for September 10 and 11 for which it was ascertained by shifting-control method. Records fair.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Discharge measurements of Kachess River near Easton, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 8	Parker and Ball	5.40	749	May 20	Ball and Crawford	5.24	602
Feb. 8	D. E. Ball	4.54	371	June 22	D. E. Ball	4.50	406
9	do	5.68	788	Aug. 2	do	3.80	123
May 2	do	3.93	240	31	do	6.75	1,960

Daily discharge, in second-feet, of Kachess River near Easton, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Feb.	Mar.	May.	June.	Aug.	Sept.
1	4			290		1,130	129	2,020
2	8			280	100	1,120	125	2,020
3	22			271	100	1,100	122	1,960
4	31			267		930	167	1,860
5	40			610		807	255	1,870
6	49	30		868		812	303	1,880
7	58	143		863		835	348	1,830
8	448	143	33	858		868	368	1,770
9	18	143	51	872		798	368	1,630
10		143		896		721	368	1,400
11		143		887		708	1,000	1,280
12		143		882		695	1,370	1,160
13		143		877		682	1,400	758
14		141		872		665	1,400	483
15		141		868		639	1,440	475
16		141		863	215	561	1,460	566
17		141		863	498	379	1,460	669
18		134		863	573	399	1,470	795
19		32		854	610	399	1,460	800
20				849	623	399	1,460	800
21				844	721	399	1,450	800
22				839	744	399	1,460	795
23				762	757	399	1,450	786
24				661	1,170	399	1,600	776
25				652	1,170	399	2,010	776
26			287	277	1,160	403	1,990	767
27			290		1,160	201	1,980	753
28			290		1,140	36	1,980	748
29					1,140		1,990	522
30					1,130		1,990	388
31					1,130		1,990	

NOTE.—No flow on days for which no discharge is shown.

Monthly discharge of Kachess River near Easton, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 64 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage, in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	448	0	21.9	1,350	+18,900	20,200	329	5.14	5.93
November	143	0	58.7	3,490	+7,310	10,800	182	2.84	3.17
December	0	0	.0	0	+16,300	16,300	265	4.14	4.77
January	0	0	.0	0	+24,700	24,700	402	6.28	7.24
February	290	0	34.0	1,890	+19,700	21,600	389	6.08	6.33
March	896	0	606	37,300	−19,400	17,900	291	4.55	5.25
April	0	0	.0	0	+25,700	25,700	432	6.75	7.53
May	1,170	0	456	28,000	+19,400	47,400	771	12.0	13.83
June	1,130	0	576	34,300	+9,290	43,600	733	11.5	12.83
July	0	0	.0	0	+14,900	14,900	242	3.78	4.36
August	2,010	122	1,170	71,900	−67,500	4,400	72	1.12	1.29
September	2,020	388	1,100	65,500	−60,400	5,100	86	1.34	1.50
The year	2,020	0	337	244,000	+8,900	253,000	349	5.45	74.03

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, 1921.

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 stages below 5.0 feet. Auxiliary gages at same datum, about 400 feet above dam, installed October, 1907, and July 16, 1915, used to obtain true elevation of lake at low stages. Prior to June 17, 1907, vertical staff in lake above outlet, at datum 0.45 foot lower than present gage. Recorder inspected by J. G. Giddings.

EXTREMES OF STORAGE.—Maximum stage during year, from water-stage recorder, 14.79 feet at 10 a. m. June 5 (storage, 32,310 acre-feet); minimum stage, from recorder, 6.29 feet at 2 a. m. August 31 (storage, 13,210 acre-feet).

1907–1921: Maximum stage recorded, 19.10 feet at 6 p. m. December 30, 1917 (storage, 43,180 acre-feet); minimum stage, estimated 1.15 feet August 31, 1906 (storage, 2,380 acre-feet).

STORAGE.—Capacity of reservoir at crest of spillway (gage height, 11.3 feet) 24,100 acre-feet). Storage or release each month used for determining discharge without storage for gaging station below dam.

ACCURACY.—Water-stage recorder referred to staff gage twice daily. Gage read to hundredths. Records excellent.

COOPERATION.—Record furnished by United States Bureau of Reclamation.

Daily storage, in acre-feet, in Cle Elum Lake near Roslyn, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	19,170	15,200	25,740	27,680	25,100	27,010	26,290	26,710	30,930	28,760	26,060	13,340
2	18,740	14,620	25,650	28,100	25,120	27,080	26,450	26,660	31,510	28,620	26,040	13,590
3	19,720	14,190	25,650	28,480	25,100	26,980	26,500	26,590	31,490	27,870	25,990	13,760
4	21,890	13,920	25,550	28,080	25,030	26,910	26,400	26,570	31,800	27,420	25,850	13,980
5	28,450	14,040	25,460	27,640	24,990	26,820	26,270	26,610	32,240	27,380	25,550	14,190
6	28,970	14,710	25,420	27,120	24,850	26,730	26,170	26,750	32,120	27,330	25,140	14,360
7	28,640	15,330	25,350	26,800	24,870	26,540	26,060	27,240	32,170	27,310	24,690	14,490
8	27,910	15,800	25,370	26,540	24,870	26,400	25,990	27,660	31,970	27,500	24,240	14,660
9	27,100	16,250	25,350	26,290	24,920	26,290	25,970	27,870	31,030	27,560	23,810	14,660
10	26,400	16,530	25,370	26,100	25,420	26,270	26,010	28,120	30,350	27,450	23,400	14,900
11	25,740	16,750	25,440	25,990	27,100	26,310	26,380	28,270	29,970	27,290	22,910	15,070
12	24,780	16,960	25,440	25,900	29,210	26,200	26,910	28,240	29,950	27,260	22,470	15,260
13	23,950	17,260	25,510	25,900	29,420	26,060	27,380	28,290	29,880	27,330	21,820	15,370
14	23,340	17,500	25,400	25,970	28,570	26,040	27,450	28,380	29,660	27,330	21,050	15,500
15	22,560	17,740	25,240	26,340	27,800	25,990	27,310	29,610	29,230	27,240	20,400	15,740
16	21,690	18,110	25,190	26,340	27,220	26,100	27,010	31,120	28,780	27,100	19,740	15,950
17	21,430	18,670	25,140	26,310	26,820	26,310	26,910	31,880	28,480	26,980	18,950	16,120
18	21,840	19,670	25,140	26,290	26,610	26,640	26,980	31,680	28,240	26,820	18,090	16,340
19	21,650	21,600	25,140	26,080	26,380	26,610	27,030	31,830	28,150	26,840	17,160	16,810
20	21,300	23,270	25,080	25,970	26,220	26,540	27,100	31,390	28,360	26,800	16,210	17,420
21	20,790	24,810	24,990	25,810	26,080	26,430	27,450	30,810	28,760	26,680	15,260	18,390
22	19,890	25,810	24,960	25,690	25,940	26,340	28,220	31,000	29,160	26,470	14,490	19,630
23	19,000	26,270	24,990	25,580	26,040	26,200	28,450	31,240	29,160	26,400	14,020	20,570
24	18,540	26,360	25,030	25,490	26,340	26,100	27,980	31,290	29,260	26,430	13,720	21,320
25	18,090	26,340	25,030	25,420	26,360	26,130	27,590	31,710	29,260	26,400	13,550	21,930
26	17,650	26,290	25,080	25,330	26,590	26,100	27,240	31,510	29,160	26,340	13,530	22,670
27	17,110	26,220	25,140	25,280	26,750	26,010	27,010	30,500	28,880	26,270	13,420	23,340
28	16,600	26,130	25,460	25,190	26,840	25,990	26,870	29,520	28,670	26,200	13,320	24,090
29	16,270	25,990	25,740	25,120	-------	25,970	26,820	29,020	28,550	26,220	13,280	25,600
30	15,890	25,900	27,100	25,080	-------	26,080	26,680	29,090	28,620	26,220	13,280	25,710
31	15,610	-------	27,780	25,100	-------	26,170	-------	29,900	-------	26,150	13,250	-------

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, 1921.

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 discharge during year, 5,060 second-feet May 17 and June 5; minimum stage, from recorder, 0.69 foot at 3 p. m. November 6 (discharge, 48 second-feet).

1904–1921: 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 May 20 to June 20 and September 2–30. Rating curve used October 1 to May 19 well defined above 200 second-feet; curve used June 21 to September 1 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 May 20 to June 20 and September 2–30. Records excellent for October and December to April; good November, May, July, and August; and fair June and September.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Discharge measurements of Cle Elum River near Roslyn, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 6	G. L. Parker	5.10	2,390	May 19	Crawford and Ball	7.24	4,700
Nov. 23	D. E. Ball	3.14	802	June 21	D. E. Ball	5.24	2,170
Jan. 7	do	3.44	1,020	Aug. 1	do	3.04	661
Apr. 2	Crawford and Ball	3.18	892	Sept. 1	do	1.55	178
May 4	D. E. Ball	3.36	976				

Daily discharge, in second-feet, of Cle Elum River near Roslyn, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	975	820	538	1,620	368	1,260	792	1,080	3,890	2,100	667	193
2	975	820	507	1,900	382	1,300	850	1,040	4,410	1,960	645	162
3	1,010	765	494	2,160	371	1,260	880	1,010	4,410	1,540	645	164
4	1,180	765	486	1,860	338	1,220	850	975	4,670	1,250	624	164
5	1,980	292	465	1,540	326	1,150	792	1,010	5,060	1,150	645	166
6	2,340	50	437	1,220	308	1,080	738	1,120	4,930	1,150	645	166
7	2,210	123	407	1,040	317	975	712	1,380	4,800	1,180	645	168
8	1,900	153	395	910	308	910	686	1,660	4,670	1,280	645	151
9	1,620	164	388	820	317	850	686	1,780	3,770	1,320	645	164
10	1,380	200	392	712	449	850	712	1,940	3,300	1,250	645	172
11	1,260	209	426	636	1,260	850	850	2,030	2,980	1,180	645	168
12	1,220	193	426	636	2,790	792	1,220	1,980	2,880	1,180	645	172
13	1,180	147	453	661	2,880	738	1,460	2,080	2,880	1,220	645	172
14	1,150	157	410	686	2,260	686	1,460	2,480	2,680	1,180	645	114
15	1,120	168	371	820	1,740	661	1,300	3,190	2,440	1,180	645	50
16	1,080	164	354	850	1,420	738	1,180	4,410	2,120	1,120	645	50
17	544	179	332	820	1,150	820	1,120	5,060	1,940	1,030	645	52
18	596	219	329	765	975	975	1,150	4,930	1,780	967	645	55
19	1,040	308	326	712	880	1,040	1,220	4,800	1,740	967	645	56
20	1,010	426	305	636	792	975	1,220	4,280	1,860	939	645	56
21	940	433	285	579	738	880	1,460	4,020	2,150	885	645	57
22	1,010	612	273	529	712	820	1,940	4,020	2,380	833	645	59
23	1,040	820	262	494	765	765	2,080	4,280	2,440	783	645	59
24	975	850	282	469	880	738	1,820	4,280	2,490	783	554	62
25	940	820	296	449	1,040	738	1,580	4,540	2,440	783	263	63
26	940	765	290	429	1,080	712	1,340	4,410	2,380	783	261	69
27	910	738	299	410	1,150	712	1,220	3,530	2,190	735	258	84
28	910	712	410	392	1,180	686	1,150	2,780	2,050	712	258	302
29	910	636	542	378	-------	661	1,180	2,480	1,960	712	245	588
30	880	584	1,150	364	-------	712	1,150	2,530	1,960	689	232	661
31	850	-------	1,660	371	-------	738	-------	3,080	-------	689	232	-------

Monthly discharge of Cle Elum River near Roslyn, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 202 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	2,340	544	1,160	71,300	−4,480	66,800	1,090	5.40	6.23
November	850	50	443	26,400	+10,300	36,700	617	3.05	3.40
December	1,660	262	451	27,700	+1,880	29,600	481	2.38	2.74
January	2,160	364	834	51,300	−2,680	48,600	790	3.91	4.51
February	2,880	308	971	53,900	+1,740	55,600	1,000	4.95	5.16
March	1,300	661	880	54,100	−670	53,400	868	4.30	4.96
April	2,080	686	1,160	69,000	+510	69,500	1,170	5.79	6.46
May	5,060	975	2,840	175,000	+3,220	178,000	2,890	14.3	16.49
June	5,060	1,740	2,990	178,000	−1,280	177,000	2,970	14.7	16.40
July	2,100	689	1,080	66,400	−2,470	63,900	1,040	5.15	5.94
August	667	232	553	34,000	−12,900	21,100	343	1.70	1.96
September	661	50	154	9,160	+12,500	21,700	365	1.81	2.02
The year	5,060	50	1,130	816,000	+5,670	822,000	1,140	5.64	76.27

NACHES RIVER BELOW TIETON RIVER, NEAR NACHES, WASH.

LOCATION.—In sec. 35, T. 15 N., R. 16 E., 600 feet below Tieton River, 500 feet above intake of Wapatox canal, and 5 miles northwest of Naches, Yakima County.

DRAINAGE AREA.—942 square miles (measured on topographic maps and Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—August 4 to October 28, 1905; March 16, 1909, to October 31, 1912; May 10 to September 30, 1915; April 13, 1916, to September 30, 1921.

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 during year, from water-stage recorder, 8.46 feet at 1 a. m. June 8 (discharge, 9,800 second-feet); minimum stage, from recorder, 2.21 feet at 8 p. m. September 16 (discharge, 450 second-feet).

1905; 1909–1921: Maximum stage recorded, 8.9 feet at 8 a. m. November 24, 1909 (discharge, 18,800 second-feet); minimum stage recorded, 1.62 feet at 5 p. m. November 20, 1917, and 1.67 feet September 23, 1918 (discharge, 202 second-feet).

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

DIVERSIONS.—Above all important diversions except Selah Valley and Tieton canals. Record of the amount of water diverted by these canals is obtained; for Selah Valley canal mean monthly discharge only is published as shown in the monthly discharge table below; for discharge of Tieton canal see page 200.

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 practically permanent; possibly slightly affected during low stages by backwater from wing dam at intake of Wapatox canal. Rating curve well defined; revised above 4,000 second-feet for use during year. Water-stage recorder inspected daily. Daily discharge ascertained by applying daily mean gage height to rating table; daily mean gage height estimated for April 21 and 22, July 28 and 29, August 28, and September 7, owing to slight backwater effect from wing dam at intake of Wapatox canal, as indicated by graph from water-stage recorder. Records excellent October to July; others good.

COOPERATION.—Station maintained by United States Bureau of Reclamation in cooperation with Pacific Power & Light Co. 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 1	Parker and Ball	2.76	793	May 17	Ball and Crawford	7.34	7,230
Nov. 13	D. E. Ball	2.48	613	June 9	D. E. Ball	7.44	7,540
Dec. 31	do	4.69	2,780	29	R. O. Crawford	5.64	4,220
Feb. 14	do	4.85	2,940	Aug. 9	do	2.88	857
Mar. 24	Crawford and Ball	4.48	2,500	25	D. E. Ball	2.57	600
Apr. 28	D. E. Ball	4.72	2,570	Sept. 20	do	2.40	533

Daily discharge, in second-feet, of Naches River below Tieton River, near Naches, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	778	895	1,380	2,320	985	2,690	2,690	2,560	6,170	4,720	1,060	708
2	866	895	1,380	2,760	962	2,820	2,950	2,440	6,770	3,870	1,020	708
3	1,060	873	1,340	3,080	940	2,820	2,880	2,320	6,970	3,080	985	667
4	1,650	822	1,340	2,760	925	2,950	2,620	2,320	7,390	2,760	910	660
5	1,750	771	1,300	2,500	866	2,880	2,440	2,260	8,490	2,690	829	647
6	1,380	736	1,260	2,200	836	2,760	2,320	2,320	9,180	2,690	807	640
7	1,180	722	1,220	2,080	829	2,620	2,200	2,690	9,660	2,690	858	694
8	1,060	708	1,220	1,970	858	2,500	2,140	2,880	9,180	2,760	873	715
9	962	708	1,220	1,800	880	2,500	2,200	2,950	7,390	2,760	851	715
10	888	627	1,180	1,600	1,380	2,440	2,260	3,300	6,770	2,560	778	708
11	858	608	1,140	1,550	2,820	2,380	2,560	3,370	6,170	2,500	722	757
12	948	589	895	1,650	3,530	2,200	3,080	3,450	6,170	2,440	694	674
13	1,020	614	771	1,650	3,220	2,080	3,150	3,620	5,980	2,320	694	539
14	1,060	601	970	1,700	2,880	1,970	2,950	4,380	5,600	2,260	701	502
15	1,100	576	962	1,860	2,560	1,860	2,760	5,420	5,060	2,220	743	485
16	1,140	614	1,020	1,750	2,260	1,970	2,560	7,390	4,380	2,080	757	467
17	1,140	940	985	1,700	2,080	2,820	2,620	7,390	3,870	1,970	736	467
18	1,100	1,860	985	1,650	2,080	3,870	2,820	6,770	3,700	1,920	778	479
19	1,060	2,690	985	1,600	2,080	3,330	3,020	7,180	3,780	1,860	757	485
20	1,020	2,380	962	1,550	1,970	2,950	2,880	6,770	4,210	1,750	694	563
21	1,020	2,020	955	1,460	1,860	2,690	3,080	6,170	4,890	1,650	667	654
22	1,060	1,860	962	1,300	1,750	2,620	4,120	6,770	5,060	1,500	701	674
23	1,060	1,700	955	1,220	2,140	2,560	4,120	6,770	4,890	1,500	694	640
24	1,060	1,600	955	1,180	2,380	2,440	3,620	6,970	5,060	1,550	708	614
25	1,060	1,550	948	1,180	2,440	2,440	3,220	7,600	5,060	1,500	701	569
26	985	1,550	918	1,180	2,560	2,320	3,020	7,600	4,720	1,460	681	576
27	978	1,460	814	1,140	2,690	2,200	2,880	6,170	4,380	1,380	667	608
28	985	1,420	858	1,100	2,620	2,200	2,760	5,240	4,210	1,340	647	621
29	985	1,460	1,020	1,060	-------	2,380	2,820	4,720	4,380	1,220	674	595
30	948	1,420	2,760	1,060	-------	2,440	2,690	4,720	4,720	1,140	654	582
31	918	-------	2,820	1,020	-------	2,500	-------	5,240	-------	1,140	674	-------

Monthly discharge of Naches River below Tieton River, near Naches, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 942 square miles.]

Month.	Observed discharge of river in second-feet.			Run-off in acre-feet.					Discharge of river in second-feet (corrected for diversions and storage).		Run-off in inches.
	Maximum.	Minimum.	Mean.	River (observed).	Diverted. Selah Valley canal.	Diverted. Tieton canal.	Stored in Bumping Lake reservoir.	River (corrected for diversions and storage).	Mean.	Per square mile.	
October	1,750	858	1,070	65,800	-------	-------	+9,720	75,500	1,230	1.31	1.51
November	2,690	576	1,180	70,200	-------	1,740	−390	71,600	1,200	1.27	1.42
December	2,820	771	1,180	72,600	-------	-------	−6,760	65,800	1,070	1.14	1.31
January	3,080	1,020	1,700	105,000	-------	-------	−1,770	103,000	1,680	1.78	2.05
February	3,530	829	1,910	106,000	-------	-------	−140	106,000	1,910	2.03	2.11
March	3,870	1,860	2,550	157,000	-------	-------	−6,610	150,000	2,440	2.59	2.99
April	4,120	2,140	2,850	170,000	2,680	3,430	+1,450	178,000	2,990	3.17	3.54
May	7,600	2,260	4,830	297,000	6,690	18,400	+25,000	347,000	5,640	5.99	6.91
June	9,660	3,700	5,810	346,000	6,650	18,000	+7,910	379,000	6,370	6.76	7.54
July	4,720	1,140	2,170	133,000	7,350	19,700	+690	161,000	2,620	2.78	3.20
August	1,060	647	765	47,000	7,310	19,700	−11,800	62,200	1,010	1.07	1.23
September	757	467	614	36,500	6,740	15,100	−15,400	42,900	721	.765	.85
The year	9,660	467	2,220	1,610,000	-------	-------	+1,900	1,740,000	2,410	2.56	34.66

NOTE.—The monthly discharge, corrected for storage and diversions, as shown in the above table represent the natural yield as nearly as may be computed from stream-flow records. No account is taken of depletion due to irrigation above gaging station, amounting to perhaps 6,000 acre-feet a year, and unmeasured waste above 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, 1921.

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, 3,430.40 feet from 7.30 a. m. July 11 to 5.30 p. m. July 12 (storage, 39,630 acre-feet); minimum stage recorded, 3,394.55 feet from 8 a. m. to 3 p. m. April 9 (storage, 3,560 acre-feet).

1911–1921: Maximum stage recorded on July 12, 1921; minimum stage recorded, 3,391.00 feet February 12–15, 1916 (storage, 1,260 acre-feet).

STORAGE.—Capacity of reservoir at crest of spillway, 33,700 acre-feet. Elevation of gate sill, 3,389 feet, and of spillway crest, 3,426 feet. Storage or release each month used for determining discharge without storage for gaging station below dam.

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

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Daily storage, in acre-feet, in Bumping Lake near Nile, Wash., for the year ending Sept. 30, 1911.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	10,010	19,560	18,760	13,410	10,660	10,240	3,930	5,200	31,700	38,290	38,890	26,530
2	10,380	19,480	18,210	14,320	10,590	9,740	3,790	5,110	33,400	38,120	38,860	25,840
3	11,520	19,420	17,690	14,950	10,520	9,130	3,760	4,980	35,050	37,960	38,810	25,190
4	13,200	19,410	17,190	14,930	10,460	8,520	3,750	4,850	36,990	37,850	38,680	24,500
5	14,440	19,410	16,650	14,880	10,440	7,990	3,730	4,720	38,380	37,780	38,600	23,810
6	15,460	19,370	16,160	14,770	10,390	7,520	3,680	4,670	38,960	37,730	38,510	23,150
7	16,310	19,360	15,730	14,620	10,370	7,000	3,630	4,660	39,060	38,000	38,370	22,360
8	17,010	19,360	15,310	14,420	10,370	6,640	3,610	4,690	38,940	38,940	38,150	21,620
9	17,540	19,350	14,900	14,190	10,380	6,270	3,570	4,760	38,730	39,530	38,000	20,900
10	18,040	19,320	14,430	13,920	10,550	5,930	3,600	4,910	38,550	39,580	37,820	20,310
11	18,500	19,230	14,040	13,490	11,390	5,680	3,630	5,060	38,470	39,620	37,600	19,620
12	19,020	18,700	14,180	13,060	12,150	5,740	3,750	5,210	38,450	39,620	37,410	18,970
13	19,330	18,600	14,340	12,640	12,620	5,310	3,860	5,460	38,440	39,580	37,210	18,440
14	19,610	18,550	14,040	12,270	12,980	4,850	3,920	5,760	38,340	39,560	36,940	17,940
15	19,750	18,540	13,700	11,950	13,210	4,690	3,950	6,650	38,230	39,560	36,630	17,460
16	19,820	18,570	13,450	11,810	13,090	4,620	3,960	8,410	38,110	39,550	36,130	16,930
17	20,040	18,990	13,140	11,620	12,590	4,790	4,000	10,340	37,970	39,490	35,700	16,470
18	20,360	20,060	12,780	11,380	12,040	5,120	4,040	12,210	37,920	39,440	35,330	15,980
19	20,510	20,990	12,550	11,090	11,560	5,270	4,140	14,100	37,970	39,410	34,890	15,680
20	20,440	21,570	12,080	10,740	11,250	5,300	4,250	15,800	38,100	39,360	34,500	15,240
21	20,320	21,630	11,760	10,440	10,950	5,260	4,400	17,420	38,140	39,290	34,070	14,860
22	20,180	21,680	11,480	10,420	10,670	5,120	4,930	18,790	38,290	39,230	33,510	14,620
23	19,710	21,560	11,240	10,450	10,540	4,940	5,450	20,140	38,330	39,220	32,840	14,320
24	18,980	21,210	10,940	10,480	10,560	4,810	5,750	21,810	38,380	39,220	32,200	13,810
25	18,880	20,930	10,650	10,510	10,570	4,660	5,890	23,590	38,400	39,200	31,420	13,390
26	19,060	20,670	10,410	10,530	10,540	4,510	5,840	25,430	38,320	39,160	30,730	13,010
27	19,210	20,360	10,350	10,530	10,530	4,330	5,770	27,080	38,190	39,140	30,080	12,720
28	19,370	19,990	10,340	10,540	10,510	4,150	5,610	28,120	38,180	39,100	29,350	12,410
29	19,480	19,620	10,470	10,580	-------	4,060	5,480	28,790	38,190	39,060	28,650	12,100
30	19,560	19,180	11,180	10,620	-------	3,980	5,350	29,430	38,250	39,000	27,940	11,750
31	19,570	-------	12,420	10,650	-------	3,900	-------	30,340	-------	38,940	27,180	-------

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, 1921.

GAGE.—Stevens water-stage recorder; installed June 17, 1913; inspected by J. H. Nelson. Since June 17, 1913, vertical staff on left bank, one-fourth of a 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 0.6 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 5.22 feet at 8.30 p. m. June 7 (discharge, 1,890 second-feet); minimum stage, from recorder, 1.27 feet at 2.30 p. m. December 13 (discharge, 16 second-feet).

1906 and 1909–1921: 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; revised for use after October 5. Water-stage recorder inspected daily. Daily discharge ascertained by applying daily mean gage height to rating table or, for a few days when range in stage was considerable, by averaging results obtained by applying to rating table mean gage heights for shorter intervals. Records fair.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Discharge measurements of Bumping River near Nile, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 11	D. E. Ball	2.29	134	June 14	Paul Taylor	4.44	1,260
11	do	2.96	322	July 25	R. O. Crawford	3.09	408
12	do	3.39	482	26	do	3.04	407

Daily discharge, in second-feet, of Bumping River near Nile, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	153	165	510	337	145	685	257	407	589	1,190	264	467
2	157	165	504	351	145	741	254	392	589	1,000	254	472
3	161	160	493	412	143	741	254	374	606	860	254	477
4	176	147	488	488	130	728	250	355	735	800	246	472
5	108	147	488	493	117	691	246	342	1,510	728	246	467
6	51	141	483	493	104	648	240	329	1,750	691	243	467
7	51	134	483	488	92	606	233	333	1,870	728	240	472
8	50	134	477	488	92	554	223	337	1,790	299	240	472
9	50	127	472	483	92	510	226	346	1,590	618	236	467
10	50	123	467	477	99	462	226	378	1,470	642	233	467
11	106	295	344	467	212	426	233	402	1,390	697	233	467
12	162	325	17	462	472	392	246	421	1,390	697	246	392
13	162	117	143	457	483	369	257	441	1,310	678	257	333
14	198	108	337	446	493	342	268	488	1,270	666	268	333
15	264	108	320	441	499	320	272	246	1,120	636	307	329
16	291	110	320	436	499	312	272	106	1,000	606	337	329
17	295	117	312	431	493	346	268	110	895	571	337	325
18	295	382	307	426	483	392	276	112	800	532	337	287
19	295	548	303	416	477	402	287	114	860	515	333	291
20	295	548	299	407	467	397	299	115	960	493	333	325
21	295	548	295	263	463	387	329	228	1,120	457	364	320
22	295	554	291	150	457	378	397	364	1,230	402	407	320
23	287	560	291	147	451	360	446	374	1,230	402	446	316
24	243	554	291	147	441	346	483	387	1,230	402	477	299
25	181	548	287	147	436	333	488	407	1,270	392	477	284
26	162	548	207	147	431	312	483	421	1,190	364	472	280
27	162	537	152	150	426	303	477	426	1,080	342	467	276
28	162	532	152	150	426	295	457	526	1,000	320	462	276
29	162	526	162	147	-------	280	441	612	1,040	303	462	268
30	165	515	256	147	-------	268	421	624	1,120	284	472	268
31	165	-------	329	147	-------	260	-------	630	-------	272	477	-------

Monthly discharge of Bumping River near Nile, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 68 square miles.]

Month.	Observed discharge in second-feet.			Run-off in acre-feet.			Discharge without storage, in second-feet.		Run-off in inches.
	Maximum.	Minimum.	Mean.	Observed.	Stored.	Without storage.	Mean.	Per square mile.	
October	295	50	182	11,200	+9,720	20,900	340	5.00	5.76
November	560	108	317	18,900	−390	18,500	311	4.57	5.10
December	510	17	332	20,400	−6,760	13,600	221	3.25	3.75
January	493	147	343	21,100	−1,770	19,300	314	4.62	5.33
February	499	92	331	18,400	−140	18,300	330	4.85	5.05
March	741	260	438	26,900	−6,610	20,300	330	4.85	5.59
April	488	223	317	18,900	+1,450	20,400	343	5.04	5.62
May	630	106	360	22,100	+25,000	47,100	766	11.3	13.03
June	1,870	589	1,170	69,600	+7,910	77,500	1,300	19.1	21.31
July	1,190	272	567	34,900	+690	35,600	579	8.51	9.81
August	477	233	336	20,700	−11,800	8,900	145	2.13	2.46
September	477	268	367	21,800	−15,400	6,400	108	1.59	1.77
The year	1,870	17	421	305,000	+1,900	307,000	424	6.24	84.58

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, 1921.

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 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. One channel at all stages; gradient steep.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 5.68 feet at 9 a. m. June 7 (discharge, 2,580 second-feet); minimum stage, from recorder, 1.77 feet August 27 (discharge, 12.5 second-feet).

1907–1921: Maximum stage recorded, 7.15 feet at 4 a. m. November 24, 1909 (discharge, 5,400 second-feet); 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.

DIVERSIONS.—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 fluctuation during irrigation season.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Rating curve well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying daily mean gage height to rating table. Records 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 29	D. E. Ball	3.40	429	June 6	D. E. Ball	5.46	2,330
Jan. 4	do	4.05	857	30	R. O. Crawford	4.65	1,440
Feb. 16	do	3.90	744	July 26	D. E. Ball	3.38	416
Mar. 26	Crawford and Ball	3.88	773	Aug. 22	do	2.50	104
Apr. 27	D. E. Ball	3.74	612	Sept. 15	do	1.88	17.2
May 23	do	4.86	1,600	26	do	2.81	186

Daily discharge, in second-feet, of Tieton River at headworks of Tieton canal, near Naches, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	380	322	434	793	361	850	809	568	1,620	1,460	352	81
2	424	322	429	1,040	348	850	927	539	1,840	1,020	357	50
3	466	309	429	1,050	343	850	868	527	1,940	850	339	27
4	731	296	434	902	334	884	793	504	2,120	745	275	33
5	598	280	419	834	317	850	738	471	2,360	689	214	26
6	510	263	409	745	309	809	710	455	2,360	689	218	47
7	477	255	399	717	326	753	682	516	2,480	738	271	98
8	450	244	384	675	339	738	689	544	2,180	978	288	109
9	434	232	380	630	339	731	703	568	1,780	876	280	98
10	419	207	371	610	692	731	724	604	1,670	731	221	102
11	424	197	348	604	1,060	777	793	604	1,560	717	181	100
12	424	184	330	592	1,120	745	876	630	1,510	682	162	45
13	409	181	317	586	1,040	724	859	682	1,460	662	162	37
14	409	181	292	610	961	689	834	825	1,360	649	194	28
15	399	175	280	630	893	668	825	1,010	1,170	604	204	19
16	389	184	288	604	785	745	769	1,460	1,050	556	181	32
17	389	384	271	592	738	1,080	769	1,360	936	533	156	40
18	389	745	267	580	731	1,220	842	1,310	910	562	184	47
19	389	876	259	568	696	1,070	817	1,410	1,010	568	148	103
20	384	642	248	556	675	978	769	1,460	1,220	510	116	126
21	384	493	232	544	642	918	834	1,410	1,460	488	123	223
22	384	444	225	539	656	893	1,010	1,510	1,410	450	109	190
23	380	419	225	527	859	834	961	1,620	1,310	455	70	184
24	394	394	221	522	893	834	850	1,720	1,360	488	50	162
25	389	389	214	533	868	834	777	1,940	1,360	471	29	162
26	384	384	211	493	884	753	703	1,890	1,220	434	22	184
27	375	371	218	450	850	717	675	1,510	1,170	399	18	187
28	375	394	271	414	850	731	616	1,260	1,170	380	59	197
29	361	434	322	409	-------	769	623	1,080	1,260	371	50	187
30	348	444	995	394	-------	745	592	1,080	1,510	357	45	181
31	343	-------	893	380	-------	753	-------	1,260	-------	371	46	-------

Combined monthly discharge of Tieton River and canal at headworks of Tieton canal, near Naches, Wash., for the year ending Sept. 30, 1921.

[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	731	343	420	----------	420	1.75	2.02	25,800
November	876	175	355	29	384	1.60	1.78	22,800
December	995	211	355	----------	355	1.48	1.71	21,800
January	1,050	380	617	----------	617	2.57	2.96	37,900
February	1,120	309	675	----------	675	2.81	2.93	37,500
March	1,220	668	823	----------	823	3.43	3.95	50,600
April	1,110	682	781	58	839	3.50	3.90	49,900
May	2,240	740	1,040	299	1,340	5.58	6.43	82,400
June	2,790	1,220	1,530	302	1,830	7.62	8.50	109,000
July	1,780	678	628	320	948	3.95	4.55	58,300
August	677	339	165	321	486	2.02	2.33	29,900
September	430	305	104	253	357	1.49	1.66	21,200
The year	2,790	175	623	----------	756	3.15	42.72	547,000

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, 1921.

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, 5.53 feet for few hours on September 9 (discharge, 344 second-feet, the result of current-meter measurement); no flow October 1 to November 19 and November 30 to April 17.

1910–1921: Maximum stage recorded on September 9, 1921; no flow when head gates are closed.

ACCURACY.—Stage-discharge relation shifts slightly at high stages; practically permanent during each irrigating season. Rating curves well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying daily mean gage height to rating table. Records excellent.

COOPERATION.—Complete record furnished by 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 27	D. E. Ball	3.09	160	Aug. 22	D. E. Ball	5.33	311
May 9	Crawford and Ball	5.19	310	Sept. 9	R. O. Crawford	5.53	344
23	R. O. Crawford	5.07	311	15	D. E. Ball	5.13	295
June 30	do	5.18	315	26	do	2.63	124
July 26	D. E. Ball	5.33	311				

Daily discharge, in second-feet, of Tieton canal near Naches, Wash., for the year ending Sept. 30, 1921.

Day.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1			219	314	315	320	322
2			245	309	318	320	321
3			245	310	318	321	322
4			269	310	317	321	322
5			269	309	318	321	321
6			293	310	318	321	322
7			302	310	319	322	321
8			310	310	318	321	321
9			316	314	318	321	319
10			315	310	319	321	320
11			315	309	321	322	320
12			316	310	320	322	309
13			315	310	320	321	309
14			315	310	320	322	310
15			316	310	320	321	302
16			315	310	320	321	286
17			314	310	319	321	286
18		43	315	310	320	321	286
19		65	302	314	320	321	229
20	76	64	302	310	320	321	213
21	75	76	302	310	321	322	193
22	98	101	302	310	321	321	173
23	98	115	302	310	321	321	157
24	97	149	302	310	321	322	157
25	98	147	302	310	321	322	169
26	98	157	309	314	321	321	121
27	98	174	309	309	322	321	146
28	98	197	309	310	321	322	150
29	42	221	309	310	321	321	136
30		221	310	48	321	321	136
31			314		320	321	

NOTE.—Canal dry during periods for which no discharge is given.

Monthly discharge of Tieton canal near Naches, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
November	98	0	29.3	1,740
April	221	0	57.7	3,430
May	316	219	299	18,400
June	314	48	302	18,000
July	322	315	320	19,700
August	322	320	321	19,700
September	322	121	253	15,100
The year	322	0	133	96,100

NOTE.—See footnote to table of daily discharge.

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, 1921.

GAGE.—Stevens continuous water-stage recorder on left bank, about 300 feet southeast of ranch house; installed April 6, 1919; inspected by F. W. Schott and G. A. Hill. Previous gages as follows: August 26, 1907, to April 1, 1913, and August 20, 1915, to September 5, 1916, vertical staff at same site and datum as present gage; April 2, 1913, to August 19, 1915, and September 6, 1916, to September 30, 1917, Stevens continuous water-stage recorder; and April 14, 1918, to October 10, 1918, Stevens 8-day water-stage recorder at same site and datum.

DISCHARGE MEASUREMENTS.—Made from gaging bridge 40 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Banks high; not subject to overflow. Concrete control installed in November, 1915, 50 feet below gage. Stage of zero flow at time of construction of control, gage height 1.45 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 3.85 feet at 11 p. m. June 5 (discharge, 512 second-feet); discharge may have been higher during period May 23–30, when recorder was not operating. Minimum stage, from recorder, 1.55 feet from 5 p. m. to 9 p. m. November 8 (discharge, 6.8 second-feet); lower stage probably occurred in winter when record was discontinued.

1907–1921: Maximum stage recorded, 4.60 feet at 9 a. m. June 18, 1916 (discharge, 728 second-feet); minimum stage recorded on November 8, 1920.

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

DIVERSIONS.—Station is above all diversions.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed June 4–5. 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 June and July; otherwise good.

Discharge measurements of North Fork of Ahtanum Creek near Tampico, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 7	John McCombs	2.54	119	June 17	R. B. Kilgore	3.02	226
7	do	2.54	117	17	do	3.00	220
13	do	2.74	161	July 17	Raleigh Skillin	2.33	82.7

Daily discharge, in second-feet, of North Fork of Ahtanum Creek near Tampico, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	16.5	17.7		130	414	177	41	25
2	18.3	15.9		124	451	152	41	24
3	17.7	14.7		115	444	140	40	23
4	19.5	12.5	190	119	470	135	39	23
5	20	14.1		117	476	127	38	23
6	18.3	14.1		122	480	125	36	23
7	17.7	15.9	122	156	476	127	30	22
8	17.1	11.0	117	161	431	123	35	22
9	16.5	12.5	117	183	391	114	33	22
10	17.1	-------	119	200	352	106	32	22
11	18.9	-------	139	200	325	101	31	23
12	18.3	-------	164	211	321	97	31	23
13	18.1	-------	161	233	328	94	31	23
14	17.9	-------	152	277	298	90	31	23
15	17.7	-------	143	331	267	84	29	22
16	17.7	-------	136	474	241	80	30	22
17	18.3	-------	141	466	227	77	29	22
18	18.3	-------	161	440	229	75	30	22
19	18.3	-------	164	466	229	72	29	23
20	18.9	-------	156	447	249	68	27	23
21	17.7	-------	159	444	264	68	26	24
22	18.3	-------	190	447	258	64	26	22
23	18.9	-------	186		246	60	25	22
24	18.3	-------	166		238	59	25	22
25	18.3	-------	154	480	221	56	26	21
26	18.3	-------	145		208	56	25	21
27	17.7	-------	141		196	53	25	20
28	17.1	-------	139		186	49	24	20
29	17.1	-------	141	330	194	48	23	20
30	14.1	-------	134		201	46	23	20
31	17.7	-------	-------	358	-------	42	23	-------

NOTE.—Water-stage recorder not operating Oct. 13–14, Apr. 1–6, and May 23–30; discharge Oct. 13–14 ascertained by interpolation; Apr. 1–6 and May 23–30 by comparison with flow of near-by streams, from recorded range of stage, and from temperature record. Braced figures show mean discharge for periods indicated.

Monthly discharge of North Fork of Ahtanum Creek near Tampico, Wash., for the year ending Sept. 30, 1921.

[Drainage area, 69 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	20	14.1	17.9	0.259	0.30	1,100
November 1–9	17.7	11.0	14.3	.207	.07	255
April	----------	117	156	2.26	2.52	9,280
May	----------	115	305	4.42	5.10	18,800
June	480	186	310	4.49	5.01	18,400
July	177	42	89.2	1.29	1.49	5,480
August	41	23	30.3	.439	.51	1,860
September	25	20	22.2	.322	.36	1,320

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 Plate I, Water-Supply Paper 369).

RECORDS AVAILABLE.—March 15, 1915, to September 30, 1921.

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 of July 20, 1919, gage height +0.05 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.80 feet June 7 (discharge, 151 second-feet); minimum stage probably occurred during winter when observations were discontinued.

1915–1921: Maximum stage recorded, 3.1 feet June 19, 1916 (discharge, 216 second-feet); minimum stage recorded, 0.60 foot September 25–26, 1915, and 0.40 foot August 22 and 23, 1920 (discharge, 4.3 second-feet).

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

DIVERSIONS.—Small ditch diverting above gage supplies water to Conrad's hop fields.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during winter and on June 7. 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 at Conrad ranch, near Tampico, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 7	John McCombs	0.84	36.0	Apr. 13	John McCombs	0.90	42.9
7	do	.84	34.5	June 17	R. B. Kilgore	1.10	58.9
12	do	.89	44.9	17	do	1.10	55.5

Daily discharge, in second-feet, of South Fork of Ahtanum Creek at Conrad ranch, near Tampico, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.4	52	36	119	32	13	8.2
2	5.4	62	34	125	31	12	8.2
3	5.4	60	34	132	30	12	8.2
4	5.4	50	31	138	30	11	8.2
5	5.4	47	31	144	28	11	8.2
6	5.1	41	34	144	25	11	8.7
7	4.8	36	38	151	24	11	8.7
8	4.8	36	39	138	23	11	8.2
9	4.8	35	41	138	23	11	8.2
10	5.1	35	47	131	21	11	8.2
11	4.8	39	49	110	21	11	8.2
12	5.1	41	52	97	20	11	8.2
13	5.4	44	56	90	20	11	8.2
14	5.4	43	64	84	18	10	8.2
15	5.4	40	76	81	18	10	8.2
16	5.4	39	125	65	18	10	8.2
17	5.8	38	144	57	18	10	7.7
18	5.4	44	138	55	17	10	8.2
19	5.4	41	138	52	17	11	8.2
20	5.4	41	144	50	16	10	8.2
21	5.4	41	132	49	16	9.2	8.2
22	5.4	49	125	47	16	9.2	8.2
23	5.4	49	132	45	14	9.2	8.2
24	5.4	45	132	43	14	9.2	8.2
25	5.4	41	144	41	13	9.2	8.2
26	5.4	38	138	41	13	9.2	8.2
27	6.2	36	125	38	13	8.2	8.7
28	6.2	38	113	36	13	8.2	8.2
29	5.8	39	102	36	14	8.2	8.2
30	6.2	38	102	35	14	8.2	8.7
31	6.2	------	108	------	14	8.2	------

Monthly discharge of South Fork of Ahtanum Creek at Conrad ranch near Tampico, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	6.2	4.8	5.42	333
April	62	35	42.6	2,530
May	144	31	87.2	5,360
June	151	35	83.7	4,980
July	32	13	19.5	1,200
August	13	8.2	10.1	621
September	8.7	7.7	8.25	491

NEW RESERVATION CANAL AT PARKER, WASH.

LOCATION.—In sec. 20, T. 12 N., R. 19 E., 1 mile below intake of canal, half a mile northwest of Parker, Yakima County, and 5½ miles northwest of Wapato.

RECORDS AVAILABLE.—Irrigation seasons 1904 to September 30, 1921.

GAGE.—Vertical staff at highway bridge a quarter of a mile below intake; installed before opening of irrigation season in 1917; read by G. M. Baugher. Gages previously used as follows: Prior to April 1, 1911, gage about 1 mile below intake; April 1, 1911, to April 26, 1916, about three-fourths of a mile below intake; April 26 to October 14, 1916, at highway bridge about 1 mile below intake.

DISCHARGE MEASUREMENT.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of gravel and small stones. Channel at times obstructed by growth of aquatic plants.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.30 feet June 28–30 (discharge, 1,380 second-feet); no flow reported during nonirrigating season.

1904–1921: Maximum stage recorded June 28–30, 1921; no flow reported during nonirrigating season.

ACCURACY.—Stage-discharge relation changed continuously throughout season. Standard rating curve for season fairly well defined. Gage read to hundredths twice daily. Daily discharge ascertained by shifting-control method, on basis of frequent, well-distributed discharge measurements. Records excellent.

COOPERATION.—Complete data furnished by United States Bureau of Reclamation and United States Office of Indian Affairs.

Canal diverts water from right bank of Yakima River in sec. 20, T. 12 N., R. 19 E., about 2 miles above intake of Old Reservation canal. Water is used for irrigation.

Discharge measurements of New Reservation canal at Parker, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 30	D. E. Ball	1.85	106	May 28	Raleigh Skillin	7.21	1,320
Apr. 6	Raleigh Skillin	3.04	118	28	Crawford and Ball	7.20	1,300
13	Ball and Crawford	3.86	330	June 17	Raleigh Skillin	6.49	1,060
14	Skillin and Guym	4.26	406	July 2	R. O. Crawford	7.25	1,360
20	Raleigh Skillin	5.00	633	19	D. E. Ball	5.51	855
27	do	6.28	1,000	22	Raleigh Skillin	6.98	1,250
May 2	R. O. Crawford	6.61	1,110	Aug. 1	R. O. Crawford	6.82	1,160
3	Skillin and Houston	6.75	1,140	3	Raleigh Skillin	6.78	1,140
13	do	6.60	1,140	12	do	7.20	1,260
13	R. O. Crawford	6.60	1,150	25	D. E. Ball	7.11	1,160
14	Skillin and Houston	6.97	1,310	Sept. 7	do	6.43	1,000
23	do	7.02	1,240	12	Raleigh Skillin	5.56	732
24	do	7.10	1,290				

Daily discharge, in second-feet, of New Reservation canal at Parker, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1	227	30	1,090	1,010	1,370	1,150	1,100
2	227	30	1,110	1,010	1,350	1,150	1,100
3	238	51	1,140	1,050	1,340	1,150	1,080
4	245	57	1,160	1,130	1,320	1,150	1,040
5	216	95	1,190	1,130	1,310	1,150	1,050
6	219	105	1,200	1,200	1,300	1,150	1,040
7	219	144	1,200	1,210	1,340	1,150	1,010
8	209	154	1,200	1,200	1,350	1,150	898
9	209	204	1,210	1,160	1,350	1,150	749
10	209	217	1,070	1,130	1,350	1,150	695
11	205	226	571	1,110	1,360	1,150	695
12	202	268	1,040	1,110	1,370	1,240	695
13	70	307	1,160	1,110	1,370	1,250	695
14	70	390	1,240	1,060	1,370	1,190	695
15	75	417	1,260	1,000	757	1,190	717
16	------	473	1,170	1,030	630	1,190	711
17	------	496	1,080	1,030	754	1,190	708
18	------	512	1,080	1,070	806	1,190	708
19	------	564	1,140	1,070	854	1,190	690
20	------	638	1,220	1,080	873	1,190	628
21	------	687	1,230	1,120	1,070	1,190	561
22	------	762	1,250	1,220	1,250	1,190	470
23	------	779	1,260	1,270	1,220	1,190	420
24	------	779	1,280	1,310	1,150	1,190	407
25	------	833	1,300	1,330	1,150	1,180	407
26	------	930	1,320	1,350	1,150	1,160	407
27	------	981	1,320	1,370	1,150	1,150	394
28	------	1,040	1,310	1,380	1,150	1,130	382
29	------	1,070	1,320	1,380	1,150	1,130	357
30	------	1,080	1,320	1,380	1,150	1,110	110
31	------	------	1,150	------	1,150	1,100	------

NOTE.—Probably no flow Oct. 16 to Mar. 31.

Monthly discharge of New Reservation canal at Parker, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October 1–15	245	70	189	5,630
April	1,080	30	477	28,400
May	1,320	571	1,180	72,600
June	1,380	1,000	1,170	69,400
July	1,370	630	1,170	71,900
August	1,250	1,100	1,170	71,900
September	1,100	110	687	40,900

OLD RESERVATION CANAL AT PARKER, WASH.

LOCATION.—In sec. 28, T. 12 N., R. 19 E., about 300 feet below intake and 500 feet above controlling waste of first lateral, 1 mile east of Parker, Yakima County, and 3½ miles northwest of Wapato.

RECORDS AVAILABLE.—Irrigation seasons 1904 to September 30, 1921.

GAGE.—Vertical staff on left side about 10 feet upstream from private farm bridge; read by H. B. Ealy and J. F. Dearing. Prior to June 23, 1908, vertical staff on downstream end of right retaining wall of Northern Pacific Railway bridge, about half a mile below site of present gage and at different datum.

DISCHARGE MEASUREMENTS.—Made from gaging bridge at gage.

CHANNEL AND CONTROL.—Bed of old slough. Velocities high. No obstruction from growth of aquatic plants. Fairly permanent for each irrigation season.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.41 feet April 24 (discharge, 322 second-feet); no flow reported during nonirrigating season. 1904–1921: Maximum stage recorded, 6.05 feet May 21, 1919 (discharge, 386 second-feet); no flow reported during nonirrigating seasons.

ACCURACY.—Stage-discharge relation changed during winter, May 14 to July 6 and August 22 to September 6. Rating curves well defined. Gage read to hundredths daily. Daily discharge ascertained by applying mean daily gage height to rating table. Shifting-control method used May 14 to July 6 and August 22 to September 6. Records excellent.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation and United States Office of Indian Affairs.

Canal diverts water from right bank of Yakima River in sec. 28, T. 12 N., R. 19 E., about half a mile above intake of Sunnyside canal. Water is used for irrigation.

Discharge measurements of Old Reservation canal at Parker, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 30	D. E. Ball	2.00	52.8	May 18	Raleigh Skillin	4.41	214
Mar. 22	Raleigh Skillin	1.37	12.3	28	R. O. Crawford	4.45	207
Apr. 1	do	2.32	56.4	June 3	Houston and Skillin	5.06	285
5	do	2.34	59.7	July 6	D. E. Ball	4.73	235
9	do	2.96	97.8	18	Raleigh Skillin	4.50	215
12	Crawford and Ball	4.22	213	Aug. 1	R. O. Crawford	3.55	121
13	Raleigh Skillin	4.00	185	3	Raleigh Skillin	3.57	122
20	do	4.82	264	8	do	3.76	140
May 2	R. O. Crawford	4.31	214	21	do	4.01	166
3	Houston and Skillin	4.37	223	26	D. E. Ball	4.02	157
10	do	4.73	254	Sept. 7	Raleigh Skillin	3.32	122
13	D. E. Ball	3.60	150	7	D. E. Ball	3.32	120

Daily discharge, in second-feet, of Old Reservation canal at Parker Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Apr.	May.	June.	July.	Aug.	Sept.
1	48	57	216	266	246	124	163
2	66	46	215	290	235	122	163
3	65	44	218	287	227	122	163
4	65	44	229	283	225	124	163
5	65	54	225	287	226	129	163
6	60	55	222	283	233	144	163
7	54	68	226	270	231	144	137
8	54	90	236	263	217	142	128
9	66	99	233	248	218	144	126
10	60	128	254	242	213	144	128
11	54	147	276	256	209	144	103
12	54	201	166	252	214	144	85
13	54	200	154	264	211	153	83
14	54	189	274	263	204	163	82
15	54	200	262	257	198	163	72
16		219	259	247	216	163	71
17		243	245	235	207	168	74
18		244	218	245	212	163	73
19		246	226	265	201	168	73
20		262	223	264	222	163	71
21		258	216	269	206	163	74
22		285	213	266	205	163	74
23		317	221	266	193	163	71
24		322	201	263	144	163	69
25		314	191	260	144	163	69
26		267	199	256	144	164	67
27		234	198	250	144	163	67
28		226	204	245	122	163	
29		222	228	237	115	163	
30		224	237	270	117	163	
31			244		122	163	

NOTE.—Probably no flow Oct. 16 to Mar. 31 and Sept. 28–30.

Monthly discharge of Old Reservation canal at Parker, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October 1–15	66	48	58.2	1,730
April	322	44	184	10,900
May	274	154	224	13,700
June	290	235	262	15,600
July	246	115	194	11,900
August	164	122	152	9,350
September 1–27	163	67	103	5,500

SUNNYSIDE CANAL NEAR PARKER, WASH.

LOCATION.—In sec. 28, T. 12 N., R. 19 E., 600 feet below intake, 1½ miles east of Parker, Yakima County, and 3½ miles northwest of Wapato.

RECORDS AVAILABLE.—Irrigation seasons 1904 to September 30, 1921.

GAGE.—Lietz water-stage recorder on right side; installed April 20, 1909, and referred to vertical staff installed April 6, 1908, at same site. Recorder inspected daily by employee of United States Bureau of Reclamation. For description of previous gages see Water-Supply Paper 442.

DISCHARGE MEASUREMENTS.—Made from gaging bridge 30 feet below gage.

CHANNEL AND CONTROL.—Bottom of canal gravel; fairly permanent. Operation of flashboard at drop No. 1 makes control changeable.

EXTREMES OF DISCHARGE.—Maximum mean daily discharge during season, 1,260 second-feet on August 7, 8, 13, 14, and 16; no flow reported during nonirrigating season.

1904–1921: Maximum mean daily discharge, 1,270 second-feet July 21, 1917; no flow reported during nonirrigating seasons.

ACCURACY.—Stage-discharge relation not permanent; affected by operation of flashboards at drop No. 1. Current-meter measurements are made frequently and discharge ascertained by shifting-control method. Records excellent.

COOPERATION.—Complete record furnished by United States Bureau of Reclamation.

Canal diverts water from left bank of Yakima River in sec. 28, T. 12 N., R. 19 E., about half a mile below intake of Old Reservation canal. Water is used for irrigation.

Discharge measurements of Sunnyside canal near Parker, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 7	B. G. James	3.70	577	June 28	B. G. James	5.52	1,230
18	do	3.50	545	July 7	do	5.60	1,260
27	James and Carmody	2.80	355	18	do	5.61	1,230
Mar. 25	James and Dowd	2.09	235	26	do	5.63	1,250
Apr. 7	B. G. James	3.04	467	Aug. 8	do	5.67	1,250
18	James and Dowd	5.15	1,080	17	do	5.67	1,260
26	B. G. James	5.36	1,200	29	do	5.46	1,200
30	do	5.40	1,210	Sept. 7	do	5.25	1,100
May 10	do	5.45	1,220	16	do	4.16	787
17	do	5.37	1,230	19	James and Carmody	4.74	912
26	do	5.35	1,200	21	B. G. James	4.46	843
June 6	do	5.38	1,210	28	James and Palmer	4.08	702
21	do	5.45	1,200				

Daily discharge, in second-feet, of Sunnyside canal near Parker, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	654		498	1,220	1,200	1,240	1,250	1,170
2	636		561	1,210	1,210	1,240	1,250	1,170
3	597		615	1,210	1,200	1,240	1,250	1,160
4	591		636	1,210	1,210	1,250	1,250	1,150
5	577		666	1,200	1,200	1,240	1,250	1,140
6	571		713	1,210	1,200	1,240	1,250	1,130
7	577		461	1,210	1,200	1,250	1,260	1,110
8	574		519	1,210	1,200	1,250	1,260	1,090
9	577		660	1,210	1,200	1,250	1,250	1,090
10	583		784	1,220	1,200	1,240	1,250	1,070
11	583		826	1,210	1,200	1,240	1,250	1,060
12	583		878	1,220	1,200	1,230	1,250	1,040
13	577		944	1,230	1,200	1,230	1,260	1,020
14	568		984	1,240	1,190	1,230	1,260	967
15	565		1,020	1,240	1,190	1,230	1,250	954
16	568		1,050	1,240	1,180	1,220	1,260	878
17	559		1,090	1,220	1,180	1,230	1,250	769
18	545		1,120	1,210	1,170	1,240	1,250	816
19	517		1,120	1,200	1,190	1,230	1,250	897
20	474		1,140	1,200	1,190	1,240	1,250	897
21	455	155	1,140	1,220	1,190	1,230	1,250	862
22	425	181	1,160	1,220	1,190	1,240	1,250	832
23	395	199	1,160	1,210	1,200	1,240	1,240	784
24	382	237	1,170	1,210	1,220	1,240	1,220	722
25	372	237	1,170	1,200	1,220	1,240	1,220	716
26	365	237	1,190	1,190	1,220	1,240	1,220	713
27	356	257	1,210	1,190	1,240	1,240	1,220	713
28	340	311	1,210	1,200	1,240	1,250	1,200	713
29	317	356	1,220	1,200	1,240	1,240	1,210	719
30	295	404	1,210	1,200	1,240	1,240	1,200	713
31	208	495		1,200		1,240	1,190	

Monthly discharge of Sunnyside canal near Parker, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	654	208	496	30,500
March 21-31	495	155	279	6,090
April	1,220	461	938	55,800
May	1,240	1,190	1,210	74,400
June	1,240	1,170	1,200	71,400
July	1,250	1,220	1,240	76,200
August	1,260	1,190	1,240	76,200
September	1,170	713	936	55,700

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, 1921.

GAGE.—Stevens continuous water-stage recorder on left bank half a mile east of ranch house; installed August 19, 1915; inspected by J. P. McCafferty and A. B. Morrison. Previous gages as follows: February 27, 1909, to July 22, 1913, on left bank a quarter of a mile above site of present gage; July 23, 1913, to August 18, 1915, vertical staff attached to cottonwood tree on right bank 150 feet above site of present gage.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Concrete control constructed in September, 1916, is gradually being washed away. Banks covered with brush; subject to overflow at extremely high water.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 4.85 feet at 4 p. m. December 30 (discharge, 1,070 second-feet); minimum stage, from recorder, 1.11 feet at 10.30 p. m. July 22 (discharge, 4.2 second-feet).

1909–1921: Maximum discharge recorded, 1,650 second-feet at noon May 4, 1916; minimum stage recorded, 1.14 feet August 15 and September 18, 1920 (discharge, 3.0 second-feet).

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

DIVERSIONS.—Toppenish Feeder canal operated since April 1, 1921, diverted a maximum of about 25 second-feet during the season. 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 is proposed.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed gradually October 1–22, abruptly on February 10, and at crest of spring flood April 22; not affected by ice. Standard rating curve used prior to April 22, fairly well defined; curve used thereafter, well defined. Parallel curves used October 23 to February 10 and February 10 to March 18. 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 by inspection from recorder graph. Shifting-control method used October 1–22. Records fair October to April; good thereafter.

Discharge measurements of Toppenish Creek near Fort Simcoe, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 23	John McCombs	1.86	17.2	Apr. 11	McCombs and McCafferty	3.10	290
23	do	1.86	17.7	June 15	R. B. Kilgore	1.84	44.9
Feb. 18	R. B. Kilgore	2.77	204	15	do	1.84	46.4
18	do	2.76	203				
Apr. 9	John McCombs	2.98	240				

Daily discharge, in second-feet, of Toppenish Creek near Fort Simcoe, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	14	18	44	341	43	234	328	289	113	23.0	7.0	8.5
2	14	18	41	300	44	241	378	286	104	22.0	6.0	9.0
3	14	19	44	471	45	257	382	266	95	19.0	6.5	8.5
4	14	19	45	382	47	310	341	257	87	16.0	10.0	9.0
5	14	18	44	296	47	314	300	251	76	13.0	9.0	9.0
6	14	18	41	234	48	296	274	251	71	11.0	8.5	8.5
7	14	18	38	182	52	266	253	277	67	10.0	8.5	8.0
8	14	19	36	148	65	245	241	292	63	8.5	8.0	8.5
9	16	19	36	124	74	237	245	301	59	8.5	7.5	9.0
10	16	19	41	106	337	249	257	323	58	8.0	7.5	8.5
11	16	20	50	92	723	234	296	323	55	7.5	8.0	8.0
12	16	20	46	80	821	207	369	313	52	7.0	8.0	8.0
13	16	20	42	74	674	193	410	295	49	7.0	8.5	8.5
14	16	21	41	88	586	170	382	307	47	6.5	8.5	8.5
15	16	22	37	146	438	148	341	319	44	6.0	8.5	9.0
16	16	25	37	131	328	146	314	355	46	7.5	8.0	8.5
17	17	37	37	111	253	332	318	379	43	8.5	8.0	8.5
18	17	99	37	97	210	920	346	355	42	7.0	9.5	8.5
19	17	100	37	87	176	772	373	352	42	7.0	9.0	10.0
20	17	100	37	76	157	600	364	319	39	7.0	8.5	10.0
21	18	100	33	68	141	499	350	289	38	8.0	8.0	9.5
22	18	51	33	63	124	490	428	268	35	8.5	8.5	9.0
23	18	50	33	59	167	424	411	251	33	7.5	8.5	8.5
24	18	50	33	57	222	387	365	234	30	7.0	9.0	8.5
25	17	49	33	54	230	369	335	221	28	6.0	9.0	8.5
26	17	49	33	51	234	332	316	207	31	6.5	9.0	8.0
27	16	48	33	48	241	296	301	186	32	6.5	9.0	8.0
28	16	47	71	44	241	274	307	165	30	6.0	8.5	8.5
29	16	46	103	44	-------	300	313	146	25	5.5	8.0	9.0
30	17	44	528	44	-------	300	301	131	26	5.5	7.0	10.0
31	17	-------	626	43	-------	310	-------	121	-------	7.0	7.0	-------

NOTE.—Water-stage recorder not operating Oct. 1-27, and Nov. 19-26; discharge ascertained by interpolating between discharge from occasional staff gage readings or by comparison with flow of Satus Creek. Braced figures show mean discharge for periods indicated. Observer estimated that about 25 second-feet wasted down Abe Lincoln ditch on Nov. 18, 19, 20, and 21, about 30 second-feet for a few hours on Dec. 30, and about 15 second-feet on Feb. 11 and in addition 20 second-feet passed down a draw above gage, and about 30 second-feet passed around gage on Mar. 19; not included in above table.

Monthly discharge of Toppenish Creek and Toppenish Feeder canal near Fort Simcoe, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Creek.			Canal (mean).	Combined (mean).	
	Maximum.	Minimum.	Mean.			
October	18	14	16.0	----------	16.0	984
November	100	18	39.4	----------	39.4	2,340
December	626	33	76.5	----------	76.5	4,700
January	471	43	134	----------	134	8,240
February	821	43	242	----------	242	13,400
March	920	146	334	----------	334	20,500
April	428	241	331	2.60	334	19,900
May	379	121	269	14.2	283	17,400
June	113	25	52.0	20.0	72.0	4,280
July	23	5.5	9.16	19.6	28.8	1,770
August	10	6	8.21	9.56	17.8	1,090
September	10	8	8.72	8.94	17.7	1,050
The year	920	5.5	126	----------	132	95,700

NOTE.—Probably no flow through canal prior to April.

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, 1921. For a station just above Spring Creek, February 28, 1909, to November 20, 1915.

GAGE.—Stevens continuous water-stage recorder on left bank just below Spring Creek; installed November 20, 1915; inspected by Ivan Hartzell, J. P. McCafferty, and A. B. Morrison. Previous gages as follows: Prior to March 24, 1910, a chain gage 100 yards above Spring Creek; March 24, 1910, to November 20, 1915, staff gage at same site and datum.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage or by wading. Several overflow channels were created during high water of December 30, 1920, and since that date discharge measurement at medium and high stages include measured flow in these channels.

CHANNEL AND CONTROL.—Bed composed of sand and gravel. Concrete control 16 feet below gage. Right bank high; left bank overflows at medium stage.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 4.15 feet at 1.30 p. m. February 13 (discharge, 296 second-feet); minimum discharge, probably less than 0.1 second-foot during periods October 1–8 and 11–20.

1916–1921: Maximum stage recorded, 6.14 feet at 5 p. m. February 10, 1916 (discharge, 731 second-feet); minimum discharge probably occurred in October, 1920.

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

DIVERSIONS.—Considerable water is diverted above station for irrigation. Since about April, 1920, Simcoe Creek flume has diverted from 0.25 second-foot to 5 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 during flood of December 30, 1920, when headworks of Simcoe Creek flume were washed out and several new channels were formed which carried a large percentage of the water around gage during period December 30 to June 10. Rating curve used prior to change fairly well defined; curve used after change fairly well defined between 10 and 150 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 from recorder graph by inspection. Records fair June to August; otherwise poor.

Discharge measurements of Simcoe Creek below Spring Creek, near Fort Simcoe, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 22	John McCombs	0.10	[a] 0.2	Apr. 10	John McCombs	1.56	[c] 68.7
Feb. 15	R. B. Kilgore	2.98	[b] 129	June 14	R. B. Kilgore	.61	[d] 15.8
16	do	2.58	[b] 104	14	do	.61	[d] 14.8
17	do	2.26	[a] 111				

[a] Estimated.
[b] Main channel only.
[c] Total in main channel and overflow channels.
[d] Main channel only; no overflow around gage.

NOTE.—Measured discharge in main channel on Feb. 17 was 87.0 second-feet, and on Apr. 10, 59.6 second-feet.

Daily discharge, in second-feet, of Simcoe Creek below Spring Creek, near Fort Simcoe, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1		0.2	0.2	79	22	116	88	48	29	5.8	1.9	0.9
2		.2	.2	106	22	113	100	44	28	4.7	1.9	.7
3		.2	.2	194	22	113	106	41	26	4.4	1.7	.7
4		.3	.6	135	23	120	100	39	25	4.1	1.7	.6
5	0.1	.3	1.1	120	23	124	94	38	24	4.4	1.6	.9
6		.3	1.3	94	23	116	85	36	22	4.7	2.0	.9
7		.3	1.4	74	23	110	79	34	22	4.7	2.0	.9
8		.3	1.4	65	24	100	72	34	21	4.4	2.3	.7
9	.1	.3	1.7	54	25	97	69	37	19.5	4.1	2.0	.6
10	.1	.3	1.5	42	116	94	68	41	19.5	4.4	2.0	.6
11		.3	2.2	37	240	91	69	46	19.0	3.8	2.3	.6
12		.3	3.5	37	266	85	82	50	18.0	3.8	2.3	.7
13		.4	2.2	34	266	79	88	53	17.5	3.8	2.3	.7
14		.4	1.8	68	220	71	85	60	16.5	3.8	2.0	.6
15		.4	1.8	72	174	66	76	69	15.5	3.5	2.3	.6
16	.1	.7	2.0	65	135	65	72	94	14.5	3.2	2.3	.7
17		.5	2.0	59	113	85	68	116	13.5	2.9	2.0	.7
18		.4	2.0	53	97	135	73	116	13.5	2.6	2.0	.6
19		.2	2.0	45	85	139	76	116	13.0	2.3	2.3	.6
20		.2	2.0	41	79	127	76	110	11.5	2.3	2.0	.7
21	.1	.2	2.0	36	72	120	72	100	10.0	2.3	2.0	.6
22	.1	.2	2.2	33	65	135	75	91	10.5	2.3	2.0	.6
23	.1	.2	2.2	30	72	120	85	82	10.0	2.3	1.9	.6
24	.1	.2	2.4	28	106	113	76	75	9.0	2.0	1.7	.6
25	.1	.2	2.7	27	116	106	69	71	9.0	1.7	1.6	.6
26	.1	.2	2.7	26	116	100	62	67	8.6	2.0	1.6	.6
27	.1	.2	2.7	24	116	91	57	58	7.7	2.0	1.6	.6
28	.1	.2	2.7	23	116	88	56	48	6.8	2.0	1.6	.5
29	.1	.2	3.7	24	-------	85	53	40	6.8	2.0	1.3	.6
30	.1	.2	132	23	-------	85	53	34	6.8	2.0	1.0	.6
31	.2	-------	110	22	-------	85	-------	32	-------	2.0	1.0	-------

NOTE.—Water-stage recorder not operating Oct. 1-8, 11-20, and Nov. 29-30; discharge determined from record of range of stage and 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, 1921.

Month.	Discharge in second-feet.					Combined run-off in acre-feet.
	Creek.			Flume (mean).[a]	Combined (mean).	
	Maximum.	Minimum.	Mean.			
October	----------	----------	0.10	----------	0.10	6.1
November	0.7	0.2	.28	----------	.28	16.7
December	132	.2	9.56	1	10.6	650
January	194	22	57.1	3	60.1	3,690
February	266	22	99.2	5	104	5,790
March	139	65	102	4	106	6,520
April	106	53	76.1	3	79.1	4,710
May	116	32	61.9	8	69.9	4,300
June	29	6.8	15.8	4	19.8	1,180
July	5.8	1.7	3.24	1	4.24	261
August	2.3	1.0	1.88	1	2.88	177
September	.9	.5	.66	1	1.66	98.8
The year	266	----------	35.3	2.6	37.9	27,400

[a] Estimated roughly from three discharge measurements (p. 218) and two to four gage readings per month on flume gage.

NOTE.—Probably no flow through flume prior to December.

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, 1921; miscellaneous measurements 1911 and 1912.

GAGE.—Vertical staff on right bank under highway bridge; read by Mrs. M. Gelhart.

DISCHARGE MEASUREMENTS.—Made from footbridge 1,000 feet below gage.

CHANNEL AND CONTROL.—Bed composed of gravel; shifting. Banks high. Current swift at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.9 feet June 10–15 (discharge, 624 second-feet); minimum stage recorded, 3.02 feet April 9 (discharge, 196 second-feet).

1913–1921: Maximum stage recorded, 8.2 feet on January 2, 1918, from high-water mark (discharge, estimated 1,500 second-feet); minimum stage recorded, 1.8 feet July 3, August 12, 15–31, September 1–14, 19, 1915 (discharge, 145 second-feet).

ICE.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed gradually October 1 to February 13. Standard rating curve fairly well defined. Gage read to quarter-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Shifting-control method used October 1 to February 13. 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, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 23	John McCombs	3.28	279	Mar. 3	John McCombs	3.47	290
Feb. 14	Kilgore and Skillin	3.85	384	Apr. 8	do	3.30	258

Daily discharge, in second-feet, of Reservation drain at Alfalfa, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	362	268	226	236	216	323	246	301	506	576	459	506
2	362	268	226	268	216	301	246	301	506	576	459	530
3	362	257	226	268	216	301	257	301	530	576	459	530
4	362	257	226	279	226	279	279	301	530	576	459	553
5	339	257	226	279	226	279	279	301	553	576	459	553
6	339	257	226	279	226	279	268	301	553	576	459	553
7	339	257	226	301	226	279	257	301	576	553	436	553
8	339	246	226	279	226	279	257	301	600	506	436	553
9	317	246	226	268	226	279	196	301	600	506	459	553
10	317	236	216	268	226	279	279	301	624	506	459	553
11	339	236	216	246	236	257	279	323	624	506	459	563
12	317	236	216	246	246	257	268	323	624	506	436	530
13	317	236	216	236	301	257	257	323	624	482	436	530
14	295	236	216	236	390	257	257	323	624	482	436	530
15	295	236	216	236	390	246	257	323	624	482	459	530
16	295	236	216	246	368	236	257	345	600	459	459	506
17	295	236	216	246	345	236	257	368	600	459	459	506
18	295	236	216	246	323	236	268	390	576	436	459	530
19	295	236	226	246	301	236	268	390	576	436	459	530
20	295	236	226	246	301	279	268	436	553	436	482	530
21	284	236	216	246	279	323	268	459	553	436	482	530
22	284	236	216	236	268	323	279	459	553	482	482	506
23	284	236	216	236	268	323	279	459	530	482	506	482
24	279	236	216	236	268	323	279	459	553	482	506	482
25	279	236	216	236	279	323	301	459	553	482	506	482
26	268	236	216	226	279	301	301	482	576	459	506	459
27	268	236	216	226	301	279	279	482	576	459	506	459
28	268	236	216	216	323	279	279	506	576	459	506	459
29	268	236	216	216	-------	268	301	506	576	459	506	436
30	268	236	226	216	-------	257	301	506	576	482	506	436
31	268	-------	226	216	-------	246	-------	530	-------	482	506	-------

Monthly discharge of Reservation drain at Alfalfa, Wash., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	362	268	306	18,800
November	268	236	242	14,400
December	226	216	220	13,500
January	301	216	247	15,200
February	390	216	275	15,300
March	323	236	278	17,100
April	301	196	269	16,000
May	530	301	383	23,600
June	624	506	574	34,200
July	576	436	496	30,500
August	506	436	471	29,000
September	553	436	515	30,600
The year	624	196	357	258,000

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, 1921.

GAGE.—Stevens continuous water-stage recorder on left bank; inspected by W. A. Walker and H. E. Larimore.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel; shifting. Stage of zero flow, according to measurements made October 24, 1921, gage height 0.77 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 7.4 feet at 12.30 a. m. February 11 (discharge, 2,400 second-feet); minimum stage, from recorder, 1.43 feet October 1 (discharge, 9.6 second-feet).

1913–1921: Maximum stage recorded, 9.15 feet December 22, 1915, from high-water mark in gage 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 at times.

DIVERSIONS.—Entire flow of Satus Creek above Lazy Creek is diverted for irrigation during July and August; records for low-water summer months show run-off of Lazy and Dry creeks and seepage return from upper Satus.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed February 10–11 and gradually September 1–30; not affected by ice. Rating curves fairly well defined. Operation of water-stage recorder unsatisfactory through several periods as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection. Shifting-control method used September 1–30. Records good except for periods of no gage-height record, for which they are fair.

Discharge measurements of Satus Creek below Dry Creek, near Toppenish, Wash., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 24	John McCombs	1.57	15.6	Mar. 2	John McCombs	3.15	399
Feb. 20	R. B. Kilgore	2.78	274	Apr. 8	do	2.52	207

Daily discharge, in second-feet, of Satus Creek below Dry Creek, near Toppenish, Wash., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9.6	19	54	461	97	400	279	150	169	40	16	14
2	9.9	19	51	434	97	390	270	145	172	39	15	14
3	11	19	50	682	104	390	264	143	167	38	15	15
4	11	20	46	530	110	413	252	138	169	37	15	14
5	12	20	45	530	108	397	240	136	162	34	14	14
6	12	19	42	444	99	371	232	134	162	32	14	14
7	12	19	40	364	99	342	217	131	157	31	14	14
8	12	19	40	304	117	323	201	131	150	28	14	14
9	12	20	40	261	170	301	192	131	134	27	14	14
10	12	20	40		1,180	288	187	134	129	26	13	14
11	12	19	48		1,830	273	182	143	124	26	13	14
12	13	21	50	200		258	179	145	113	25	13	14
13	15	21	48			249	195	150	98	24	13	14
14	14	22	45			235	195	152	94	23	13	14
15	13	23	35			215	185	162	88	22	14	14
16	15	24	40		650	235	177	185	88	21	14	14
17	13	26	45			624	172	198	82	21	13	14
18	15	85	43	200		1,020	185	212	76	20	13	14
19	16	106	40			691	203	217	76	19	14	14
20	15	104	39		276	582	201	220	69	19	14	17
21	15	79	36	158		530	185	217	66	19	13	17
22	16	67	36	155		600	182	203	62	18	13	16
23	16	60	36	140		582	185	201	58	18	13	16
24	17	54	36	134		495	182	198	52	18	13	16
25	18	51	38	132	350	444	174	201	50	17	13	16
26	18	56	38	127		397	162	209	48	17	14	16
27	18	87	38	117		364	157	198	47	17	14	16
28	18	71	42	110		345	152	177	46	16	14	16
29	18	64	149	108		329	152	167	43	16	14	16
30	18	60	1,240	102		310	150	164	40	16	14	16
31	18		794	99		291		167		16	14	

NOTE.—Water-stage recorder not operating Jan. 10–20, Feb. 12 to Mar. 1, and July 9–18; discharge Jan. 10–20, Feb. 12–19, and Feb. 21 to Mar. 1 estimated by comparison with flow of Toppenish Creek near Fort Simcoe; Feb. 20, from staff gage readings; and July 9–18, by interpolation. 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, 1921.

Month	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	18	9.6	14.3	879
November	106	19	43.1	2,560
December	1,240	35	109	6,700
January	682	99	245	15,100
February	1,830	97	439	24,400
March	1,020	215	409	25,100
April	279	150	196	11,700
May	220	131	170	10,500
June	172	40	99.7	5,930
July	40	16	23.9	1,470
August	16	13	13.8	848
September	17	14	14.8	881
The year	1,830	9.6	146	106,000

MISCELLANEOUS DISCHARGE MEASUREMENTS.

In addition to the records of stream flow obtained at gaging stations and reported in the preceding pages, measurements of flow were made at a number of other points, as shown by the following table:

Miscellaneous discharge measurements in drainage basins in Washington during the year ending Sept. 30, 1921.

Chehalis River basin.

Date.	Stream.	Tributary to or diverting from—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Jan. 7	Chehalis River	Grays Harbor	Galvin Bridge, near Centralia, Wash.	93.36	17,300

Skokomish River basin.

Sept. 5	Skokomish River	Hood canal	Olympic Highway bridge near Union, Wash.		573

Snohomish River basin.

Oct. 9[a]	Dorothy Creek	East Fork of Miller Creek.	Outlet of Dorothy Lake, Wash.	1.82	72.1
10[a]	do	do	do	1.67	53.4
10[a]	do	do	do	1.66	54.1
10[a]	do	do	do	1.65	52.8
11[a]	do	do	do	1.69	56.6
11[a]	do	do	do	1.72	59.9
12[a]	do	do	do	1.79	64.4
12[a]	do	do	do	1.78	65.0
13[a]	do	do	do	1.68	55.6
13[a]	do	do	do	1.67	54.4
14[a]	do	do	do	1.79	66.8
14[a]	do	do	do	1.82	71.2
15[a]	do	do	do	1.79	66.8
15[a]	do	do	do	1.79	65.5
16[a]	do	do	do	1.68	59.7
16[a]	do	do	do	1.67	55.7

Skagit River basin.

May 24	Skagit River	Skagit Bay	Suspension footbridge at Newhalem power camp, Wash.	488.22	16,600
Aug. 5	do	do	do	483.38	4,190
Sept. 25	do	do	do	481.70	2,110
Oct. 28	Colonial Creek	Thunder Creek	Mouth, Washington		13.1

[a] Furnished by Stone & Webster Engineering Corporation.

Miscellaneous discharge measurements in drainage basins in Washington during the year ending Sept. 30, 1921—Continued.

Nooksack River basin.

Date.	Stream.	Tributary to or diverting from—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Oct. 17	Nooksack River	Bellingham Bay	Railway bridge at Warnick, Wash.		1,260
17	Glacier Creek	Nooksack River	¼ mile above highway bridge, Glacier, Wash		165
13	Skookum Creek	South Fork of Nooksack River.	Highway bridge near mouth, Washington.		238
Sept. 11	do	do	do		42.8

Kettle River basin.

Apr. 22	Curlew Lake branch of Sanpoil River.[b]	Curlew Lake	Torboy, Wash		1.0
21	Lambert Creek	Curlew Creek	Mouth, Washington		4.7
21	do	do	do		4.2
May 25	do	do	do		8.1

Spokane River basin.

June 16	Spokane River	Columbia River	Blackwell Lumber Co.'s bridge at Coeur d'Alene, Idaho.	[c] 26.72	12,400
Oct. 6	Little Spokane River	Spokane River	Mouth, Washington	1,540.69	341

Sanpoil River basin.

Apr. 22	Sanpoil River	Columbia River	40 feet below Curlew Lake branch at Torboy, Wash.		13.4
May 26	do	do	do		22.3
Apr. 23	O'Brien Creek	Sanpoil River	200 feet above mouth, Washington.		25.3
May 26	do	do	10 feet below tailrace of Curlew creamery power plant at Republic, Wash.		62.3
Apr. 23	Granite Creek	do	600 feet above mouth of Creek draining Mud Lake, in Republic, Wash.		71.5
Oct. 11	Lost Creek	West Fork of Sanpoil River.	Dam site 1½ miles above gage on Lost Creek near Aeneas, Wash.		2.5

Okanogan River basin.

Oct. 5	Okanogan River	Columbia River	Lower highway bridge at Oroville, Wash.		219
6	Sinlahekin Creek	Similkameen River	Former gaging station at Blue Lake, near Loomis, Wash.	1.93	4.2
6	do	do	do	1.93	3.1
6	do	do	Former gaging station at Garrett's ranch, near Loomis, Wash.		2.1
May 6	Chopaka Creek	Sinlahekin Creek	¼ mile below outlet of Chopaka Lake, Wash.	[d] 2.6	1.5
Apr. 25	West Okanogan Valley Irrigation District canal.	Similkameen River	20 feet below spillway, ¼ mile above Salts plant, near Oroville, Wash.	1.12	42.5
Oct. 8	Anglin ditch	Bonaparte Creek	Opposite gage on Bonaparte Creek near Anglin, Wash.	2.76	.8
8	do	do	do	2.68	.6
May 25	do	do	do	3.20	3.2

[b] Upper Sanpoil drainage which flows into Curlew Lake.
[c] Coeur d'Alene Lake gage.
[d] Inches.

Miscellaneous discharge measurements in drainage basins in Washington during the year ending Sept. 30, 1921—Continued.

Methow River basin.

Date.	Stream.	Tributary to or diverting from—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Oct. 17	Methow River	Columbia River	Former gaging station at Pateros, Wash.	5.02	1,030
15	Falls Creek	Chewack Creek	400 feet above mouth, above Falls Creek ditch, Washington.		16.8
15	Eightmile Creek	do	100 feet above bridge, Washington.		23.4
15	Boulder Creek	do	50 feet above bridge, Washington.		6.6
July 23	do	do	30 feet above bridge, Washington.		11.8
24	Methow Valley Irrigation District canal.	Right side of Twisp River, about 4½ miles above mouth.	3 miles below headworks, Twisp, Wash.	2.61	53.3

Yakima River basin.

Apr. 11	Toppenish Feeder canal.	Left side of Toppenish Creek, about 1 mile above gage, near Fort Simcoe.	250 feet below headgate, Washington.	1.71	3.9
11	do	do	do	2.18	10.9
June 15	do	do	do	2.65	21.1
Feb. 17	Simcoe Creek flume	Left side of Simcoe Creek a short distance above gage, near Fort Simcoe.	Gaging station near headworks, Washington.	1.12	4.4
Apr. 10	do	do	do	1.15	3.6
June 14	do	do	do	1.12	4.1

INDEX.